TRANSLATED VERSION OF THE ORIGINAL SPANISH TEXT

SERIES 5 Maritime and port works in the surroundings of the coastal area

RECOMMENDATIONS FOR MARITIME WORKS

ROM 5.1-13

Quality of coastal waters in port areas

Puertos del Estado

GOBIERNO DE ESPAÑA MINISTERIO DE FOMENTO

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GOBIERNO DE ESPAÑA MINISTERIO DE FOMENTO

RECOMMENDATIONS FOR QUALITY OF COASTAL WATERS IN PORT AREAS

ROM 5.1-13

Prologue

The need to establish standardised operational protocols in the area of maritime engineering has resulted in the development of the **ROM (Recomendaciones de Obras Marítimas – Maritime Works Recommendations) Program.** The constitution of the Technical Commission responsible for its development in 1987 commenced the drawing up of a series of technical standards that establish the execution procedures, methods and criteria in maritime and port works executed in state-owned ports.

The range of subjects in the Recommendations required them to be structured into seven thematic series:

- **Series 0:** Definition and classification of the project situation and factors in maritime and port works.
- **Series 1:** Shelter works against sea oscillations.
- **Series 2:** Mooring works project and execution.
- **Series 3:** Planning, project, management and operation of port areas.
- **Series 4:** Land-based superstructures and installations in the port areas.
- **Series 5:** Maritime and port works in the coastal environment.
- **Series 6:** Technical, administrative and legal provisions.

Among these, Series 5, **Maritime and Port Works in the Coastal Environment,** covers the recommendations aimed at the development of Environmental Impact Studies (ROM 5.0), Coastal Maritime and Port Works (ROM 5.2), Dredging and filling (ROM 5.3) and the development of this document: ROM 5.1, Coastal Water Quality in Port Areas. Within this framework, ROM 5.1-05 was published in 2005 to tackle the problems involved in port water, within the spirit and principles established by the EU Water Framework Directive (2000/60/CE): "To establish a framework for the protection of continental surface waters, transitional waters, coastal waters and groundwaters", all this, taking into account that the port aspects and activities must be present in the general planning as well as in the manner in which to tackle the aquatic system problems and management.

After its publication in 2005, the methodological procedure of ROM5.1-05 was validated by means of a pilot study in the Ports of Tarragona, Gijón and Huelva. As a result of this calibration work, certain aspects of the original methodological proposal were updated in this document.

This **ROM 5.1-13**, **Recommendation on Coastal Water Quality in Port Areas**, was drawn up by the Spanish National Port Administration (Puertos del Estado), under the responsibility and supervision of the Technical Management, with the participation of the following persons:

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The aim of this recommendation, which combines legislative, methodological and technological aspects, is to serve as a base document in the planning and development of management systems for port water quality.

ROM 5.1-13 is structured into five large working chapters: 1) Articles, 2) Technical and Legal Fundamentals, 3) Technical Methods, 4) Data and 5) Tools, each of which develops specific aspects relating to the application of the proposed methodology. In order to better understand the document and to facilitate implementation, the aspects and contents covered in each chapter are indicated below.

The **Articles** represent the central chapter of the Recommendation, establishing the line of reasoning and application methodology for each of the four basic elements that make up this document, the Delimitation and Typification of Port Aquatic Management Units Program, the Environmental Risk Assessment and Management Program, the Environmental Quality Monitoring Program and the Pollutant Incident Management Program.

As a complement to the application methodology, the **Technical and Legal Fundamentals** justify the proposed procedures, framing them within the legal environment, both EU and state and developing the most relevant theoretical scientific and technical aspects for the Articles.

The chapter on **Technical Methods** includes a detailed list of the various methods and techniques proposed in the Articles.

The **Data** chapter is intended to contain the information required for ROM 5.1-13 application.

The document is completed with a description of the **Tools** that could be of use in the application of this Recommendation.

MINISTERIO
DE FOMENTO

Puertos del Estado

José Llorca Ortega
PRESIDENTE

IR/or

Madrid 25 de junio de 2013

ASUNTO: APROBACIÓN DEL DOCUMENTO ROM 5.1-13, CALIDAD DE LAS AGUAS LITORALES EN AREAS PORTUARIAS, REVISIÓN ACTUALIZADA DEL DOCUMENTO ROM 5.1-05.

Desde el 21 de junio del 2012, la Comisión Técnica nombrada al efecto, formada por 40 expertos pertenecientes a la universidad, las empresas consultoras y constructoras, a distintos organismos públicos de investigación, a Puertos del Estado y las Autoridades Portuarias; ha trabajado en la revisión del documento ROM 5.1-05, desarrollado en su día por el equipo de investigadores del Instituto de Hidráulica Ambiental de la Universidad de Cantabria (IH Cantabria), y que han actuado también como responsables de la ponencia para su nueva redacción.

En la reunión la Comisión Técnica, celebrada el 18 de febrero de 2013, se acordó por unanimidad y por tanto, sin ningún voto particular, la aprobación del documento ROM 5.1-13, CALIDAD DE LAS AGUAS LITORALES EN AREAS PORTUARIAS.

Esta revisión de la recomendación ROM 5.1, representa un avance metodológico destacable desde el punto de vista de los puertos del sistema portuario de titularidad estatal, respecto de las propuestas que en 2005 planteaba la primera versión de la recomendación, en materia de desarrollo sostenible y gestión ambiental integral de sus aguas competenciales.

La actual revisión de la ROM 5.1, ha sido redactada desde la perspectiva planificadora y gestora de los puertos pero ya considerando todo el amplio marco de referencia administrativo y regulador en materia de aguas costeras y de transición; actualmente en muy avanzado estado de desarrollo en España, como consecuencia de la implantación de los principios de la Directiva Marco del Agua, así como de toda la regulación internacional, nacional, autonómica y local hoy en día existente.

Adicionalmente, los años transcurridos desde la publicación de la primera edición de la recomendación, han permitido una completa calibración y validación de los procedimientos metodológicos propuestos, mediante ejercicios piloto realizados en diversos puertos del sistema portuario de titularidad estatal.

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Todo ello ha contribuido a que el actual planteamiento metodológico de la ROM 5.1-13, resulte coherente con el amplio contexto regulatorio de las aguas costeras y de transición que gravita sobre las aguas portuarias y que además resulte también robusta su aplicación por las Autoridades Portuarias para la gestión de la calidad del agua en sus puertos.

A la vista del acuerdo unánime alcanzado por la Comisión Técnica, una vez remitido el texto a las Autoridades Portuarias, discutidas e incorporadas, en su caso, las alegaciones recibidas por dicha Comisión.

HE RESUELTO:

Aprobar el Documento ROM 5.1-13, CALIDAD DE LAS AGUAS LITORALES EN AREAS PORTUARIAS, ordenando se proceda a su edición, difusión y aplicación general como recomendación técnica.

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CHAPTER I. ARTICLES

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Acronym List

AA	Annual Average
AAPA	Associated American Port Authorities
ABP	Associated British Ports
AMSA	Australian Maritime Safety Authority
CEDA	Central Dredging Association
CEDEX	Centro de Estudios de Experimentación de Obras Públicas (Centre for experimental studies of Public Works)
CEDRE	Centre de documentation, de recherche et d'expérimentations sur les pollutions accidentelles des eaux (Centre of documentation, research and experimentation on water accidental pollution)
CIRIA	Construction Industry Research and Information Association
COT	Carbono Orgánico Total (Total Organic Carbon)
EMSA	European Maritime Safety Agency
EPA	Environmental Protection Agency
EQS	Environmental Quality Standard
ESPO	European Sea Ports Oganization
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection
GIS	Geographical Information Systems
HELCOM	Helsinki Commission
HMWB	Heavily Modified Water Body
ICO	Índice de Calidad Orgánica (Index of Organic Quality)
ILO	International Labour Organization
IMO	International Maritime Organization
IPIECA	International Petroleum Industry Environmental Conservation Association
MAC	Maximum Allowable Concentration
NOAA	National Oceanic and Atmospheric Administration
NTK	Nitrógeno Total Kjeldahl (Kjeldhal Total Nitrogen)
OSPAR	Oslo Paris Commissions
PAH	Polyciclic aromatic hydrocarbons
PAMU	Port Aquatic Management Unit
PEI	Plan de Emergencia Interno (Interior Emergency Plan)
PIANC	Permanent Internacional Association of Navigation Congresses
PICCMA	Plan Interior de Contingencia por Contaminación Marina Accidental (Interior Contingency Plan for Accidental Marine Pollution)
PJA	Port Jurisdiction Area
PRTR	Pollutant Release and Transfer Register
PT	Fósforo Total (Total Phosphorus)
RBD	River Basin District
RBDP	River Basin District Plan
RD	Royal Decree
REMPEC	Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea
ROM	Recomendación de Obras Marítimas (Maritime Works Recommendations)
SECBE	South East Centre for the Built Environment
SPZ	Shellfish Production Zone
UNE	Una Norma Española (A Spanish Standard)
WFD	Water Framework Directive

Spanish Reference Norms

Law 2/2013, de 29 de mayo, de protección y uso sostenible del litoral y de modificación de la Ley 22/1988, de 28 de julio, de Costas..
Law 31/1995, de 8 de noviembre, de Prevención de Riesgos Laborales
Law 62/2003, de 30 de diciembre, de medidas fiscales, administrativas y del orden social.
Legislative RD 2/2011, de 5 de septiembre, por el que se aprueba el Texto Refundido de la Ley de Puertos del Estado y de la Marina Mercante.
Order ARM/2656/2008, de 10 de septiembre, por la que se aprueba la instrucción de planificación hidrológica.
Order de 23 de febrero de 2001 por la que se aprueba el Plan Nacional de Contingencias por contaminación marina accidental
RD 1161/2010, de 17 de septiembre, por el que se modifica el Real Decreto 907/2007, de 6 de julio, por el que se aprueba el Reglamento de la Planificación Hidrológica.
RD 125/2007, de 2 de febrero, por el que se fija el ámbito territorial de las demarcaciones hidrográficas.
RD 1254/1999, de 16 de julio, por el que se aprueban medidas de control de los riesgos inherentes a los accidentes graves en los que intervengan sustancias peligrosas.
RD 126/2007, de 2 de febrero, por el que se regulan la composición, funcionamiento y atribuciones de los comités de autoridades competentes de las demarcaciones hidrográficas con cuencas intercomunitarias.
RD 145/1989, de 20 de enero, por el que se aprueba el Reglamento Nacional de Admisión, Manipulación y Almacenamiento de mercancías peligrosas en los puertos.
RD 1695/2012, de 21 de diciembre, por el que se aprueba el Sistema Nacional de Respuesta ante la contaminación marina.
RD 253/2004, de 13 de febrero, por el que se establecen medidas de prevención y lucha contra la contaminación en las operaciones de carga, descarga y manipulación de hidrocarburos en el ámbito marítimo y portuario.
RD 266/2008, de 22 de febrero, por el que se modifica la Confederación Hidrográfica del Norte y se divide en la Confederación Hidrográfica del Miño-Sil y en la Confederación Hidrográfica del Cantábrico
RD 29/2011, de 14 de enero, por el que se modifican el Real Decreto 125/2007, de 2 de febrero, por el que se fija el ámbito territorial de las demarcaciones hidrográficas, y el Real Decreto 650/1987, de 8 de mayo, por el que se definen los ámbitos territoriales de los Organismos de cuenca y de los planes hidrológicos.
RD 60/2011, de 21 de enero, sobre las normas de calidad ambiental en el ámbito de la política de aguas.
RD 606/2003, de 23 de mayo, por el que se modifica el Real Decreto 849/1986, de 11 de abril, por el que se aprueba el Reglamento del Dominio Público Hidráulico, que desarrolla los Títulos preliminar, I, IV, V, VI y VIII de la Ley 29/1985, de 2 de agosto, de Aguas.
RD 907/2007, de 6 de julio, por el que se aprueba el Reglamento de la Planificación Hidrológica.
ROM 0.4-95, sobre las Acciones Climáticas para el Proyecto (II): Viento.
UNE 150008-EX, Análisis y Evaluación del Riesgo Ambiental.

Chapter I
Articles

Articles

CHAPTER I

1. INTRODUCTION

Since the beginning of the 90s, Spanish ports, together with all other ports in the European Union, have been working on the environmental improvement of port zones. The goal of this implication was to contribute to transport sustainability, harmonising their environmental policies and developing tools that permit the identification and reduction of environmental impacts in ports, enhanced prevention, control and management of environmental risks and, in summing up, the adaptation of ports to the demands and requirements of the abundant environmental regulation that is being produced.

On a state level, the *water quality vector* in port zones forms a sphere of competence shared among the various environmental administrations (on local, autonomic and state levels) and the actual port authorities, although in the latter case, only in their role as regulator of the activity developed in the port jurisdiction area (hereinafter PJA).

In relation to port water quality management, the port authorities' activities include the following, among others:

- The assessment of the effects of investment on infrastructures and, as applicable, of the port director plans for preparing the mandatory environmental declaration.
- The supervision of the concessional activities and port services and operations for compliance with the applicable environmental legislation, through its inclusion into the regulatory frameworks of the cited activities: regulations and by-laws of service and police, regulatory documents and concessional contracts.
- Water sheet cleaning.
- Collaboration with the competent administrations in the prevention and control of emergencies cause by accidental pollution in the PJA.
- Fostering the training of its personnel and the development of studies and research into matters relating to port activities and environmental protection, together with collaboration with other ports, organisations or companies, both national and foreign.

When faced by this scenario of concurrent competences, recognised with the integration of port waters into the scope of application of River Basin District (hereinafter RBD), in which the various administrations have competence in regulation as well as port water quality and control, it is essential not only to have inter-administrative coordination instruments available, such as the Competent Authorities Committee and the River Basin District Councils, but also technical and objective methodological tools. Such tools, jointly adopted by all competent administrations, must enable comprehensive port water quality management, with common criteria and in a simple, but complete manner, in accordance with the underlying principles of the Water Framework Directive (hereinafter WFD) and with all current international, national, autonomic and local regulations, independently of the competences assigned to each administration.

For these reasons, with the goal and own interest in efficiently delving deeper into the sustainable development of port areas, with respect to protection and improvement of the aquatic environment, Puertos del Estado recognises the need to develop the designated ROM 5.1-05. Coastal Water Quality in Port Areas within its Maritime Works Recommendations Program (hereinafter ROM). This forms a first methodological and technical tool for comprehensive management of port waters, with direct influence on the design, assessment and environmental tracking of infrastructure works, but mainly on port activities and operations.

The publication of ROM5 5.1-05 was followed by the calibration and validation of the methodological procedure that was developed through a pilot study in the Ports of Gijón, in the Cantabrian Sea; Huelva, in the Gulf of Cádiz, and Tarragona, in the Mediterranean Sea. The results from the various studies carried out confirmed that the methodological and conceptual approximations developed in ROM 5.1-05 represented a comprehens-

ive, standardised, coherent tool. The calibration results allowed confirmation of the philosophy and the Recommendation principles, exclusively proposing improvements in methodological procedures or specifications in the development of particular tools. In order to incorporate the cited improvements in the procedures and tools, Puertos del Estado decided to tackle the publication of the updated version of the Recommendation in 2013 as ROM 5.1-13.

It should be stressed that this Recommendation, since it is in accordance with the WFD principles, reflects the existence of similar goals associated with two different work scales. Whereas for WFD, the overall port may represent a pressure, for ROM 5.1-13, the pressures consist of each contaminant source that could affect the PJA, the Recommendation application scope. Thus, when the port water quality is analysed from this new perspective, it is possible to perform the identification, assessment and specific management of those problems that, having local repercussions, could put compliance of the WFD at risk on the overall port scale.

However, this Recommendation exclusively represents a proposal for a methodological system to tackle comprehensive environmental management of port waters, which does not involve new responsibilities beyond those legally binding. ROM 5.1-13 is put forward with a double purpose, firstly, to assist port administrations to put environmental management of port areas into objective terms and secondly, to put a common technical reference framework at their disposal that will enable them to reach agreements with administrations with concurrent competences in port water quality management.

The main objective of this Recommendation can be broken down into the following specific goals:

- The establishment of methods and procedures for the delimitation and typification of port aquatic management units.
- The establishment of methods and procedures for the assessment and management of environmental risks involved in port activities.
- The establishment of methods and procedures for the environmental quality evaluation of the port aquatic environment.
- The establishment of methods and procedures for managing accidental marine pollution.

2. ROM 5.1 CONCEPTUAL SCHEME

According to the diagram of Figure 2.1, the ROM 5.1-13 application is structured into four programs, the Delimitation and Typification of Port Aquatic Management Units Program, the Environmental Risk Assessment and Management Program, the Environmental Quality Monitoring Program and the Pollutant Incident Management Program. The detailed development of the specific procedures referring to each one forms the central body of the Articles of this Recommendation.

Figure 2.1. ***ROM 5.1 application scheme***

The basic aspects into which these work areas are structured, together with the general process established for its application are introduced in the following subsections.

A. Delimitation and Typification of Port Aquatic Management Units Program

The planning of the Port Jurisdiction Area (PJA) aquatic environment constitutes the starting base for achieving the Recommendation goals. To this end, the methods and procedures approach is required for the definition of the Port Aquatic Management Units (hereinafter PAMUs) according to the socioeconomic, environmental and physical singularities of each port.

For this reason, this program is based on developing the following tasks:

- PAMUs delimitation.
- PAMUs typification.
- PAMUs regrouping by homogeneous types.

This activities program shall be exclusively carried out when this Recommendation is implemented and, in the case of relevant changes in port uses or infrastructures, when these are subjected to environmental impact evaluations.

B. Environmental Risk Assessment and Management Program

The PJA water quality is conditioned by the overall interaction of Port Authority and outside activities, which meet up in this space. Therefore, a significant objective of this Recommendation is aimed at establishing procedures that allow the assessment of environmental risks associated with the various contaminant sources that affect the PJA.

Environmental risk assessment and management is a preventive instrument applied to introduce measures to minimise the environmental repercussions of the cited contaminant sources. For which the following procedure is established:

- Contaminant source identification.
- Environmental risk estimation.
- Environmental risk assessment.
- Preventive and corrective measures proposal.

This activities program will be developed after application of the Delimitation and Typification of Port Aquatic Management Units Program and will be maintained over time searching for continuous improvement. This requires the application of preventive and corrective measures that reduce the environmental risk of each contaminant source.

C. Environmental Quality Monitoring Program

The Environmental Quality Monitoring Program is the tool that evaluates the environmental quality of natural and heavily modified PAMUs in the PJA.

Environmental Monitoring is a periodic, systematic and standardised process of quality measurement that comes into operation after application of the programs of Delimitation and Typification of Aquatic Management Unit and Environmental Risk Assessment and Management.

Its application commences with prior PAMU identification and inventory of contaminant sources in the PJA.

Based on this information, the application of the Environmental Quality Monitoring Program is performed by:

- The evaluation of the environmental quality of natural PAMUs.
- The evaluation of the environmental quality of heavily modified PAMUs.

D. Pollutant Incident Management Program

This program is the methodological procedure for detecting and classifying pollutant incidents in the PJA, together with coordinating the actions required to minimise their effects. It consists of the following operational steps:

- Pollutant incident detection.
- Execution of the action-operation plan.
- Environmental recovery assessment.

This program is activated when a pollutant incident is detected.

Because of the volume of information to be processed and analysed by the application of various programs, the implementation of a Port Environmental Information Management System would optimise these tasks (Chapter V: Tool 1). The use of such computer tools would allow efficient storage and management of all results produced after running each program in this Recommendation with respect to querying and interpretation.

3. APPLICATION SCOPE

The ROM 5.1 application scope is the port jurisdiction area legally established for each Port Authority.

Article 69 of Spanish Legislative RD 2/2011, of the 5th of September, which approved the adapted text of the State Ports and Merchant Navy Act, defines the port jurisdiction area as "the land and sea spaces required for the development of port uses referred to by Article 72.1 of this Act, the reserve spaces that guarantee the possibility of port activity development and those intended for uses linked to port-city interaction". Along these lines and according to Article 72.1, the spaces considered as having port uses are "commercial (…), fishing, nautical-recreation and complementary or auxiliary for the previous ones, including those relating to logistic and storage activities and those corresponding to industrial or commercial companies".

According to the mentioned Legislative RD, "the water space included in the jurisdiction area includes the water areas and basins where cargo loading, unloading and transfer, together with fishing and passenger embarking and disembarking take place. It also includes technical-nautical services and ship building, repairs and breaking, together with mooring, turning and manoeuvring of ships and boats, access and navigation channels, waiting and anchoring areas and also the necessary margins for maritime security, terrorist and antisocial action protection. It also incorporates the required reserve space for port expansion".

The aquatic space will be divided into two zones:

- Zone I, or interior port waters, which covers the sheltered water spaces, both natural and because of sea walls.
- Zone II, or exterior port waters, consisting of all other waters.

Without prejudicing competences over the defined application scope, collaboration with other competent administrations is recommended for better classification of the environment in marine areas contiguous to the port waters. For this reason, knowledge of existing pressures and environmental characteristics of the exterior strip, which is outside port responsibility and jurisdiction, could be invaluable to water quality management in the port environment.

4. DELIMITATION AND TYPIFICATION OF PORT AQUATIC MANAGEMENT UNITS PROGRAM

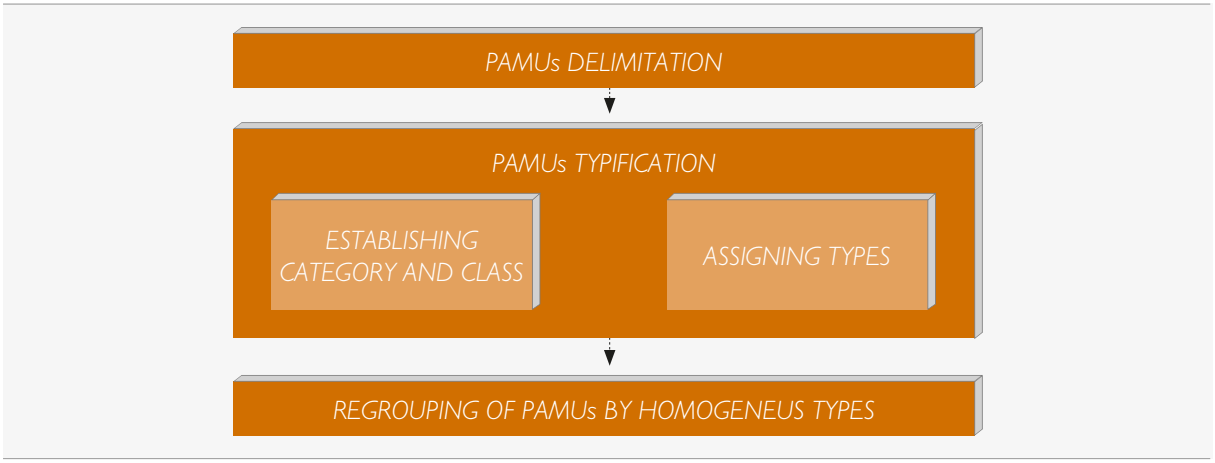
The Delimitation and Typification of Port Aquatic Management Units Program is the Port Jurisdiction Area (PJA) aquatic environment planning instrument. In this sense, the Port Aquatic Management Units (PAMUs) are constituted as basic units for port water quality management.

This program will be executed when this Recommendation is implemented and whenever changes are made to the aquatic environment configuration (port installation expansion, alteration on zones and variations in aquatic environment uses, etc), subject to an environmental impact evaluation.

In general, its application will be adapted to the methodological scheme of Figure 4.1:

- Port Aquatic Management Units delimitation: planning and organisation of the port aquatic environment in management units in function of its associated uses and activities, physical and hydromorphological characteristics and hydrodynamic conditions.
- Port Aquatic Management Units typification: previously delimited management unit classification into different homogeneous types.
- Port aquatic management units regrouping by homogeneous types: overall delimitation optimisation of the management units in function of the required detail level.

Figure 4.1. ***Scheme of the Delimitation and Typification of the Port Aquatic Management Units Program***



4.1. Delimitation of Port Aquatic Management Units

The aim of this stage is to organise the port aquatic environment into various PAMUs according to:

- The uses and activities developed in the PJA.
- Their physical and hydromorphological characteristics.
- Their hydrodynamic conditions.

First, a survey is performed of the *uses and activities* in this environment, based on the characteristics of the physical, economic and cultural surroundings of the port.

For this reason, all existing base legislation will be considered, that referring to socioeconomic activities in the port area and that providing detailed information of its natural and cultural patrimony, currently in force when this program is applied. In principle, two classes of generic usage will be considered, port and non-port uses.

A. Port activities and uses

- Port uses, according to Article 72 of Legislative RD 2/2011, of the 5th of September, which approved the adapted text of the State Ports and Merchant Navy Act and includes the following:
  - Commercial uses, including those relating to transport mode interchange, those relating to the development of port services and other commercial port activities.
  - Fishing uses.
  - Nautical-recreational uses.
  - Complementary or auxiliary uses for the above, including those relating to logistic and storage activities and those corresponding to industrial or commercial companies, the location of which in the port is justified by their relationships with port traffic, the maritime traffic volume they generate or by the services they provide to port users.

B. Non-port activities and uses

- Protected areas in the context of the WFD, among which are the following:
  - Areas designated for the protection of economically significant aquatic species.
  - Bodies of water designated as recreational waters, including areas designated as bathing waters under Directive 2006/7/EEC.
  - Nutrient-sensitive areas, including areas designated as vulnerable zones under European Directive 91/676/EEC and areas designated as sensitive areas under European Directive 91/271/EEC.
  - Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant Natura 2000 sites designated under European Directive 92/43/EEC and special protection areas (SPA) of wild birds under European Directive 2009/147/CE.
- Other unprotected zones in the context of the WFD.

Furthermore, it must be taken into account that Zone I of Spanish ports is subject to *hydromorphological alterations* that have significantly changed their natural character. Normally, these alterations are mainly associated with the construction of sea walls and maintenance dredging.

Lastly, the *hydrodynamic conditions* must be taken into account, which enable the zones within the PJA to be differentiated in a natural manner. To this end, the consideration of current velocities (Chapter III: Method 3) represent an appropriate criterion for recognising this zone variability. However, other factors should also be considered, such as upwelling and downwelling phenomena according to the particularities of study zone (Chapter III: Method 1).

4.2. Typification of Port Aquatic Management Units

PAMUs classification represents the process that catalogues the previously organized PJA aquatic environment into various homogeneous types. This classification process consists of two different steps, i) the establishment of category and class and ii) type assignment.

The former classifies the PAMUs into two categories of coastal and transitional waters. Subsequently, each identified PAMU is assigned a class (heavily modified or natural) depending on its degree of hydromorphological or physical alteration.

The second step comprises the consideration of different types that allow contemplation of the peculiarities and variability of the aquatic environment in each category (Figure 4.1).

4.2.1. Establishing category and class

From that established for each River Basin District (Chapter IV: Data 1) in the River Basin District Plans (RBDP), each water body (sensu WFD) for a determined category (coastal or transitional) and class (natural or heavily modified) may be maintained as a single PAMU or divided into several, but always considering the limits established by each District for the original water body. Categories and classes are adjusted to the following definitions according to the WFD:

A. Categories:

- *Transitional waters:* are bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their proximity to coastal waters but which are substantially influenced by freshwater flows.

- *Coastal waters:* are surface waters on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters.

B. Class:

- *Natural waters:* surface waters that have not undergone any substantial change resulting from physical alterations produced by human activity.

- *Heavily modified waters:* are bodies of surface water which as a result of physical alterations by human activity is substantially changed in character

In order to avoid contradictions, the water body category and class originally designated by the District for each PAMU shall always be maintained, which could result in their spatial division (Chapter IV: Data 3). Because of this, PAMUs categories, classes and extensions shall be adapted and updated according to possible changes to the corresponding RBD Plans.

4.2.2. Assigning types to Port Aquatic Management Units

In function of the aquatic environment singularities of each PJA, a specific type assignment is made to each PAMU in a differentiated manner according to whether they are natural or heavily modified waters as indicated below.

4.2.2.1. Types of natural Port Aquatic Management Units

The management units classified as natural are catalogued according to the types of transitional and coastal waters established in the Spanish Hydrological Planning Instruction (Spanish Order ARM/2656/2008) for the natural water bodies. This classification includes the types proposed in the various Districts. However, for the purpose of applying this ROM, those types not liable to include port infrastructures have been excluded. For this reason, of the 33 types established by the Spanish Hydrological Planning Instruction for natural water bodies, only six types of transitional and nineteen types of coastal waters have been considered, as indicated in Table 4.1.

*Table 4.1. **Natural PAMUs types***

Type	Natural transitional waters
TN1	Mediterranean microtidal estuary, without saline wedge
TN2	Mediterranean microtidal estuary, with saline wedge
TN3	Mediterranean estuary bay
TN4	Subtidal Atlantic estuary
TN5	Mesotidal Atlantic estuary with irregular river discharges
TN6	Tinto-Odiel estuary
Type	**Natural coastal waters**
CN1	Mediterranean coastal waters with moderate fluvial influence, shallow sandy
CN2	Mediterranean coastal waters with moderate fluvial influence, shallow rocky
CN3	Mediterranean coastal waters with moderate fluvial influence, deep sandy
CN4	Mediterranean coastal waters with moderate fluvial influence, deep rocky
CN5	Mediterranean coastal waters not influenced by fluvial inputs, shallow sandy
CN6	Mediterranean coastal waters not influenced by fluvial inputs, shallow mixed
CN7	Mediterranean coastal waters not influenced by fluvial inputs, deep sandy
CN8	Mediterranean coastal waters not influenced by fluvial inputs, deep rocky
CN9	Mediterranean coastal waters with high fluvial influence, shallow sandy
CN10	Mediterranean coastal waters influenced by Atlantic waters
CN11	Exposed east Cantabrian Atlantic coastal waters without upwelling
CN12	Gulf of Cádiz Atlantic coastal waters
CN13	Exposed west Cantabrian Atlantic coastal waters with low upwelling
CN14	Exposed Atlantic coastal waters with medium upwelling
CN15	Semi-exposed or protected Atlantic coastal waters with intense upwelling

Natural PAMUs types (Continuation)

CN16	Exposed Atlantic coastal waters with intense upwelling
CN17	Semi-exposed or protected Atlantic coastal waters with medium upwelling
CN18	Atlantic coastal waters influenced by alluvial inflows
CN19	Atlantic coastal waters influenced by Mediterranean waters

4.2.2.2. Types of heavily modified Port Aquatic Management Units

Similarly, the management units classified as heavily modified are classified according to the types of transitional and coastal waters established in the Spanish Hydrological Planning Instruction (Spanish Order ARM/2656/2008) for heavily modified water bodies by the presence of ports, as shown in Table 4.2.

Table 4.2. THeavily modified PAMUs types

Type	Heavily modified transitional waters
TM1	Atlantic transitional waters with low renewal rate
TM2	Atlantic transitional waters with high renewal rate
Type	**Heavily modified coastal waters**
CM1	Atlantic coastal waters with low renewal rate
CM2	Atlantic coastal waters with high renewal rate
CM3	Mediterranean coastal waters with low renewal rate
CM4	Mediterranean coastal waters with high renewal rate

According to this classification, the renewal capacity for each PAMU must be estimated for each heavily modified water body, independently of their categories (transitional or coastal). Flushing time is defined as the required time for the residual mass of a conservative tracer, hypothetically introduced into the management unit, to be reduced to 37% (Chapter V: Tool 3), taking into account the average values of the most significant dispersive agents (Chapter III: Method 4). If the calculated flushing time is less than seven days, the PAMU will be considered having high renewal. Otherwise, if the calculated flushing time is greater than or equal to seven days, it will be assumed that PAMU renewal capacity is low.

In order to standardise the flushing time estimation conditions, those established in Methods 2 and 3 of Chapter III shall be used.

4.3. Regrouping of the Port Aquatic Management Units by homogeneous types

The division of a water body into several PAMUs is made for the convenience of working with smaller management units. However, when the various PAMUs of the PJA are classified, those corresponding to the same type can be grouped for form a single PAMU, when these are adjacent.

Here, the required detail level for the application of the various Programs will be considered. A special case in that of water confined between docks which must be considered as independent management units because of their physical configuration and the various activities carried out within them.

However, it must be remembered that, in the end, the Port Authorities have to design their own management system according to their own specific needs.

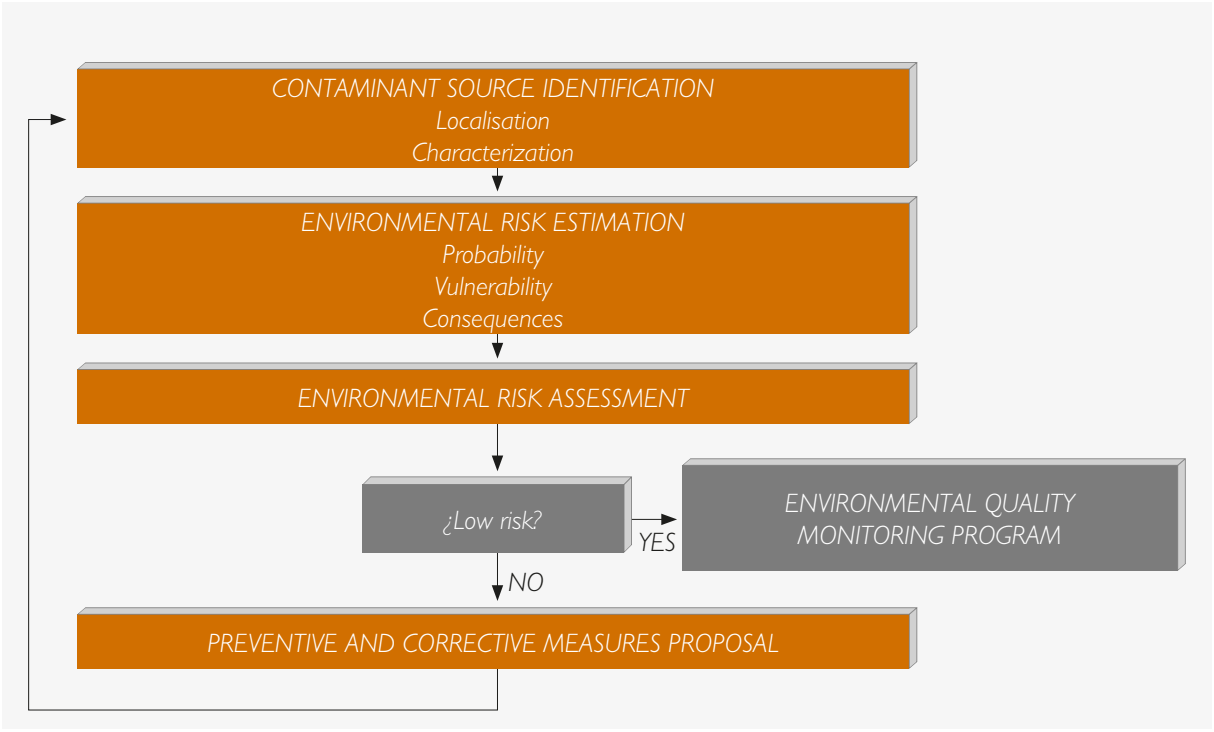
5. ENVIRONMENTAL RISK ASSESSMENT AND MANAGEMENT PROGRAM

The Environmental Risk Assessment and Management Program is the procedure that establishes the effects on port water quality of each contaminant source, produced by ordinary activities as well as accidents. To do this, the risk for each contaminant source is assessed by its occurrence probability, the derived consequences and the vulnerability of the port aquatic systems that could be affected. Subsequently, depending on the risk value, the possible preventive and corrective measures will be put into place to reduce it to acceptable values.

The methodology for carrying out this program is based on the following procedure (Figure 5.1):

- Contaminant source identification: localisation and characterization of contaminant sources produced by ordinary human activity or accidents.
- Environmental risk estimation: calculating the environmental risk magnitude.
- Environmental risk assessment: classification of contaminant sources in function of the estimated risk value.
- Preventive and corrective measures proposal: establishment of measures to reduce the values of the various factors intervening in the risk estimation.

Figure 5.1. ***Scheme for the Environmental Risk Assessment and Management Program***



5.1. Contaminant source identification

The goal of this first stage will be the localisation and characterization of contaminant sources produced by ordinary human activity or accidents. In this respect, the contaminant source is the discharge of substances or energies into the aquatic environment that alter Port Aquatic Management Units (PAMUs) quality.

The contaminant source is classified into point or diffuse in function of the way in which it is introduced into the aquatic environment (Table 5.1).

Table 5.1. Contaminant source classification

Type	Definition
POINT	Discharge of pollutant substances or materials channelled through predefined fixed points (channelled runoff waters, storm drains, and point-source discharge, etc)
DIFFUSE	Non-channelled discharge of pollutant substances or materials (filtrations, dredging, losses, etc).

5.1.1. Contaminant source localisation

The objective of this action will be to carry out the inventory and classification of the contaminant sources inside or outside the Port Jurisdiction Area (PJA), which could affect PAMUs quality.

One basic task of this activity will be the localisation of contaminant sources in Zone I of the PJA. However, thorough knowledge of all contaminant sources within the PJA, irrespective of their origin, is considered fundamental. Similarly, general knowledge of all discharges into areas outside the port that could affect the PJA is recommended.

In the case of authorised point contaminant sources, all the information from the corresponding discharging authorisations shall be available and which indicates the exact point where the evacuation, injection of deposit of waters or waste products occurs (Spanish RD 606/2003). To this end, it must be taken into account that competences over authorisation for discharging into the sea, according to Article 57 of Spanish Law 2/2013, on Coasts, depends on the region administration. Moreover, for the survey to be complete, all possible uncontrolled point contaminant sources shall be recorded.

With respect to diffuse contaminant sources that could affect PJA management unit quality, the areas from which they are produced or could be produced will also be localised.

After localising each contaminant source, classification will take place, in function of the situation at the discharge point or area and its origin, as shown in Figure 5.2.

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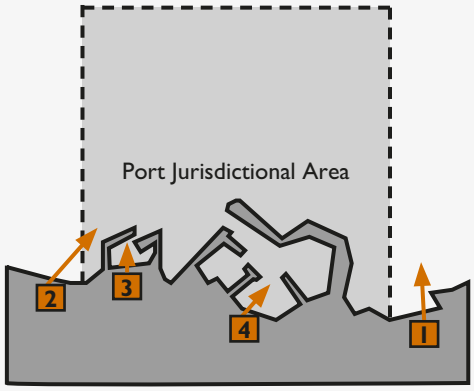
Figure 5.2. ***Representation and definition of contaminant sources in function of discharge point or area***



1	External contaminant sources	Contaminant sources that are discharged outside the PJA.
2	Foreign contaminant sources	Contaminant sources that are discharged inside the PJA, but not produced by activities carried out on port land, works or installations.
3	Contaminant sources from concessionary or authorised companies	Contaminant sources produced by activities carried out on port land, works or installations.
4	Port contaminant sources	Contaminant sources produced by port activities.

Within the PJA, there could be a wide range of contaminant sources in function of the activities producing them. The classification of activities given in Table 5.2 will be used to localise the contaminant sources that could potentially affect port aquatic systems. This classification will enable each port to identify the activities, infrastructures, equipment and uses that could produce contaminant sources. Chapter IV: Data 4 defines the activities given in the mentioned table.

Table 5.2. ***List of activities liable to cause contaminant sources***

Activities
Port infrastructure and installation works
Dredging
Maritime traffic
Land traffic
Loading, unloading and storage of bulk solids
Loading, unloading and storage of bulk liquids
Fuel and victualling supplies
Ship construction, repairs and breaking
MARPOL waste reception, transport and management
Reception, transport and management of ships' ballast water and sediment
Machinery and installation cleaning and maintenance
Urban activities
Industrial activities
Fishing and aquiculture
Nautical-recreational activities
Public usage areas
Military installations
Others

In order to facilitate diffuse contaminant source identification, the principal port activities that produce them can be classified into five groups:

- Loading, unloading and storage of bulk solids.
- Loading, unloading and storage of bulk liquids.
- Fuel and victualling supplies.
- MARPOL waste reception, transport and management
- Machinery and installation cleaning and maintenance.

5.1.2. Contaminant source characterization

The purpose behind contaminant source characterization is to know the pollutant substances or materials discharged by them, together with the variation ranges of their concentrations and flow rates.

All port contaminant sources or those from concessionary or authorised companies that could alter the management units' quality shall be subjected to a thorough study.

It is similarly essential to characterize foreign contaminant sources as precisely as possible because they are discharged inside the PJA.

The consideration of both point and diffuse external contaminant sources will depend on the incidence which, due to the actual hydrodynamic conditions of the environment, it could have on the management units' quality in the PJA.

It will be possible to estimate the environmental risk of each contaminant source from the information gathered during characterization. A list of the necessary information is provided below:

- Contaminant source frequency of occurrence.
- Substances discharged or materials handled by the contaminant source produced by an activity (priority substances, bacteriological pollutants, oxygen consuming agents and hazardous materials).
- Substance concentrations or amounts of handled materials.
- Average flow rate.
- Society's perception of the contaminant source effects.
- Existence of the corresponding detection, control, defence or alarm systems for the generating activity.
- Level of efficiency of existing operational procedures for the contaminant sources-generating activity.

Chapter III: Method 5 provides a typical form that permits standardisation of the information petition required for contaminant source identification. In addition, Chapter III: Method 6 describes specific procedures for obtaining the necessary information for contaminant source identification.

5.2. Environmental risk estimation

When all contaminant sources liable to affect PJA management units' quality have been identified, risk estimation for each one will be carried out, taking into account various scenarios.

Only one scenario will be taken into account for point contaminant sources:

- *Scenario E1*: Authorised situation, normal operation.

The diffuse contaminant source risk estimation will be associated with three specific scenarios:

- *Scenario E1*: Normal operational situation or minor discharge.
- *Scenario E2*: Operational situations with specific problems or discharge of certain intensity, but without activating the Contingency Marine Plan.
- *Scenario E3*: Situations in which operations are executed under completely unfavourable conditions or discharge of certain intensity that activates the Contingency Marine Plan.

The methodology employed to estimate the environmental risk of each contaminant source makes use of the following expression:

$$\mathbf{R}_{ij} = \mathbf{P}_{ij} \times \mathbf{V}_{ij} \times \mathbf{C}_{ij}$$

where:

$\mathbf{R}_{ij}$: is the risk value of contaminant source *i* for scenario *j*.

$\mathbf{P}_{ij}$: is the probability factor of contaminant source *i* for scenario *j*.

$\mathbf{V}_{ij}$: is the PAMUs vulnerability of contaminant source *i* for scenario *j*.

$\mathbf{C}_{ij}$: is the consequence factor of contaminant source *i* for scenario *j*.

This expression enables the risk of each identified contaminant source and each defined scenario as a previous step in environmental risk assessment (Section 5.3) and the establishment of measures for its elimination, correction or prevention (Section 5.4).

The following sections provide a basic methodology for estimating the value of risk for each identified contaminant source and considered scenario in an independent, homogeneous and standardised manner. However, it should be pointed out that in cases for which sufficient precise information is available, there are quantitative estimate methods that can be applied (statistical, probabilistic methods, etc), if considered necessary (see Chapter II).

5.2.1. Estimating the probability factor

The *probability factor* (P_{ij}) refers to the probability of a contaminant source occurring in terms of its occurrence frequency.

Probability assessment is performed on a scale of 1 to 4 according to the criteria in Table 5.3.

Table 5.3. Probability factor assessment criteria

P_{ij}	Time between two pollutant discharges
4	< 1 month
3	1 to 12 months
2	1 to 7 years
1	> 7 years

5.2.2. Estimating the vulnerability factor

The *vulnerability factor* (V_{ij}) for PAMUs affected by the contaminant source is estimated in function of their susceptibility, the existence of detection, control, defence and alarm systems, together with the efficiency of established operational procedures.

Vulnerability factor estimation is produced in function of weighting the values assigned to the previous terms according to the following expression:

$$\mathbf{V}_{ij} = \frac{1}{10}\left[5 \cdot \mathbf{Fs}_{ij} + 3 \cdot \mathbf{Fa}_{ij} + 2 \cdot \mathbf{Fe}_{ij}\right]$$

where:

Fs_{ij}: is the PAMU susceptibility to contaminant source *i* for scenario *j*.

Fa_{ij}: is the accessibility of contaminant source *i* for scenario *j*.

Fe_{ij}: is the efficiency of the operational procedures of the activity producing contaminant source *i* for scenario *j*.

5.2.2.1. Susceptibility of the Port Aquatic Management Units

Susceptibility (Fs_{ij}) assesses the potential effects of a contaminant source on a PAMU in function of its conservation category.

Thus, a PAMU is considered affected by a contaminant source if the discharge extends over a minimum of 10% of its surface.

The calculation method for the area affected by a contaminant source will vary depending on the level of available information and knowledge:

- If sufficient information and knowledge are available for numerical model application (Chapter V: Tool 3) (bathymetry, hydrodynamic currents, point/area of discharge, concentrations of discharged substances or amount of handled materials, flow rates), then Method 7 of Chapter III will be applied.
- If no sufficient information and knowledge are available for numerical model application, then Method 8 of Chapter III will be applied.

In both cases, Chapter III: Method 9 described a methodological procedure to calculate the affected surface percentage of PAMU by a contaminant source.

The PAMU susceptibility assessment is performed on a scale of 1 to 4, depending on the type of PAMU affected by the contaminant source according to the criteria of Table 5.4.

If there are different PAMUs affected by the contaminant source the adopted susceptibility value will be that corresponding to the affected management unit with the highest susceptibility value (Fs).

Table 5.4. Susceptibility of port aquatic management units term assessment criteria

Fs_{ij}	Type of affected management unit
4	Protected areas in the WFD context
3	Natural PAMU
2	Heavily modified PAMU
1	Any PAMU type affected by the contaminant source, but covering less than 10% of its surface area.

5.2.2.2. Contaminant source accessibility

The *contaminant source accessibility* (Fa_{ij}) to the management units quantitatively evaluates the existence or establishment of detection, control, defence and alarm systems in the activity producing this contaminant source. In this sense, a contaminant source has less accessibility with more presence of detection, control, defence and alarm systems in the activity producing this contaminant source.

The contaminant source accessibility evaluation is performed on a scale of 1 to 4 depending on the detection, control, defence and alarm system level according to the criteria of Table 5.5.

Table 5.5. ***Detection, control, defence and alarm system assessment criteria***

Fa_{ij}	Detection, control, defence and alarm system level
4	There are no detection, control, defence and alarm systems in the activity producing the contaminant source or existing systems are not in permanent operation.
3	There are permanently operational defence systems in the activity producing the contaminant source, but no detection, control or alarm systems.
2	There are permanently operational defence and control systems in the activity producing the contaminant source, but no detection and alarm systems.
1	There are permanently operational detection, defence, control and alarm systems in the activity producing the contaminant source.

5.2.2.3. Operational procedure efficiency

The *operational procedure efficiency* (Fe_{ij}) quantitatively evaluates the possibility that the preventive and corrective measures established to combat contaminant sources achieve their goals.

The operational procedures of an activity producing the contaminant source describe who, how, where, why and with what this activity should be performed in the required detail in each case. Their objective is to standardise the action procedures and avoid improvisation and lack of definition that could lead to problems or deficiencies in the performance of each activity.

The evaluation of *operational procedure efficiency* is carried out using a scale of 1 to 4 depending on the level of existing operational procedures to tackle the cause or the effects of the contaminant source according to the criteria of Table 5.6.

Table 5.6. ***Operational procedure efficiency term assessment criteria***

Fe_{ij}	Operational procedure efficiency level
4	There are no operational procedures available to tackle the cause or reduce the effects of a contaminant source.
3	Generic operational procedures are available which, although they are not specifically established to reduce the cause or the effects of a contaminant source, they do provide certain associated coverage.
2	Specific operational procedures are available to tackle the cause or reduce the effects of a contaminant source, but without any simulation drills or other activities being carried out associated with equipment maintenance and the training of personnel.
1	Specific operational procedures are available to tackle the cause or reduce the effects of a contaminant source. Furthermore, simulation drills or other activities are periodically carried out associated with maintenance and the training of personnel and equipment.

5.2.3. Estimating the consequence factor

After estimating the probability associated with the contaminant source and the PAMU vulnerability, their consequences must be estimated. The *consequence factor* (C_{ij}) is based on three terms: the hazard level of the discharged pollutant substances or handled materials, the extension to which each PAMU is affected and their recovery.

Additionally, in function of the social repercussions of the contaminant source effects, a multiplying term may be added to increase the final value of the consequence factor.

This factor is estimated in function of weighting the values assigned to the cited terms via the expression below:

$$\mathbf{C_{ij}} = \frac{1}{10}\left[5\cdot \mathbf{Fp_{ij}} + 2{,}5\cdot \mathbf{Fg_{ij}} + 2{,}5\cdot \mathbf{Fr_{ij}}\right]\cdot \mathbf{Fc_{ij}}$$

where:

$\mathbf{Fp_{ij}}$: is the hazard level of contaminant source *i* for scenario *j*.

$\mathbf{Fg_{ij}}$: is the degree of extension of contaminant source *i* for scenario *j*.

$\mathbf{Fr_{ij}}$: is the management unit recovery regarding the effects of contaminant source *i* for scenario *j*.

$\mathbf{Fc_{ij}}$: is the social repercussion of contaminant source *i* for scenario *j*.

5.2.3.1. Contaminant source hazard level

The *contaminant source hazard level* (Fp_{ij}) is the potential to affect environmental quality, human health or the established uses.

It will be evaluated according to the substances or materials present in the contaminant source, taking into account:

- The substances and pollutants according to Spanish RD 60/2011.
- The substances and pollutants according to European Regulation (EC) No 166/2006.
- The bacteriological pollutants according to European Directive 2006/7/EC.
- The materials included in Spanish RD 145/1989.

Chapter IV: Data 5 provides a list of specific substances and materials included in the cited legislation for estimating the hazard level of the contaminant source.

The *hazard level* value will vary over a scale of 1 to 4 according to criteria established in Table 5.7.

Table 5.7. Contaminant source hazard level term assessment criteria

Fp_{ij}	Group of substances or materials included in the contaminant source
4	Substances and pollutants under Spanish RD 60/2011.
3	Substances and pollutants under European Regulation (EC) No 166/2006. Hazardous materials under Spanish RD 145/1989.
2	Bacteriological pollutants under European Directive 2006/7/EC. Potentially hazardous materials under Spanish RD 145/1989.
1	Other substances or materials.

If the contaminant source contains various substances or materials, then the one with largest hazard level value will be adopted for this contaminant source (Fp_{ij}).

5.2.3.2. Contaminant source degree of extension

The contaminant source *degree of extension* (Fg_{ij}) is the percentage of surface area affected by it.

The surface area affected by the contaminant source is calculated from the results obtained in the PAMU *susceptibility* estimation (Section 5.2.2.1.), employing Methods 7 and 8 of Chapter III.

The calculation of the percentage of PAMU surface area affected by a contaminant source is given in Chapter III: Method 9.

The assessment of this term is performed for each affected PAMU on a 1 to 4 scale in function of the percentage of surface area affected by the contaminant source, according to the criteria established in Table 5.8.

Table 5.8. ***Contaminant source degree of extension term assessment criteria***

Fg_{ij}	Percentage of affected management unit
4	> 50 %
3	30 to 50 %
2	10 to 30 %
1	<10%

If there are several PAMUs affected by the contaminant source, the value of the management unit having the highest percentage will be adopted as the degree of extension.

5.2.3.3. Recovery of Port Aquatic Management Units

Management unit recovery (Fr_{ij}) quantitatively estimates the period of time that has to elapse for the PAMU to recover the environmental quality it had prior to being affected by the contaminant source, assuming recovery is possible.

For the purpose of this methodology, PAMU recovery will be a function of the environmental persistence of the substances or materials present in the contaminant source. Consequently, to longer a substance or material remains in the environment, the longer will be PAMU recovery.

Chapter IV: Data 6 shows a list of substances for estimating recovery of PAMU affected by a contaminant source depending on its persistence.

Recovery assessment is performed on a 1 to 4 scale in function of the management unit recovery with respect to the effects of the contaminant source according to the criteria of Table 5.9.

Table 5.9. ***Recovery of Port Aquatic Management Units term assessment criteria***

Fr_{ij}	Persistence of the substances or materials
4	> 100 days
3	50 to 100 days
2	10 to 50 days
1	< 10 days

If there are several PAMUs affected by the contaminant source, the maximum estimated value for any management unit and any type or substance or material will be adopted as the *management unit recovery* value, for this contaminant source.

5.2.3.4. Contaminant source social repercussions

The *social repercussion* (Fc_{ij}), within the consequence factor, will be taken into account to finalise risk estimation and obtain the environmental risk for the identified contaminant source and considered scenario. This parameter will depend on the social alarm that the contaminant source could generate.

The assessment criteria are shown in Table 5.10.

Table 5.10. Contaminant source social repercussions term assessment criteria

Fc_{ij}	Social alarm level
1.25	High level of social alarm
1.10	Significant level of social alarm
1	There are no signs of social alarm

5.3. Environmental risk assessment

This evaluation will enable contaminant source classification in function of the risk calculated in the estimation. According to the terminology used by the Spanish UNE 150008-EX, each identified contaminant source and considered scenario may be classified as:

- *High-risk contaminant sources:* $R_{ij} > 20$. Such contaminant sources require a study into the problems associated with the risk and the immediate adoption of the necessary preventive and corrective measures.
- *Medium-risk contaminant sources:* $15 \leq R_{ij} \leq 20$. These contaminant sources require a study into the problems associated with the risk and the evaluation of the need to implement immediate full or partial preventive and corrective measures, or be considered in the Environmental Quality Monitoring Program.
- *Low-risk contaminant sources:* $R_{ij} < 15$. These are contaminant sources that, although they do not require any special action, they must be considered in the design of the Environmental Quality Monitoring Program

5.4. Preventive and corrective measures proposal

Contaminant sources that represent a high or medium environmental risk require the establishment of preventive and corrective measures to reduce the values of all or some of the factors involved in risk estimation until a low-risk classification is obtained.

The preventive and corrective measures shall:

- Be based on the best available techniques and the best available environmental practices.
- Be adapted to the type of contaminant source to be corrected as well as the environmental conditions in which it occurs.
- Present certain guarantees of success without causing any indirect damage after application, with verification of benefits from the applied measures.

The preventive and corrective measures are intended to avoid the risk, by reducing occurrence probability, the management unit vulnerability factor or the contaminant source consequence factor. They could also contemplate full or partial transfer of the discharge.

Once the preventive and corrective measures are applied, the previously described environmental risk assessment procedure will be run in an iterative manner as many times as necessary until the contaminant source is classified as low risk.

Chapter IV: Data 8 and 9 includes various good environmental practices manuals, both general and specific, in function of the generating activity according to Table 5.2.

6. ENVIRONMENTAL QUALITY MONITORING PROGRAM

The Environmental Quality Monitoring Program is the tool that evaluates the environmental quality of natural and heavily modified PAMU in the PJA.

Environmental Monitoring is a periodic, systematic and standardised process of quality measurement that comes into operation after application of the programs of Delimitation and Typification of Aquatic Management Unit and Environmental Risk Assessment and Management.

Its application commences with prior PAMU identification and inventory of contaminant sources in the PJA.

Based on this information, the application of the PAMU Environmental Quality Monitoring Program is performed by:

- The evaluation of the environmental quality of natural PAMU.
- The evaluation of the environmental quality of heavily modified PAMU.

6.1. Environmental quality of natural Port Aquatic Management Unit

The environmental quality of the *natural management units* will be evaluated in collaboration with the competent authorities according to the methodological procedure established in the corresponding River Basin District Plan to evaluate the ecological status of natural water bodies. The River Basin District to which each port belongs and the applicable district plan can be consulted in Chapter IV: Data 1 and Data 2, respectively.

6.2. Environmental quality of heavily modified Port Aquatic Management Unit

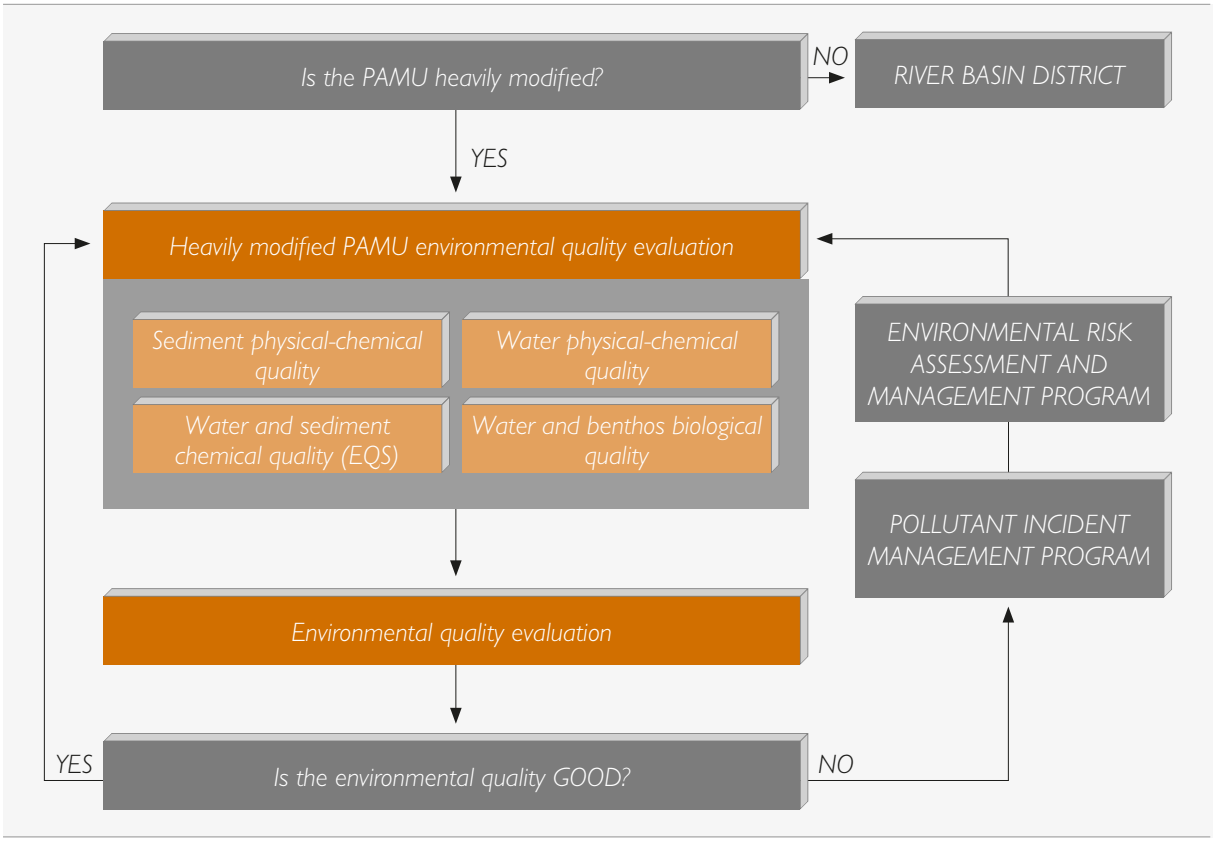
The environmental quality of the *heavily modified management units* will be evaluated according to the procedure of Figure 6.1.

Evaluation will require the analysis of four quality elements:

- Sediment physical-chemical quality.
- Water and benthos biological quality.
- Water physical-chemical quality.
- Water and sediment chemical quality (EQS).

The following sections describe the evaluation procedure of each quality element.

Figure 6.1. ***Scheme for the Environmental Quality Monitoring Program***



6.2.1. Sediment physical-chemical quality

The indicators used in the sediment physical-chemical quality evaluation include total organic carbon (COT), Kjeldahl total nitrogen (NTK) and total phosphorus (PT).

The evaluation of this quality element will be established from the *Organic Quality Index, ICO*.

$$\mathbf{ICO} = \mathbf{C}_{\mathbf{COT}} + \mathbf{C}_{\mathbf{NTK}} + \mathbf{C}_{\mathbf{PT}}$$

Where:

$\mathbf{C}_{\mathbf{COT}}$: is the standardised annual average percentage value for the total organic carbon.

$\mathbf{C}_{\mathbf{NTK}}$: is the standardised annual average value for the Kjeldahl total nitrogen concentration.

$\mathbf{C}_{\mathbf{PT}}$: is the standardised annual average value for the total phosphorus concentration.

The ICO will be calculated annually (Table 6.1), according to the methodological requirements (sampling design, analytic techniques, etc) indicated in Chapter III: Method 10.

Table 6.1. ***Standardised system of indicator values for the Sediment Organic Quality Index (ICO)***

Total Organic Carbon (COT) (%)		Kjeldahl Total Nitrogen (NTK) (mg/kg)		Total Phosphorus (PT) (mg/kg)	
Values	C_{COT}*	Values	C_{NTK}*	Values	C_{PT}*
$x < 0.6$	4	$x < 600$	3	$x < 500$	3
$0.6 \leq x < 2.3$	3	$600 \leq x < 2100$	2	$500 \leq x < 800$	2
$2.3 \leq x < 4.0$	2	$2100 \leq x < 3600$	1	$800 \leq x < 1200$	1
$4.0 \leq x < 5.8$	1	$x \geq 3600$	0	$x \geq 1200$	0
$x \leq 5.8$	0				

* To determine the standardised value for each indicator, the mean value is calculated for all the data recorded during one year for all PAMU sampling stations and replaces the value "x" in the corresponding standardisation table.

The ICO is evaluated on a scale of 1 to 10. The established evaluation system includes five sediment quality levels as shown in Table 6.2.

Table 6.2. ***ICO quality levels***

ICO	Quality level
$x \geq 8$	Very good
$6 \leq x < 8$	Good
$4 \leq x < 6$	Moderate
$2 \leq x < 4$	Deficient
$x < 2$	Bad

6.2.2. Water and benthos biological quality

The biological quality evaluation contemplates obligatory and optional indicators.

The only obligatory biological quality element for the ROM 5.1 application will be phytoplankton. The evaluation of other biological quality elements (for example, macroalgae, seagrasses, and benthic invertebrates) will be optional and their inclusion will depend on specific interest at each port.

In both cases, (obligatory and optional indicators), evaluation is performed annually, at the same sampling points established in the sediment physical-chemical quality evaluation and according to the river basin district plan (applicable methods, reference conditions, thresholds, etc) applicable at each port (Chapter IV: Data 2). The methodological requirements for indicators selection, sampling design, analytic methods and evaluation system are given in Chapter III: Method 11.

When evaluation combines obligatory and optional elements (for example, phytoplankton and invertebrates), the management unit biological quality will be established by the critical value method. This measurement is based on the *one out-all out* principle and is an independent evaluation of each considered quality element and the assignment of the worst obtained value as the final management unit biological quality value.

6.2.3. Water physical-chemical quality

The evaluation of water physical-chemical quality will be performed annually according to the terms given in the corresponding river basin district plan (Data 1 and Data 2).

Measurement of water physical-chemical quality indicators is performed in each management unit at the same sampling points (number and location) established in the sediment physical-chemical quality (Section 6.2.1). The methodological requirements for indicator selection, sampling design, analytic methods and evaluation system are described in Chapter III: Method 12.

6.2.4. Water and sediment chemical quality (EQS)

The PAMU chemical quality is evaluated according to current legislation on water quality (Spanish RD 60/2011, 21st of January, on EQSs in the water politics scope), or with any subsequent standard that modifies it. Evaluation will be carried out annually.

Indicator selection to evaluate chemical quality of a management unit will be based on the list of priority substances and other pollutants listed in Appendix I, Section A, of the Spanish RD 60/2011, according to the following guidelines:

- *In water*, the indicators considered for EQS evaluation will only be those that have been recorded in one of the contaminant sources and will be measured in the management units reached by these, according to the extension estimates of the Environmental Risk Assessment and Management Program (Section 5.2.3.2). A management unit will fulfil with the EQSs when i) the arithmetic average of the concentrations measured in one year, at each management unit site, does not exceed its corresponding EQSs established in Appendix I of RD 60/2011. The only exception to this evaluation will be mixing zones. The competent authorities may designate mixing zones adjacent to the discharge points, where the substances of Appendix I may exceed the EQSs, provided these concentrations are met in the other management units.

- *In sediment,* the indicators considered for EQS evaluation will include all the heavy metal and Polycyclic Aromatic Hydrocarbon (PAHs) included in the RD 60/2011 (Appendix I, Section A). Evaluation will be carried out based on the EQSs established in the corresponding legislation. However, if this legislation is not available, sediment quality standards will be established from the lower Action Levels established in recommendations for dredging material in force at the time of this Recommendation application.

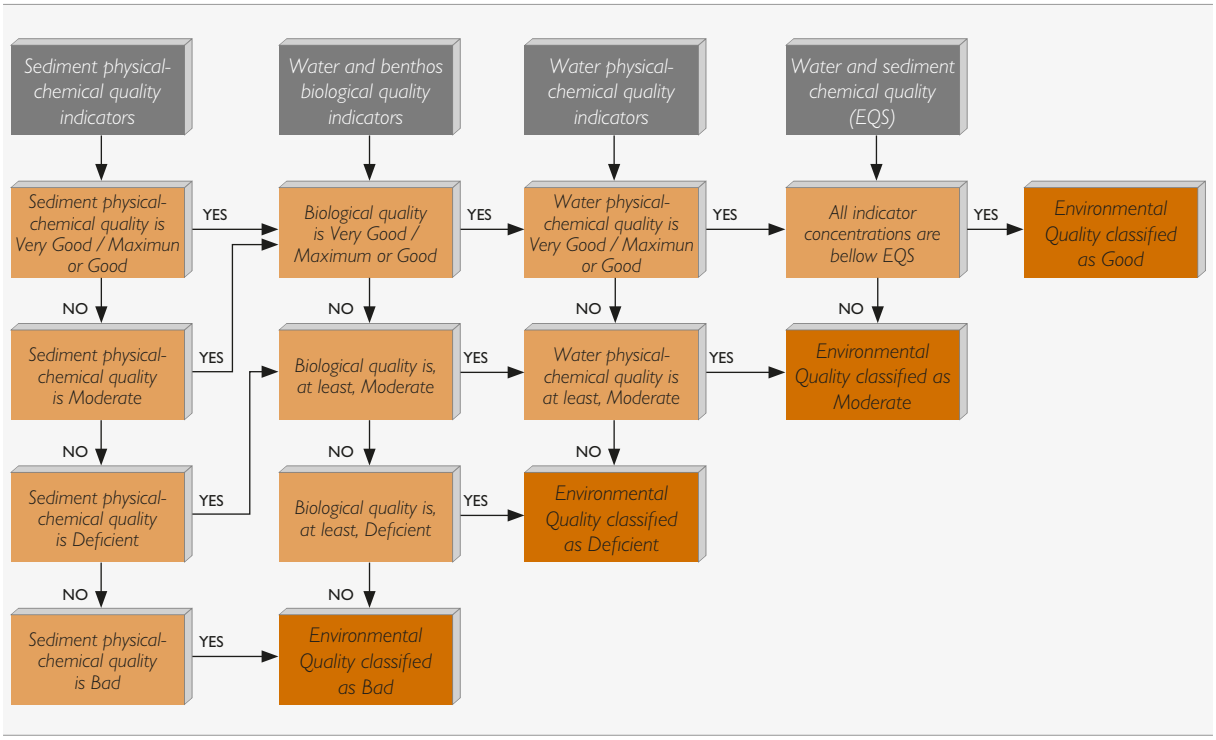
The final evaluation of this element will be performed by applying the *one out-all out* principle to the water and sediment evaluations. A management unit will fullfil with the EQSs when all analysed substances in water and sediment are below the established environmental quality standards.

The analytic methods will be adjusted to RD 60/2011 (Appendix V). The technical specifications relating to indicators selection, sampling design, analytic techniques and chemical quality assessment are given in Chapter III: Method 13. EQS.

6.2.5. Environmental Quality Evaluation

Environmental quality of heavily modified PAMU is evaluated from the hierarchical integration of the quality elements of Figure 6.2.

Figure 6.2. ***Integration procedure for quality elements to evaluate the environmental quality***



The four established environmental quality levels (Good, Moderate, Deficient and Bad) will enable possible environmental problems to be recognised for each management unit. If a management unit does not obtain a Good qualification, adequate mechanisms will be employed to improve the situation (Figure 6.1).

6.3. Environmental quality monitoring of protected areas

In addition, when there are protected areas within the PJA (in terms of the Spanish Hydrological Planning Instruction), the corresponding information will be requested from the competent authorities responsible for applying the obligatory environmental evaluation programs according to the standards governing quality in such areas.

7. POLLUTANT INCIDENT MANAGEMENT PROGRAM

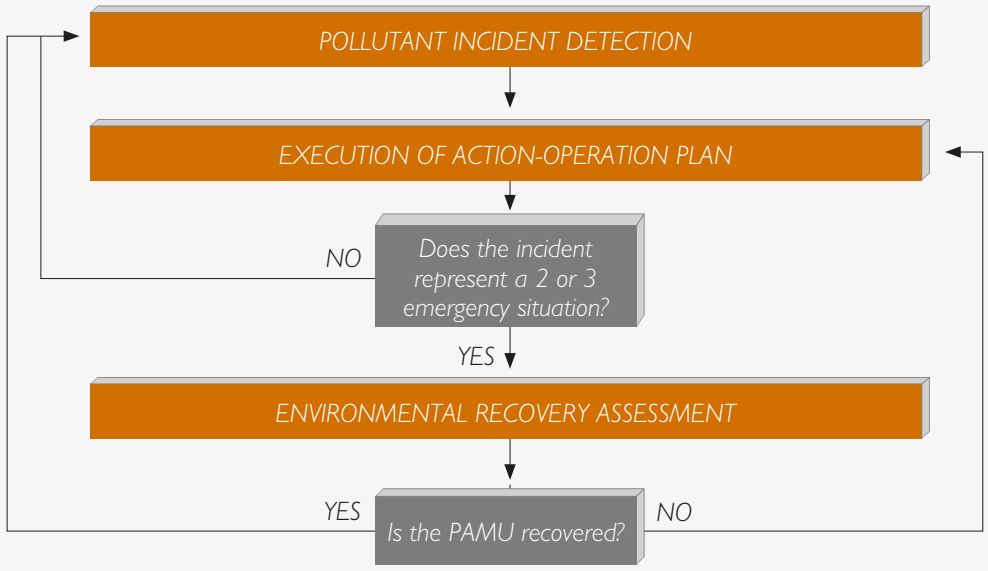
The main aim of this Program is the detection, classification and coordination of action required to minimise the effects of pollutant incidents occurring inside the PJA. However, beyond the management of each specific pollutant incident, this Program will provide objective judgement elements so that Port Authorities can identify

whether the detected incidents are produced fortuitously or are due to operational deficiencies or improper practices. For this reason, the Pollutant Incident Management Program establishes a general action-to-take framework that can be adapted to the various internal procedures of each port in function of competences and operational management needs.

This program will be developed by the following tasks (Figure 7.1):

- Pollutant incident detection: this establishes the detection path for the pollutant incident, whether by direct communication by those responsible, by a complaint or visual inspection protocols.
- Execution of the action-operation plan: this defines the mechanisms that are to be activated against a pollutant incident.
- Environmental recovery assessment: this proposes a procedure to evaluate recovery of areas affected by a pollutant incident.

Figure 7.1. Scheme for Pollutant Incident Management Program



For the purpose of contextualisation of this program within the current Spanish legislative framework, it must be taken into account that, according to Spanish RD 1695/2012 (21st of December), which approved the National Response System, the port must have an interior marine plan. The interior contingency plans for accidental marine pollution plans (PICCMA due to its Spanish acronym), by naval construction and repair yards, ship breakers, reception installations for hydrocarbon waste and any other maritime installations that handle hydrocarbons in maritime and port areas, together with actual PICCMAs in the ports as regulated by Spanish RD 253/2004, will be considered as interior marine plans and will continue being valid until they are modified. Spanish RD 1695/2012 is applicable to modifications and new approvals of these interior marine plans.

7.1. Pollutant incident detection

Pollutant incident detection may occur in three main ways, by direct communication by those responsible, by a complaint or routine visual protocols. Unlike the first two situations, in which incident detection occurs via direct notification, visual inspection detection requires specific procedures.

In general, Port Authorities have procedures available for performing visual inspections. However, in addition, Method 14 (Chapter III) proposes a procedure to establish the visual inspection level and its subsequent design based on two principal aspects, pollutant incident occurrence frequency in an area and the hazard level of the substances or materials handled by the involved activities. Putting it into service requires the analysis of the pollutant incident log and a survey of the activities carried out in the PJA, in order to establish the most suitable inspection levels for each area.

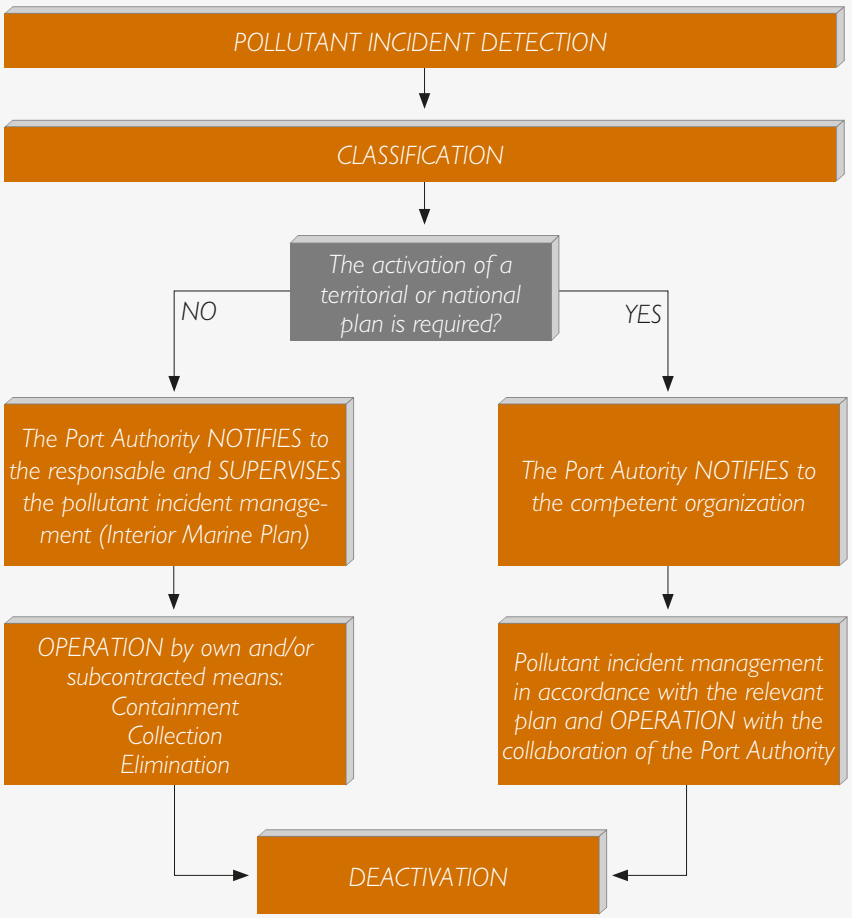
In each case, independently of the employed procedure, full compilation and standardisation of all information relating to the pollutant incident are required (Chapter III: Method 15. Section 1). Here, it is important to stress that a full homogeneous information compilation is essential to establish the actual source of possible problems relating to port operation (deficient installations and/or procedures, improper practices, etc.). This knowledge will improve the design of visual inspections of the installations or activities producing pollutant incidents.

7.2. Execution of the action-operation plan

The port action-operation plan against accidental marine pollutant incidents will be developed through four consecutive tasks (Figure 7.2)

- Classification: its final objective is the identification of adequate measures and actions for the management of a pollutant incident in function of its characteristics and the emergency situation it represents.
- Notification: this represents the coordination nexus with the competent organisation or department for the effective implementation of the various plans of action (interior marine plan for the installations or port plan, local plan) or contingency (territorial, national).
- Operations: establishing the possible specific measures for containment, collection and elimination of the discharged products depending on their characteristics.
- Deactivation: this determines the criteria for terminating the action-operation plan.

Figure 7.2. ***Methodological schematic of the action-operation plan***



7.2.1. Classification

This first task in the action-operations plan will facilitate making decisions with respect to pollutant incident management by means of three specific items: i) incident characterization, ii) determination of the type of emergency situation it represents and iii) identification of adequate management measures and actions.

7.2.1.1. Incident characterization

When a pollutant incident is detected, it is essential to estimate its *magnitude* and the *hazard level* of the involved substances and materials. It is also necessary to calculate the *vulnerability* of the affected management units.

The *magnitude* of a pollutant incident may be affected by various factors, such as the tidal range, weather conditions or the water sheet visibility conditions from the inspection points. This why it is not easy to determine the magnitude with precision, however, it must be approximately estimated in order to establish the type of emergency situation associated with a detected pollutant incident. Thus, Table 7.1 establishes the thresholds that differentiate between high, medium and low magnitude depending on the surface area affected by these or the discharged amount or, if available, both information types.

It should be pointed out here that, if incident detection is via communication from those responsible, the magnitude may be obtained with the objective data about the discharged amount. Otherwise, if it is detected by visual inspection or by a complaint, then, because further information is not available, the magnitude will have to be obtained from the affected surface area.

Table 7.1. Assessment criteria for pollutant incident magnitude term

Magnitude	Affected extension	Amount discharged
High	> 10000 m^2	> 10 m^3
Medium	Between 100 and 10000 m^2	Between 1 and 10 m^3
Low	< 100 m^2	< 1 m^3

The *hazard level* is evaluated in function of substances or materials involved in the pollutant incident (Chapter IV: Data 5) and it enables the potential effects to be estimated on the chemical and ecological environmental qualities, on human health or the established uses in function of the discharged product type (Table 7.2).

Table 7.2. Assessment Criteria for pollutant incident hazard level term

Hazard level	Discharged product type
High	Substances and pollutants under Spanish RD 60/2011. Substances and pollutants under European Regulation (EC) No 166/2006. Hazardous materials under Spanish RD 145/1989.
Medium	Discharges with significant bacteriological load under European Directive 2006/7/EC. Potentially hazardous materials under Spanish RD 145/1989.
Low	Other substances or materials.

PAMU's *vulnerability* is evaluated in function of the protection level, the uses and associated management unit activities that are affected by the pollutant incident (Table 7.3.). Within the scope of Spanish RD 1695/2012, at least, those corresponding to Very High vulnerability will be considered especially vulnerable areas (Table 7.4).

Table 7.3. Assessment criteria for management unit vulnerability term

Vulnerability	Affected management unit type
Very high	Protected area within the context of the WFD.
High	Natural and heavily modified PAMUs where they develop authorised recreational and sports uses.
Medium	Heavily modified PAMUs exclusively dedicated to port activities.
Low	Any type of PAMUs affected by low magnitude pollutant incidents.

7.2.1.2. Determining the emergency situation type

According to Spanish RD 1695/2012, four emergency situation types are defined. Depending on the magnitude, hazard level and vulnerability obtained during the classification of the pollutant incident, the emergency situation it represents will be established according to the specific circumstances described in Table 7.4. However, it should be emphasised that the emergency could be conditioned by the port operational situation at the time when the incident was detected and consequently, it may be necessary to elevate or decrease the type of emergency situation.

Table 7.4. Types of emergency situations according to Spanish RD 1695/2012

Emergency situation type	Characterising circumstances
Situation 0 This will be produced when a marine pollution incident of *low magnitude and hazard level* occurs.	- That the marine pollution is within the application scope of an interior marine plan and/or local plan. - That the pollution is within the application scope of the interior marine plans. - That the pollution exclusively affects or could exclusively affect the coastal front of a local organisation in a limited manner
Situation 1 This will be produced when a marine pollution incident of *medium magnitude and hazard level* occurs.	- That the measures available in the activated plans for situation 0 are insufficient to combat the pollution. - That the pollution was produced outside the application scope of the interior marine plans. - That the pollution affects or could affect a section of coast corresponding to various bordering municipalities. - That because of vulnerability circumstances of the affected or threatened area, while situation 0 is still applicable, the responsible authorities consider the situation 1 plans should be activated with the necessary response degree.
Situation 2 This will be produced when a marine pollution incident occurs in an *especially vulnerable area.*	- That the measures available in the activated plans for situation 1 are insufficient to combat the pollution. - That the affected or threatened area is especially vulnerable.
Situation 3 This will be produced when a marine pollution incident of *high magnitude or hazard level* occurs.	- That the pollution affects or could affect the coast of several regions. - That the pollution could affect the waters or coast of various bordering municipalities. - That the pollution is produced in waters under the state sovereignty. - That, with personal safety and goods being endangered, the emergency is declared of natural interest.

7.2.1.3. Identifying adequate measures and actions

Depending on the type of emergency situation represented by the pollutant incident, the corresponding plans shall be activated as indicated in Table 7.5.

Table 7.5. Measures and actions required when faced by the various emergency situations according to Spanish RD 1695/2012

Emergency situation	Required measures and actions
Situation 0	At least the corresponding interior marine plan and/or the local plan will be activated in an adequate degree of response.
Situation 1	In addition to the interior marine plan and, as applicable, the regions territorial plan and/or the corresponding local plans and, as applicable, the National Marine Plan shall be activated in an adequate degree of response.
Situation 2	The corresponding local plans, the regions territorial plan and, as applicable, the interior marine plan will be activated in an adequate degree of response. The controlling organisation for the territorial plan may petition the Ministry of Public Works for the support of maritime measures and, as applicable, the activation of the National Marine Plan. Similarly, controlling organisation may petition the Ministry of Environment for the mobilisation of the State Protection Plan for the Seashore against pollution, with the integration of these measures into the territorial plan as applicable.
Situation 3	The National Marine Plan and the State Protection Plan for the Seashore will be activated against the pollution in addition to the regions territorial plans or together with the interior marine plans and corresponding local plans as applicable.

7.2.2. Notification

When the pollutant incident has been identified and it has been designated as an emergency situation, clear and rapid notification shall be given to the competent organisations so that they can carry out whatever action is deemed necessary.

Incidents, the responsibility of which, lies with an organisation other than the Port Authorities, will be notified and provided with all the information relating to the pollutant incident (Chapter III: Method 15. Section 2). Similarly, the Port Authorities will place itself at their disposition and provide support for incident management. Otherwise, the Port Authorities will manage it internally using its own and/or subcontracted means.

7.2.3. Operations

In incidents for which the Ports are responsible, they shall carry out cleaning and collection jobs with their own and/or subcontracted means. Otherwise the competent organisation, with Port Authorities assistance, will carry out whatever action is deemed necessary according to Spanish RD 1695/2012 for each emergency situation.

Complementary to this, the general environment in which the procedure is to be carried out, due to the characteristics in the affected area, could indicate the recommended type of measures. In this sense, the need will be assessed on whether to apply containment, collection and elimination measures in function of the characteristics and physical state of the product involved in the pollutant incident (Chapter III: Method 16), considering that:

- *Containment* measures are intended to confine the pollutant.
- *Collection* measures are intended to remove the pollutant.
- *Elimination* measures are intended to inactivate the pollutant as much as possible by making react.

7.2.4. Deactivation

According to the International Maritime Organisation's recommendations, contingency plans shall establish, among other minimums, the circumstances in which the contingency may be declared as terminated (Spanish RD 1695/2012). Based on this, the effectiveness of the measures adopted will be verified in order to announce the deactivation of the ongoing plan.

When the action-operation plan has been deactivated, the associated information shall be complied into a report so that it can be analysed in the future or simply to have written record of what occurred. Section 2 of Method 15 (Chapter III) provides an example form for full systematised recording of all relevant information.

If the action processes were not the responsibility of the Port Authorities, the latter must request this deactivation information from the organisation or department that carried out the necessary action.

7.3. Environmental recovery assessment

The environmental recovery assessment procedure will define the directives for evaluating the evolution of the environment affected by a pollutant incident. Even when the application of this procedure is optional, it is still recommended for incidents with emergency situations classified as level 2 or 3.

The stages of this procedure require, on the one hand, adequate classification of the pollutant incident (Section 7.2.1.1.) and on the other, information about the prior condition of the affected areas (Environmental Quality Monitoring Program).

Method 17 (Chapter III) provides a guide for indicator selection and the design of a sample required to evaluate the degree of recovery of the affected environment.

Chapter II
Technical and Legal Fundamentals

Technical and Legal Fundamentals

CHAPTER II

1. INTRODUCTION

In recent years, various national and international administrations and organisations have decided to promote environmental protection policies in order to establish a common sustainable development strategy. The protection of aquatic ecosystems was not an exception in this trend. These policies are leasing to the existence of an emerging assembly of legal standards that are ever-increasingly specific and complex in their requirements which, in many cases, are applicable to marine waters in general and hence, ports also. International, European, state and autonomic standards tend to agree in these matters, with the coexistence of those regulating general environmental policy aspects with others that specifically govern marine water quality requirements. To these are added those that indirectly deal with quality matters, such as those regulating ports and their activities, those relating to responsibilities for specially protected natural areas, to coasts and fishing activity development, among others.

In ports, environmental problem complexity and diversity are determined by actual peculiarities of each port. Aspects such as their location, their activities and interactions produced by the confluence of these with other uses developed in their surroundings mark the type of actions needed to improve environmental quality. However, nowadays ports are integrated, from economic, social and environmental viewpoints, into the population centres, the influence of which cannot be ignored. Because of this, in recent years there has been a trend towards reordering ports so that, while tending to expand their activities, they plan their optimisation to minimise usage conflicts or interference with their surroundings, attempting to adapt to the requirements of a society regarding environmental conservation and implementation of sustainable development.

This coexistence of uses in the port environment has produced heavy pressure on the aquatic environment, which must be managed using adequate tools adapted to their own peculiarities. In this scenario, approval of the Water Framework Directive is noteworthy and which establishes a community action framework in water politics, because it provides a legal instrument that serves as a reference for the development of all legislation applicable to European aquatic ecosystem protection, whether surface (freshwaters, transitional waters and coastal waters) and groundwater, and which therefore, have direct effects on port waters. The effects of this directive, the transposition of which into the Spanish legal system was commenced via Spanish Law 62/2003 on Fiscal, Administrative and Social Order Measures, was translated into conceptual, legislative, political and social focuses intended to go deeper into comprehensive aquatic system management in order to permit their sustainable use, protecting their quality and preventing their deterioration.

Subsequently, Spanish RD 125/2007 (modified by Spanish RD 266/2008 and Spanish RD 29/2011) and Spanish RD 126/2007 were the legal tools responsible for fixing the territorial area and to regulate the composition operation and attribution of their representative bodies. Furthermore, the legislation for hydrological planning (Spanish RD 907/2007, modified by Spanish RD 1161/2010) and Spanish Hydrological Instruction Planning through Spanish Order ARM/2656/2008 established the standards for the regulation framework for the analysis of environmental pressures to which the water bodies are subjected; impact estimation; assessment of their chemical and ecological status; and the calculation of the economic use to which this water is put.

Regarding this, the ports have been fully incorporated into the spatial scope of a River Basin Districts (RBD), established as the territorial reference unit for aquatic system management through the so-called Committee of Competent Authorities and the River Basin District Councils. This coordination body between the various administrations that have concurrent competences in matters or spaces relating to RBD water management that is formed by the Port Authorities and Maritime Authorities (directly or through representation), has been given competence in the planning process and all aspects relating to water protection, with the main goal of guaranteeing adequate application of the requirements demanded by legislation.

This policy of marine environment protection has been endorsed with the approval of European Decision 2850/2000, setting up a Community framework for cooperation in the field of accidental or deliberate marine pollution. This Decision advocates supporting and complementing member states' efforts on local, regional and national levels for protecting the marine and coastal environment and to contribute to the member states' response capability in case of accidents involving hazardous substances. Attaining a goal of this size required concep-

tual and procedural restructuring which, although is complex, was necessary to reach a balance between aquatic environment users and its sustainability.

With all this, the latest goal of this new proposal is to establish a common reference framework for all community water bodies that serves as a base for standardising the diagnostic procedures and the putting into operation of measures to maintain or improve aquatic system quality.

Since the WFD is the most important aquatic system management tool, it is necessary to bring this Recommendation conceptually and methodologically closer to the actual marked directives. This intension is incorporated into ROM 5.1-13, on *Coastal water quality in port areas*, aimed at comprehensive port aquatic system quality, in which the requirements are combined to evaluate environmental quality with the assessment of risks liable to alter it.

2. DELIMITATION AND TYPIFICATION OF PORT AQUATIC MANAGEMENT UNITS

According to WFD principles, the minimum water body management units are established as discrete and significant element that are fully delimited and which include water columns as well as their bottoms and the various communities associated with them. However, the work scale of this community standard corresponds to a supra-regional geographical scope. For this reason, the vision of the WFD aquatic system management could be insufficient for adequately dealing with elements that present specific problems or require a more detailed management scope. Among these are ports, singular elements of coastal aquatic systems with activities requiring adaptive environmental management.

This means that the dimension of water bodies managed by the Directive, as defined in the various River Basin District Plans, is sufficiently extensive so that the included ports represent a global activity, the singularity of which could be difficult to recognise. In the best of situations, ports in themselves become a single heavily modified water body (HMWB), but could also form part of a large water body in which they would not have any additional acknowledgement.

In contrast, ROM 5.1 application scope is framed by the port jurisdiction areas, which permits their treatment as areas subject to special planning that must be acknowledged. Therefore, overall, ROM 5.1 represents an instrument that performs detailed analysis of the various aspects required in the WFD (analysis of pressures and impacts, ecological status and measures programs) on a much smaller work scale. This interaction between WFD and ROM 5.1, far from being contradictory, shows the existence of equal objectives associated with the two work scales, the differentiation of which must be promoted and evaluated as a significant asset for port management.

Due to the close conceptual relationship between the WFD and ROM 5.1, many of the considerations established in this management instrument were incorporated into the Hydrological Planning Instruction (Spanish Order ARM/2656/2008), state-level standards promulgated by the Spanish Government in order to set up homogeneous criteria for the WFD application. Logically, these considerations refer to the water bodies that are heavily modified by port presence. In this context, the Hydrological Planning Instruction propose that, on a level of Spanish state-owned ports, Zones I (interior port waters) and those parts of Zone II (exterior port waters) where there are access channels or in which maintenance dredging tasks are carried out, will have to be preliminary identified as bodies to be designated as heavily modified. This provisional qualification must subsequently verify that benefits deriving from artificial or modified water body characteristics cannot be reasonably attained by other means which constitute a significantly better environmental option, because of technical possibilities or disproportional costs.

However, on many occasions, this methodology, fundamentally based on administrative delimitations (Zone I – Zone II), may not adequately show the physical reality of the port area or its socioeconomic reality (Port activities, spaces and uses). To this end, because ROM 5.1 and the River Basin Districts handle different

scales of analysis, the water bodies proposed via the ROM 5.1 methodological procedure do not necessarily have to coincide with the proposals from each basin organisation. Therefore, it must be remembered that the ROM 5.1 delimitation and typification criteria represent a way of recognising the diversity of spaces within the port area in order to apply specific and individualised evaluation and management measures to those PJA parts that require this, independently of the fact that the port can be acknowledged as a single water body within the WFD.

Along these lines, the water bodies established in ROM 5.1 correspond more to management units than to water bodies sensu WFD. For this reason, for the purpose of applying this Recommendation, the minimum management units are defined as *Port Aquatic Management Units* (PAMUs). These allow customised management to be performed at a level of detail as considered most suitable for each specific case, in other words, it promotes adaptation of water body establishment according to the characteristics and needs of each port. This differentiation enables a WFD water body to be divided into several PAMUs that are more compatible with port activities and dimensions. This allows more specific environmental management to be carried out that is consequently more efficient.

In this way, the difference in work scales between the WFD and ROM 5.1 means that, while for the former, the port represents a pressure, for the latter, the pressures are related to each contaminant source affecting the PJA. Thus, by analysing the port water quality from this perspective, it is possible to identify, evaluate and specifically manage those problems that put directive compliance at risk.

Along these lines, since the areas defined by aquatic environment usage and activity zoning are characterised by being units subject to the same type of pressure, their prevailing conditions may be considered homogeneous. So, for the purpose of this Recommendation and according to peculiarities associated with port zones, the PAMU limits are established in function of the aquatic environment uses, of the physical or physiographical peculiarities and most significant hydrodynamic conditions.

These uses, to which aquatic systems are subjected, are pressure factors that, in the end, can produce impacts on marine habitats. This circumstance reveals the true incidence that human activities have on aquatic system quality and hence, the need to adapt their environmental goals to the external conditioning factors to which they are subjected. The work philosophy is nothing more than a reflection of the strategy advocated by the European Commission for marine environment protection and conservation, according to which, this protection should begin with identifying the pressure factors acting on the aquatic environment. Its application to ROM 5.1, therefore, has involved the need to consider special attention the PAMUs which, because they are subject to uses of special economic and social importance, they can adapt their environmental goals to more coherent ones with their hydromorphological characteristics with uses developed in them and with the impacts produced by these uses.

In order that, in addition to being appropriate to the uses, the environmental goals objectively include the natural variability which, in terms of physical, chemical and hydromorphological terms, characterise the aquatic systems, the PAMUs classification is aimed at reducing the environmental heterogeneity through the fragmentation of the water bodies into a series of PAMUs types. With this proposal, the designated descriptors, determinant and discriminatory variables of these characteristics are introduced into the classification process.

The need for PAMU to have an environmental classification and evaluation procedure that makes its quality maintenance compatible with the port activities, in which its singularities are made evident, justifies the necessity to establish suitable descriptors for it. The associated studies in this respect consider that although the environmental variability should be represented by a combination of biological, physical and chemical descriptors, etc., the physical descriptors are the ones that best reveal the complexity and heterogeneity of the port zones. The direct consequence was the use of salinity as a descriptor of continental water influence on marine community structure and distribution, which differentiates the coastal and estuarine zones for any PAMU, independently of subsequent classification as natural or heavily modified. Additionally, in order to show the peculiarities associated with heavily modified PAMUs, it was decided to use a hydromorphological descriptor, such as flushing time, which is a representative factor in transport processes and directly related to water body pollution processes.

Summing up, the division of a water body into several PAMUs, responds to the convenience of working with smaller management units. However, this Recommendation establishes the principle whereby the Port Authorities are responsible for designing their own management system according to their needs and requirements.

3. ENVIRONMENTAL RISK ASSESSMENT AND MANAGEMENT

Aquatic system quality in port areas is a consequence of their activities and of the uses made in their environments. On many occasions, the interaction of possible influences makes it difficult to precisely identify the surrounding hazards existing in the PJA aquatic environment and consequently, its resolution also. It is thus necessary to implement an evaluation procedure that discriminates the sources and effects of the various hazards with the highest possible certainty in order to proceed with the most suitable management.

It should be point out that all risk evaluations include significant uncertainty associated with various factors (scientific knowledge limitations, lack of information sources, existence of several, at times contradictory, perceptions of existing risks and of their severity, etc.). Because of this, the criteria on which they are based, such as scientific-technical hypotheses, administrative conditioning factors in force at any given time, information sources and their traceability, among others, must be adequately documented in order to permit updating and revision.

Currently, environmental risks and their associated responsibilities are of increasing interest to all types of organisations and institutions. In recent years, the Technical Committee ISO/TC 207 *Environmental management* has adapted Spanish UNE 150008-EX for environmental evaluation of sites and organisations. This standard on *Environmental risk analysis and evaluation*, published in 2000, presents a general methodology for identifying, analysing and evaluating the risks of the various industrial and commercial activities.

In the European area, environmental risk is considered in the White Book on Environmental Responsibility. Also, in Directive 96/61/CE of the Council, relating to integrated pollution prevention and control (IPPC), the environmental risk concept is significant when authorising new activities. Other applicable standards are Regulation (CEE) 793/93, on risk evaluation and control of existing substances, and Directive 93/67/CEE, which fixes the risk evaluation principles for people and the environment of notified substances according to Directive 67/548/CEE. Subsequently, in 2003, the European Commission developed a guide document which set out various guidelines for the application of Directive 93/67/CEE.

Environmental risk evaluation consists of two principal stages, *risk analysis* and *risk assessment*. Risk analysis is a process that identifies the hazards and estimates their risks. Through *identification* its existence is acknowledged and its characteristics are defined. On the other hand, *risk estimation* involves their nature and magnitude descriptions through the determination of the occurrence probability, the environmental vulnerability and the derived consequences. To this end, the information collected in the previous stage is integrated, together with the characteristics of the environmental or ecosystem affected by the hazard.

Regarding the selection precision of the measures to adopt, the methods employed for risk estimation are classified into two categories, qualitative and quantitative methods. Both methods have initiated their standardisation process through the publication of Spanish UNE 150008-EX. This Recommendation proposes a semi-quantitative method based on the cited standard.

However, this risk estimation can be performed by the following focuses or models:

- Tolerances: hazard evaluation and classification using indices that tabulate risk tolerability.
- Instrumental: trend monitoring and estimation of the environmental indicators and their thresholds in magnitude and persistence in this environment.

- Economic-probabilistic: probabilistic and economic risk quantification of the chain of environmental consequences, such as those affecting overall operation and its supply chain.

This Recommendation develops the first risk estimation model (tolerances) through basic methodology to estimate the environmental risk value in a homogeneous and standardised way as a prior step to its tolerability analysis and the establishment of measures for its elimination, correction or prevention.

However, in such cases in which monitoring and forecasting networks are deployed, it is sufficient to apply the instrumental risk estimation models to the reliability framework of the environmental agent forecasts. If statistically representative temporal records are available for the environmental variables, together with data for economic consequences of the discharging in the overall activities affected by failures or shutdowns in their economic subsystems, it is recommended that the economic-probabilistic risk estimation models be applied, which are described in the *Practical guide for risk calculating using probabilistic methods in marine and port engineering* (in the drawing-up stage when this Recommendation was published).

When the risk is estimated, the tolerability criterion for its evaluation is established and which is based on the results obtained in the estimation process using a previously defined scale. The risk evaluation for the various hazards must be notified in terms understandable by the managers so that they can decide on what measures to adopt.

Risk management is performed after evaluation and it proposes the preventive and corrective measures to be applied to reduce such risk. Thus, a detailed study must be carried out for each measure applied to the correction of the various risks so that they can be evaluated, since the adoption of certain measures must be justified by cost and by their specific characteristics. Lastly, a priority order is established for the measures that may be applied after evaluating each measure.

4. ENVIRONMENTAL QUALITY MONITORING

Monitoring, which is the continuous systematic observation of marine ecosystem components is the base underpinning aquatic system quality management. If this information is obtained over a long enough time period to determine the variation ranges and indicator trends, it will provide environmental information essential in the decision-making process.

In the European legislative scope, the concept of comprehensive aquatic system monitoring was introduced by the WFD, which emphasises the importance of "monitoring surface waters, groundwaters and protected areas". In this manner, the new approaches in environmental matters advocated on a community level have converted the classic *water quality* concept, comprising sectorial norms (bathing waters, shellfish production areas, etc) and specific criteria (bacteriological, biological, physical and chemical), into a new term called *ecological potential* of heavily modified water bodies and *ecological status* of natural water bodies.

In ROM 5.1, the *environmental quality* of the management units combines procedures established in the Hydrological Planning Instruction, in the River Basin District Plans and in RD 60/2011 about Environmental Quality Standards (EQS), with procedures specifically developed for responding to port singularities. The *environmental quality of heavily modified management units* is tackled via an evaluation system that reflects the aquatic ecosystem functioning and integrates indicators for the biological quality, the physical-chemical quality of water and sediment and the chemical quality. The Hydrological Planning Instruction was the first legislation that explicitly recognised port water particularities and the significance of including sediment in the quality assessment. Since it could not be any other way, ROM 5.1-13 has also given sediments a relevant role in environmental quality evaluation.

In port areas, the hydromorphological alterations deriving from their physical configuration, together with its own and outside uses and activities developed in its environment encourage intensification of sediment processes and gradual pollution of their bottoms. Bottom response to anthropic pressures is determine by the fact that most toxic and persistent pollutants (evaluated in chemical quality) and the organic compounds (evaluated

in sediment physical-chemical quality) may accumulate or remain retained in the sediment particles and, under certain circumstances, subject to absorption dynamics of aquatic organisms that may manifest their effects in the medium and long-terms.

The preoccupation for this type of pollution produced the publication of Directive 2008/105/CE in 2008, which established the EQS for priority substances and other pollutants and Directive 2009/90/CE in 2009, with the technical specifications for the chemical analysis and the monitoring of the ecological status. It was entered into Spanish law by RD 60/2011, which constitutes the legislative reference relating to water and sediment chemical quality. This standard includes the EQSs for priority and preferential substances and other pollutants and establishes the possibility of proposing the EQS for sediment. As already stated, a significant goal of ROM 5.1 is to evaluate the incidence of uses and activities on sediment. Thus, in chemical quality evaluation, compliance with the EQS for water was completed with priority substance evaluation in sediment which, *a priori* is more closely related to the port activities, such as heavy metals and polycyclic aromatic hydrocarbons.

5. POLLUTANT INCIDENT MANAGEMENT

A pollutant incident is associated with any pollutant discharge that may reduce the PAMU quality, whether the reduction is accidental or occurs progressively.

Pollutant discharges that drastically reduce quality are framed within what Spanish RD 1695/2012 defines as a "marine pollution incident". The potential risk of pollutant incidents or, put another way, accidental marine pollution incidents occurring in the various activities (port and external) in the ports (loading and unloading operations, cargo transferring and handling merchandise onboard and in terminals, installation breakdown, etc.) make pollution-fighting measures essential which, on the one hand, reduce spill risks and on the other, guarantee rapid, effective response levels.

Acknowledgement of the high-level risk associated with accidental spills of certain hazardous substances was ratified in 1990 by the signing of the International Agreement on cooperation, preparation and fight against hydrocarbon pollution. This document introduced, for the first time, the recommendation of having a National Contingency Plan, supplemented by specific contingency plans for ships, inshore operations companies and handling installations, etc., aimed at preventing oil pollution and evaluate its nature, magnitude and consequences of recorded pollutant incidents. This agreement was ratified by the Spanish State in 1993 and was translated into the publication of two specific standards, the Spanish Order dated 23rd of February 2001, which defined the National Contingency Plan and Spanish RD 253/2004, which established the prevention and combating measures against pollution in hydrocarbon loading, unloading and handling operations in maritime and port environments.

The first standard defined the National Contingency Plan for tackling any maritime accident type and established the master lines of the so-called Interior Contingency Plan, applicable to pollutant incidents at potentially pollutant product installations and the Territorial Contingency Plan for pollutant incidents in specific coastline areas or at installations without the means to combat spills. Subsequently, Spanish RD 253/2004 defined the content of Interior Contingency Plans required of authorities and companies in charge of maritime ports, naval construction and repair yards, oil platforms, ship-breaking yards, hydrocarbon waste reception installations and any other maritime installation that handles bulk hydrocarbons.

Moreover, certain laws and regulations establish a complementary framework that facilitates pollutant incident control and management. For example, according to Spanish RD 1254/1999, all establishments containing hazardous substances in determined quantities are obliged to prepare an Interior Contingency Plan based on the self-protection concept. This same obligation is also include in Spanish Law 31/95 on Workplace Risk Prevention.

In turn, European Regulation (EEC) No 145/89, on hazardous merchandise admission, handling and storage in ports and Spanish RD 1254/1999, which approves the control measures inherent in serious accidents involving hazardous substances that could serve as preventive tools in pollutant incident management.

Although accident pollutant incidents usually have greater social repercussions, smaller discharges that are continuous over time are the ones that finally become chronic pollution incidents in the environment. For this reason, the latter must also be considered pollutant incidents. Although there are currently no standards, agreements or specific legislation for this incident type, the publication of the WFD has given rise to certain standards that directly or indirectly advocate prevention and, when necessary, correction. In 2000 European Decision 2850/2000/CE was published, which established a community framework for cooperation in accidental or deliberate marine pollution. Its application requires the implementation of a rapid and efficient community information exchange system that facilitates preparation and intervention in the case of "(...) discharging hazardous substances into the marine environment, whatever its source (...)".

In the context, Spanish RD 1695/2012 constitutes an integrating framework for the most relevant aspects relating to accidental or deliberate pollutant incidents, with the establishment of a National Response System in all cases, whatever its source or nature, which affects or could affect marine waters under Spanish sovereignty, sovereign rights or jurisdiction as are the Spanish coasts.

Pollutant incident management was completed by the subsequent publication of European Directive 2004/35/CE, a standard that established the environmental responsibility framework. Based on the principle *the polluter pays*, this Directive sets out the prime objective as the prevention and repair of environmental damage that produces significant adverse effects on PAMU environmental quality.

The Pollutant Incident Management Program includes the legislation established in this matter through the development of procedures that cover from the moment when pollutant incident detection occurs until recovery of the affected environmental is confirmed.

Chapter III
Technical Methods

Technical Methods

CHAPTER III

The Chapter on Technical Methods is intended to be a work tool to supplement the ROM 5.1 application procedures.

Given the heterogeneity that characterises port systems, together with the diversity of analysis methods and procedures, this document is implemented as a basically guideline tool with the sole objective of defining the technical specifications of each proposed method and to establish the minimum criteria to be met in the implementation of the Recommendation.

To this end, this document defines the methodological procedures that require some analysis or calculation (Table 1).

Table 1. List of methods for each ROM 5.1 Program

Methods	Program
1. PAMUs delimitation. 2. Grid-calculation generation. 3. Obtaining tidal and wind currents. 4. Calculating flushing time.	Delimitation and Typification of Port Aquatic Management Units Program
5. Compiling information for contaminant source identification. 6. Contaminant source characterization. 7. Calculating contaminant source extension using numerical models. 8. Calculating contaminant source extension using GIS. 9. Calculating the PAMU percentage surface affected by a contaminant source.	Environmental Risk Assessment and Management Program
10. Evaluation of sediment physical-chemical quality. 11. Evaluation of water and benthos biological quality. 12. Evaluation of water physical-chemical quality. 13. Evaluation of water and sediment chemical quality (EQS)	Environmental Quality Monitoring Program
14. Establishing visual inspection levels. 15. Compiling information in the pollutant incident log. 16. List of specific plans of action in function of product type involved in the pollutant incident. 17. Environmental recovery assessment.	Pollutant Incident Management Program

Each method in this document especially contemplates its objective, the information required to carry it out, the actual method description and its final result.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 1. PAMUs DELIMITATION
Objective:
To establish the spatial division of the water bodies, delimited by the corresponding River Basin District, into management units that allow adequate application ROM 5.1 proposals.
Required information:
◆ Water body delimitation by the corresponding River Basin District (Chapter IV: Data 3). ◆ Tidal current velocities in study area (Method 3). ◆ Wind velocities in the study area (Method 3).
Method description:
Each water body, originally designated by the corresponding River Basin District, may be divided into several PAMUs that respect the classification (natural or heavily modified) assigned by this. Such classification should be updated according to the River Basin District Plan. From a tidal current velocity map (Method 3), zones will be established as defined by the similar hydrodynamics, taking into account that a PAMU may not be shared between two different River Basin District water bodies. Furthermore, in areas of heavy upwelling and downwelling, it is necessary to also consider wind velocity for PAMUs delimitation. PAMUs from natural water bodies are classified according the types specified in Table 4.1 of the Chapter I. In turn, the PAMUs from heavily modified water bodies will require evaluation of the renewal capacity (Method 4) before being able to assign the types specified in Table 4.2 of the Chapter I. PAMUs corresponding to the same type may be grouped to form a single management unit when these are contiguous. However, waters confined between docks must be considered as independent management units. It should be mentioned that when changes are produced in uses or infrastructures that are subject to environmental impact evaluation, the management unit delimitation must be reviewed.
Final result:
The final method result will be the port aquatic management unit delimitation.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 2. GRID-CALCULATION GENERATION
Objective:
To generate a grid containing the bathymetric information for the study area in order to perform the circulation and transport calculations required by the Delimitation and Typification of Port Aquatic Management Units Program.
Required information:
◆ Bathymetric information for the study area in digital format (.xyz or .dxf). ◆ Aerial pictures of the study area.
Method description:
Bathymetric information is usually referred to in .xyz or .dxf format (transformable to .xyz), which means files in which each coordinate pair corresponds to a depth value. If this information is not available in digital format then each bathymetric line on the nautical chart(s) within the study area will have to be digitised to obtain the information in .xyz format. It must be mentioned that the study area must fully cover all the Port Jurisdiction Area with some overlap. The information obtained in the .xyz file must be interpolated with a suitable software tool, indicating the cell size required for the mesh. Cell size selection should take into account the study area geometric characteristics in order to achieve an adequate representation. The employment of 50 x 50-metre mesh cells has produced satisfactory results; however, if higher detail is required, cell size can be reduced. Before proceeding with the hydrodynamic calculations, the mesh must be carefully reviewed to guarantee its capacity to adequately discriminate the areas of water from those of land (including islands/islets, breakwaters, pantalan wharves and small salients, etc.); in addition to verifying that interpolation has provided coherent results. The superposition of the mesh calculation over the updated aerial photo of the study area will allow better adaptation of the mesh generated with physical reality since it will be possible to: ◆ Delete erroneous points: superposition of a mesh on an aerial photo enables discrepancies between the generated information and the actual (for example, points with depth values located on land). ◆ Add omitted points: superposition of a mesh on an aerial photo enables missing points to be detected (water areas interpreted as land during interpolation and which, therefore, lack depth values).
Final result:
The final result will be obtaining a properly-dimensioned grid calculation that represents physical reality of the study area and contains the depth at each point.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 3. OBTAINING TIDAL AND WIND CURRENTS
Objective:
To obtain the currents produced by tidal and wind actions in the study area, using two-dimensional and/or quasi three-dimensional numerical hydrodynamic circulation models (Chapter V: Tool 3).
Required information:
◆ Grid calculation (Method 2). ◆ Tidal wave range and characteristics at the site. ◆ Representative wind force and direction at the site, including statistical distribution by directional sectors. ◆ If the study area is subjected to incoming fluvial influence, the mean flow rate of each one is necessary.
Method description:
In order to consider the dispersive effects of tide and wind as generators of the main currents at the site, the following hypotheses shall be assumed when possible: ◆ Tidal currents can be considered uniform in depth and that the bi-dimensional, vertically averaged hydrodynamic models provide a sufficiently accurate solution considering the Coriolis acceleration term. ◆ Wind currents may be considered distributed to the bottom according to wind direction according to a non-uniform parabolic-type law, using quasi three-dimensional hydrodynamic models that do not consider the vertical velocity component. ◆ Both current types can be linearly superposed. In relation to tidal currents, this hypothesis is generally reasonable, provided the circulation baroclinic component is not significant, in other words, when the horizontal pressure gradient variation along the water column is practically uniform. It should be stated that if the study area is influenced by fluvial contributions, these must be considered in order to obtain tidal currents. However, if the PAMU measurement surveys show thermocline or halocline presence (for example, saline wedge estuaries) or its equivalent in isopicnals (density), permanent and clearly marked, it would then be necessary to employ three-dimensional hydrodynamic models that include the circulation baroclinic component (Chapter V: Tool 3). In relation to wind currents, this hypothesis may be acceptable in evaluating the velocity field in the water column, caused by drag tension on its surface and produced by a stationary wind and, in the case of shallow gentle slope bottoms, in other words, of shallow depth compared to the Ekman oceanic limit layer. In other circumstances, three-dimensional hydrodynamic models would have to be employed (Chapter V: Tool 3). **Obtaining tidal currents:** Vectorial currents and tidal levels in the computer model area are obtained by forcing the free edges of the model outline with the elevation of an average type tidal wave at the site (tidal coefficient of 50 – 80) and during sufficient time to obtain a full free tidal cycle of the model load transient. In order to obtain the tidal wave elevation at the free edges of the outline, the principal tidal harmonic components (M2, S2, etc.) are superposed at the site and sufficiently out of phase to obtain a mean tidal forcing coefficient. The tidal harmonic components can be obtained by harmonic analysis of automatic tide gauge records. The Spanish Port System has extensive associated information available at the Spanish National Port Administration Data Bank (www.puertos.es). For other sites without any automatic tide gauge records, the principal tidal harmonics can be consulted through general databases (for example, Grenoble).

***List of methods for each ROM 5.1 Program** (Continuation)*

Obtaining wind currents:

This will take into account the representative wind velocities in the study area, moderate winds (2-8 $m \cdot s^{-1}$) and strong winds (>8 $m \cdot s^{-1}$) for the eight significant wind directions (N, NE, E, SE, S, SW, W, NW). From the sixteen considered wind events an annual mean regime will be obtained from assuming constant eight-hour wind situations by applying the Monte Carlo method according to the probabilities of each event occurring.

To this end, using data from Spanish ROM 0.4-95 Weather action II: Wind, it is possible to obtain the probability for the occurrence of each of the sixteen sectors, together with their accumulated probability in mean directional regime for the established wind velocity intervals. Based on this information, the occurrence probabilities can be determined for the eight mentioned directions through the integration of their corresponding components.

Calibrating the model results:

The results from the models must be calibrated for the grid calculation so that the employed parameters, such as bottom friction and wind drag coefficients and those relating to turbulence closing models (for example, eddy viscosity), are suitable for the study area.

Final result:

The final result will be obtaining the currents produced by tide and wind actions.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 4. CALCULATING FLUSHING TIME
Objective:
To calculate heavily modified PAMU flushing time using numerical models (Chapter V: Tool 3).
Required information:
◆ PAMU delimitation results (Method 1). ◆ Grid calculation (Method 2). ◆ Results from tidal currents (Method 3). ◆ Results from wind currents (Method 3).
Method description:
It is assumed that the heavily modified PAMU under study (Method 1) behaves like a continuous stirred-tank reactor (CSTR) and that: ◆ A known quantity of conservative tracer is added to each PAMU cell at time 0 resulting in an initial homogeneous concentration throughout the domain. ◆ Subsequently no more conservative tracer is added to the PAMU. ◆ Water entering the PAMU is able to thoroughly mix with the water existing in the domain during each tidal cycle. This depends on the currents produce by the mean tidal wave considering a mean fluvial contribution flow rate and a mean annual wind regime (Method 3). As the model simulates conservative tracer transport, this reduces its residual mass in the PAMU due to the effects of currents produced by wind and tide. The tracer spatial distribution in the domain enables the residual mass in the PAMU to be calculated in a specific time. Thus, the flushing time is defined as the time required for the conservative tracer initially introduced into the system to be reduced to 37% of its initial mass value. Therefore, for the flushing time calculation, the conservative tracer mass evolution is obtained from the continued calculation of the residual mass percentage in the domain. Subsequently, the PAMU flushing time is estimated from data adjustment to an exponential function. This exponential function corresponds to this equation : $$M_{(t)} = M_{(0)}\, e^{-\gamma t}$$ Where coefficient γ will be equivalent to the inverse of the flushing time. Lastly, seven days will be established for flushing time evaluation in order to discriminate between a low-renewal PAMU and a high-renewal one. If the calculated flushing time is less than seven days, the PAMU will be considered having high renewal. Otherwise, if the calculated flushing time is greater than or equal to seven days, it will be assumed that PAMU renewal capacity is low.
Final result:
Evaluation of heavily modified PAMU renewal capacity.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 5. COMPILING INFORMATION FOR CONTAMINANT SOURCE IDENTIFICATION
Objective:
To compile information to identify contaminant source (localisation and characterization) through a systematic homogeneous system to facilitate information exchange between port authorities and organisations responsible for activities producing the contaminant source.
Required information:
No preliminary information is required for applying this method.
Method description:
Information compilation can be carried out completing a form. The form has to gather information relating to contaminant source classification, localisation and characterization (Method 6), in addition to occurrence frequency information, contaminant source accessibility and operational procedure efficiency. An example of such a form is provided below.
Final result:
The final result will be the homogeneous, standardised and systematised identification of contaminant source information in order to subsequently perform environmental risk assessment.

***List of methods for each ROM 5.1 Program** (Continuation)*

IDENTIFICATION FORM EXAMPLE

CODE ☐

Classification

- ☐ Point
- ☐ Difuse

- ☐ External
- ☐ Foreign
- ☐ Concesionary
- ☐ Port

- ☐ Port infrastructure and installation works
- ☐ Dredging
- ☐ Maritime traffic
- ☐ Land traffic
- ☐ Loading, unloading and storage of bulk solids
- ☐ Loading, unloading and storage of bulk liquids
- ☐ Fuel and victualling supply
- ☐ Ship construction, repairs and breaking
- ☐ MARPOL waste reception, transport and management
- ☐ Reception, transport and management of ships' ballast water and sediments
- ☐ Machinery and installation cleaning and maintenance
- ☐ Urban activities
- ☐ Industrial activities
- ☐ Fishing and aquiculture
- ☐ Nautical-recreational activities
- ☐ Public usage areas
- ☐ Military instalallations

Localisation

Lat (ETRS89) ☐
Lon (ETRS89) ☐

Location ☐
Person Responsible ☐

Point contaminant source characterization

Mean flow rate ☐ m^3/s

Substance (n° CAS)	Concentration (mg/l)

Difuse contaminant source characterization

Amount ☐

Material	Amount (units to be defined)

Ocurrence frequency (P_{ij})

- ☐ $P_{ij} \leq$ 1 month
- ☐ 1 month $< P_{ij} \leq$ 1 year
- ☐ 1 year $< P_{ij} \leq$ 7 years
- ☐ $P_{ij} >$ 7 years

Social repercussions (Fc_{ij})

- ☐ High
- ☐ Significant
- ☐ Negligible

Contaminant source accessibility (F_{ij})

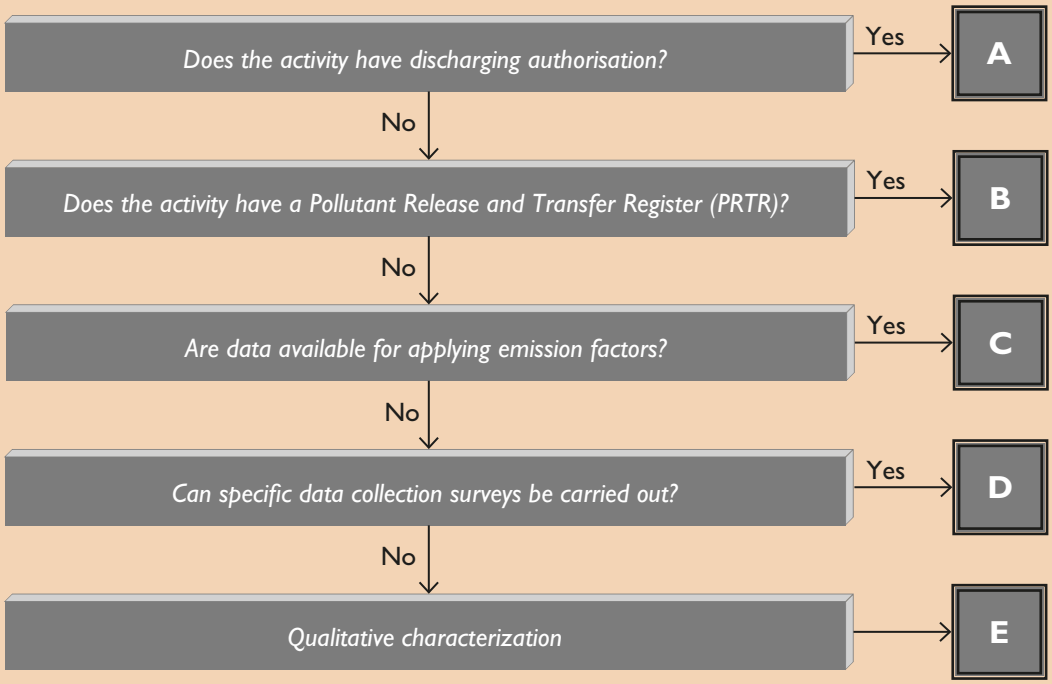
- ☐ There are no detection, control, defence and alarm systems or are not operational.
- ☐ There are operational defence systems, but no detection, control and alarm systems.
- ☐ There are operational detection, control and defence systems, but no alarm systems.
- ☐ There are operational detection, control, defence and alarm systems.

Operational procedure efficiency (Fep_{ij})

- ☐ There are no operational procedures.
- ☐ There are generic operational procedures.
- ☐ There are specific operational procedures. Simulations, maintenance and training activities are not performed.
- ☐ There are specific operational procedures. Simulation, maintenance and training activities, are performed

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 6. CONTAMINANT SOURCE CHARACTERIZATION
Objective:
To establish the substances or materials discharged by contaminant sources, together with the variation ranges of their handled concentrations or amounts and the flow rate.
Required information:
The type of activity producing the contaminant source.
Method description:
Six methodological procedures are provided below to facilitate contaminant source characterization. The type of available information and the port requirements will determine the procedure to use in each case:



Procedure		Description
A	Discharging authorisation	This is the main data source for direct contaminant sources. Characterization of contaminant sources that result from the grouping of various effluents (indirect discharges) may be carried out via authorisations or licences corresponding to each one.
B	Pollutant Realease and Transfer Register (PRTR)	The owners of installations given in Appendix I European Directive 2008/1/EC are obliged to notify the data on their contaminant source at least yearly. This information is held in the PRTR Register.

***List of methods for each ROM 5.1 Program** (Continuation)*

Procedure		Description
C	Emission factors	When specific information concerning existing discharging is missing, analysis of the associated processes may permit contaminant source quantification using accepted national or international estimation methods or emission factors representative of the production sector.
D	Specific data acquisition surveys	These are based on contaminant source substance analysis close to the discharging points. The characterization process design must take into account the peculiarities of each analysed discharging operation.
E	Qualitative characterization	This may be obtained from the matrix that relates the contaminant source generation activities, grouped into specific sectorial subtasks with the intervening substances considered in the PRTR Register (European Decision 2000/479/CE).

Final result:

The final result will be the obtaining of contaminant source information in a homogeneous, standardised and systematised manner for subsequent environmental risk assessment.

List of methods for each ROM 5.1 Program (Continuation)

METHOD 7. CALCULATING CONTAMINANT SOURCE EXTENSION USING NUMERICAL MODELS
Objective:
To obtain contaminant source extension from spatial and temporal development studies of the discharged substances or handled materials using numerical models (Chapter V: Tool 3).
Required information:
◆ Grid calculation (Method 2). ◆ Study area hydrodynamic currents (Method 3). ◆ Contaminant source characterization (Method 6).
Method description:
The extension affected by contaminant source by means of numerical models requires the calculation of the affected area due to three processes: bacteriological contamination, dissolved oxygen reduction and chemical pollution. Using the hydrodynamic currents (Method 3), a study of the contaminant source substances or materials dispersion will be performed. Dispersion shall be carried out using 2D models (for areas without stratification) or 3D models, (Chapter V: Tool 3), during one year: ◆ *Bacteriological contamination*: E. coli transport will consider at least the effects of seawater, temperature and salinity, also sunlight intensity on the disappearance rate. ◆ *Dissolved oxygen reduction:* The biological oxygen demand-dissolved oxygen (BOD-DO) will consider at least the mechanisms responsible for changes in dissolved oxygen in the water column, re-aeration, oxidation sediment demand, respiration and photosynthesis. ◆ *Chemical pollution*: By default, substances and pollutants under Spanish RD 60/2011 dispersion will be considered as having conservative natures. However, substances with low molecular weight, high partition coefficients or subject to high degradation constants may be considered as subject to physical and chemical processes (volatilisation, sedimentation and re-suspension, adsorption and degradation or diffusion from the sediment). An area will be considered affected when at least some of the following conditions apply: ◆ *E. coli*: The E. coli concentration exceeds the thresholds recognised in European Directive 2006/7/EC for bathing waters in any time period or exceed 5×10^4 UFC/100 ml in the other port aquatic systems. ◆ *Dissolved oxygen*: The reduction of average daily concentration of dissolved oxygen in the water column reaches a value of less than 50% saturation for more than 5% of the time. ◆ *Substances and pollutants under RD 60/2011*: This exceeds any of the environmental quality standards (EQS) established in current legislation during any time period. The contaminant source extension will be the result of superposing the affected areas for each pollutant process.
Final result:
The final method result will be the contaminant source extension that permits the percentage calculation of the affected surface of a PAMU or protected area (Method 9).

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 8. CALCULATING CONTAMINANT SOURCE EXTENSION USING GIS
Objective:
To obtain contaminant source extension from spatial and temporal development studies of the discharged substances or handled materials using Geographic Information Systems (GIS) (Chapter V: Tool 2).
Required information:
◆ Grid calculation (Method 2). ◆ Study area hydrodynamic currents (Method 3). ◆ Contaminant source characterization (Method 6). ◆ Surface occupied by the contaminant source.
Method description:
For contaminant source for which sufficient information is not available for calculating extension using numerical models (Method 7), the affected extension will be calculated using a GIS (Chapter V: Tool 2). The calculation will be performed in two stages: ◆ *Delimitation of an area around the contaminant source at a given constant distance:* The distance to the contaminant source in metres will be established in function of the nature (N) and handled substance or material density (D), considering a correction factor depending on the scenario (E). $$\text{distance} = k \times \frac{N \times E}{D / 1000}$$ Where: k: is 100 kg/m^2. N: is 1 for liquid materials and 5 for solids. E: is 0.1 for scenario E1 (normal operations), 0.5 for scenario E2 (operations with certain problems) and 1.0 for scenario E3 (operations under completely unfavourable conditions). D: is the substance or material density in kg/m^3 (Data 6). The formula parameters and thresholds are based on the analysis of various incident records from various ports. Their adaptation by considering: i) the characteristics or a typical port incident; ii) the introduction of aspects, such as substance or material solubility, or, iii) the consideration of other evaluation thresholds for the considered parameters, could improve the diffuse contaminant source extension calculation for a specific study area. ◆ *Obtaining the affected area by particle path surveys:* Using a conservative particle calculation tool, the paths of virtual particles, separated by ten metres and located in the perimeter of the area around contaminant source are calculated during a two-hour period. This tool must establish the path in function of certain given currents. The currents considered for this study are the sum of the currents generated by the flood tide and the most probable wind in the study area (Method 3). The contaminant source extension will be the result of the areas affected by the discharged substance or material by the less dense material or substance (Data 6).
Final result:
The final method result will be the contaminant source extension that permits the percentage calculation of the affected surface of a PAMU or protected area (Method 9).

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 9. CALCULATING THE PAMU PERCENTAGE SURFACE AFFECTED BY A CONTAMINANT SOURCE
Objective:
To determine the percentage surface affected by a contaminant source of each management units and protected areas.
Required information:
◆ Contaminant source extension (Methods 7 and 8). ◆ Thematic cartography: protected areas and port aquatic management units.
Method description:
Percentage estimation of PAMU or protected area surface affected by a contaminant source will be based on three tasks: ◆ Firstly, the cartographic information referring to management units, protected areas and the calculated contaminant source extension will be superposed (Methods 7 and 8) using a GIS (Chapter V: Tool 2). ◆ Secondly, the result of this superposition will be the obtaining of the affected areas of each management unit and each protected area. ◆ Then, the surface percentage of surface for each management unit or protected area affected by the contaminant source will be calculated. A management unit will be considered affected by a contaminant source if its extension affects at least 10% of its surface.
Final result:
The final method result will be a list of management units and/or protected areas affected by a contaminant source with their associated affected percentages, thus allowing PAMU susceptibility to be estimated and the contaminant source extension.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 10. EVALUATION OF SEDIMENT PHYSICAL-CHEMICAL QUALITY

Objective:

To establish sediment physical-chemical quality in heavily modified PAMU in the PJA.

Required information:

- Heavily modified PAMU delimitation.

Method description:

Indicator selection

Total organic carbon, Kjeldahl total nitrogen and total phosphorus.

Sampling design

- *Number of sampling stations*
  The *minimum number* of required sampling stations for evaluation will be established according to PAMU surface:

PAMU surface (ha)	Minimum number of sampling stations
<100	2
100-1000	3
>1000	4

In any case, to establish the *optimum number* of required sampling stations for PAMU evaluation, it is recommended to take into account prior information about its spatial-temporal variability or consult specialists in the subject.

- *Sampling station localisation*
  Sampling stations are localised at points considered representative of the general management unit conditions.
- *Sampling frequency*
  At least semiannual frequency. Both surveys will coincide with the corresponding water physical-chemical and water biological quality surveys. The spatial and temporal sampling intensity may be modified according to data uniformity, together with the evaluated risk for contaminant sources that could affect each management unit.
- *Sample types*
  Point surface samples (15 cm), obtained using Van-Veen grab sampler, gravity corer or Box Corer.
- *Sample conservation*
  UNE-EN ISO 5667-19:2010. Part 15. Guide for the conservation and handling of sludge and sediment samples.

Analytic methods

An example list is given below for the analytic methods of the three physical-chemical sediment quality indicators regulated by UNE standards. However, independently of method, it must be guaranteed that the employed method is traceable in all cases (for example UNE, Standard methods, EPA, etc) and the results are equivalent.

- *Total organic carbon*
  Measured in the sediment non-coarse fraction (<2mm) according to the analysis methods described in UNE-EN 13137:2002. Waste classification. Determining total organic carbon in waste, sludge and sediment.
- *Kjeldahl total nitrogen*
  Measured in the sediment non-coarse fraction (<2mm) according to the analysis methods described in UNE 77318:2001. Soil quality. Total nitrogen determination. Modified Kjeldahl method.

***List of methods for each ROM 5.1 Program** (Continuation)*

- *Total phosphorus*
  Measured in the sediment non-coarse fraction (<2mm) according to the analysis methods described in UNE-EN 14672:2006. Sludge classification. Total phosphorus determination.

Evaluating sediment physical-chemical quality

The sediment physical-chemical quality is analysed using the ICO.

$ICO=C_{COT}+C_{NTK}+C_{PT}$

where, ICO Organic Quality Index; C_{COT} is the standardised annual mean percentage of the total organic carbon, C_{NTK} is the standardised annual mean Kjeldahl total nitrogen concentration and C_{PT} is the standardised annual mean total phosphorous concentration.

The standardised indicator values are given in the following Table.

Total Organic Carbon (COT) (%)		Kjeldahl Total Nitrogen (NTK) (mg/kg)		Total Phosphorus (PT) (mg/kg)	
Values	C_{COT}*	Values	C_{NTK}*	Values	C_{PT}*
$x < 0.6$	4	$x < 600$	3	$x < 500$	3
$0.6 \leq x < 2.3$	3	$600 \leq x < 2100$	2	$500 \leq x < 800$	2
$2.3 \leq x < 4.0$	2	$2100 \leq x < 3600$	1	$800 \leq x < 1200$	1
$4.0 \leq x < 5.8$	1	$x \geq 3600$	0	$x \geq 1200$	0
$x \geq 5.8$	0				

* To determine the standardised value for each indicator, the mean value is calculated for all the data recorded during one year for all PAMU sampling stations and replaces the value "x" in the corresponding standardisation table.

The organic quality index will be calculated for minimum yearly periods, although these evaluations may be extended to longer ones (for example, River Basin District Plan extension). Each PAMU will be classified by a single ICO value. The index indicator values will be established by averaging all data obtained during the analysed period for all the sampling stations established in the PAMU.

When an indicator concentration is below the employed method quantification limit, a concentration indicator value corresponding to half the defined limit will be employed.

The ICO is valued on a scale from 0 to 10. The rating system includes the five quality levels indicated in the following table

ICO	Quality level
$x \geq 8$	Very good
$6 \leq x < 8$	Good
$4 \leq x < 6$	Moderate
$2 \leq x < 4$	Deficient
$x < 2$	Bad

Remarks

As far as possible, the sampling station number and localisation for physical-chemical quality (sediment and water), biological quality and chemical quality will coincide.

Final result:

The final result for the method will be the heavily modified PAMU water physical-chemical quality in the PJA.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 11. EVALUATION OF WATER AND BENTHOS BIOLOGICAL QUALITY
Objective:
To establish heavily modified PAMU biological quality in the PJA.
Required information:
◆ Heavily modified PAMU delimitation ◆ River Basin District Plan corresponding to the Port River Basin District (Data 1 and 2)
Method description:

Indicator selection

◆ *Obligatory quality element: Phytoplankton.*

Indicator: Chlorophyll a

◆ *Optional quality elements: Macroalgae, seagrasses, invertebrates*

Indicators: Composition and abundance

Sampling design

◆ *Number of sampling stations (idem Method 10)*

The *minimum number* of required sampling stations for evaluation will be established according to PAMU surface:

PAMU surface (ha)	Minimum number of sampling stations
<100	2
100-1000	3
>1000	4

As previously indicated, to establish the *optimum number* of required sampling stations for PAMU evaluation, it is recommended to take into account prior information about its spatial-temporal variability or consult specialists in the subject.

◆ *Sampling station localisation (idem Method 10)*

Sampling stations are localised at points considered representative of the general PAMU conditions.

◆ *Obligatory quality element sampling: Chlorophyll a*

- Sampling frequency

  Three-monthly minimum frequency to have an adequate representation of seasonal variability. However, independently of the proposed frequency, sampling will be adapted to recorded indicator variability in the port area.

- Sampling type

  Continued or periodic measurements. Vertical profiles measured at a minimum of two depths (surface and bottom) using fluorometric techniques or by collecting samples with oceanographic bottles. The first case requires sensor calibration using laboratory analytic techniques.

***List of methods for each ROM 5.1 Program** (Continuation)*

• Conservation

Samples collected with oceanographic bottles will be conserved according to Standard Methods. Method 10.200 H Chlorophyll. Spectrophotometric determination. Trichromatic method.

◆ *Optional quality element sampling: macroalgae, seagrasses and benthic invertebrates*

• General aspects:

The following standards are given as examples of general sampling method procedures.

UNE-EN ISO 19493:2007. Water quality. Guidelines for biological hard substrate population studies.

UNE-EN ISO 16665:2005. Water quality. Directives for quantitative sampling and treatment of macro-fauna samples from soft marine bottoms.

• Specific aspects:

In accordance with the corresponding official methods included in the associated European Commission Decision (*2013), otherwise those given in the River District Basin Plan.

Analytic methods

An example list is given below for the analytic method established by the Standard methods for chlorophyll "a". However, independently of method, it must be guaranteed that the employed method is traceable in all cases (for example UNE, Standard methods, EPA, etc) and the results are equivalent.

◆ *Chlorophyll a*

Standard methods. Method 10.200 H Chlorophyll. Spectrophotometric determination. Trichromatic method.

Biological quality evaluation

◆ *Chlorophyll a evaluation:*

The biological quality will be calculated for minimum yearly periods, although these evaluations may be extended to longer ones (for example, River Basin District Plan extension). While the river basin district plans are not approved, chlorophyll a evaluation may be performed by applying reference conditions and quality thresholds for heavily modified water bodies by ports gathered in the Spanish Hydrological Planning Instruction (Order ARM 2656/2008), in the European Decision (* 2013), or in the corresponding River Basin District Plan.

The evaluation method established in the Spanish Hydrological Planning Instruction for chlorophyll a is percentile 90. If not indicated otherwise, P90 will be calculated with all the available data. As an example, the following table contains (µg/l, 90%), the limits between the quality categories for each ecological type for *natural coastal PAMU* (established by the European Decision of December * 2013) and *heavily modified PAMU* (established by the CEDEX).

List of methods for each ROM 5.1 Program (Continuation)

European Coastal water Types	Natural coastal PAMU (4) (5)				Heavily modified PAMU (4) (5)						
						High renewal			Low renewal		
	Spanish Types Natural waters	Reference Condition	High-Good	Good-Moderate	Spanish Types Heavily modified waters	Max. Potential	Max-Good	Good- Moderate	Max. Potential	Max-Good	Good- Moderate
Atlantic											
NEA 1/28a											
Spain South Cádiz Gulf	13, 19, 20, 29	3,3	5,0	10,0		3,96	5,91	12,00	4,62	6,90	14,00
Spain North East Cantabrian	12	1,0	1,5	3,0		1,20	1,79	3,64	1,40	2,09	4,24
Spain North Central Cantabrian	12,14	2,0	3,0	6,0	1, 2, 3, 4	2,40	3,58	7,27	2,80	4,18	8,48
West Cantabrian (1)	14	4,0	6,0	9,0		4,80	7,16	10,91	5,60	8,36	12,73
Canary Islands (2)		0,7	1,0	2,0		0,80	1,20	2,44	0,94	1,40	2,84
NEA 1/26e											
Upwelling (all)	15, 16, 17, 18	5,3	8,0	12,0		6,40	9,55	14,54	7,46	11,14	16,96
Mediterranean											
Type II-A											
Spain. Moderate influence of freshwater inputs	1, 2, 3, 4	1,9	2,38	3,58		2,28	2,85	4,30	2,66	3,33	5,02
Type Isla-W											
Spain. Islands		0,6	0,75	1,20		0,72	0,90	1,44	0,84	1,05	1,68
Type III-W											
Spain. Not influenced by freshwater inputs	5, 6, 7, 8	0,9	1,13	1,80	5,6	1,08	1,35	2,16	1,26	1,58	2,52
Type I (1)											
High influence of freshwater inputs	9	10,44	12,7	22,28		12,53	15,28	26,65	14,62	17,82	31,09
Type II-B (3)											
Influenced by Atlantic waters	10	4,0	6,0	12,00		4,80	7,16	14,54	5,60	8,36	16,96

(1) This type does not appear in the European Commission decision (2013, in press) (no intercalibration).

(2) Canary coastal waters are classified in 1/26am NEA, but not appear in the European Commission decision (2013, in press). The river basin management plans remain the thresholds resulting from Phase I for the 5 national types identified in the Canary island, which are not listed in the IPH.

(3) This type does not appear in the European Commission decision (2013 in press). It is not shared with another country (not intercalibration is required).

(4) These thresholds will be implemented by applying the most restrictive criteria (assigning, in case of doubt, the lowest quality level).

(5) Thresholds between Moderate-Deficient and Deficient-Poor quality levels are established from the corresponding EQRs according to the following expression: Threshold= Maximum potential (or reference condition) / EQR.

- *Macroalgae, seagrasses and invertebrates evaluation:*

  While specific measures are not developed for heavily modified water bodies, the evaluation of each port PAMU for macroalgae, seagrasses and invertebrates will be carried out applying the national methods included in the European Commission Decision (*2013) for natural water bodies, justifying where necessary, the use of adequate reference conditions for port variability. The following table contains the evaluation systems applicable in the various eco-regions, which are included in Appendix I (approved methods)[a] and Appendix II (accepted method pending approval)[b].

***List of methods for each ROM 5.1 Program** (Continuation)*

MACROALGAE	Coastal water bodies
ATLANTIC[a]	Rocky bottom quality (RBQ)
	Reduced species list (RSL)
	Rocky intertidal communities quality index (RICQI)
MEDITERRANEAN[a]	Cartography of Littoral and upper-sub-littoral Rocky-shore communities (CARLIT)

PHANEROGAMS	Coastal water bodies
MEDITERRANEAN[a]	*Posidonia oceanica* Multivariate Index (POMI)
	Valencian CS
INVERTEBRATES	**Coastal water bodies**
ATLANTIC[b]	Multivariate Azti Marine Biotic Index (M-AMBI)
	Benthic opportunistic Annelid Amphipod adapted (BO2A)
MEDITERRANEAN[a]	Benthic opportunistic Annelid Amphi-pod(BOPA)
	Occidental Mediterranean (MEDOCC)
MACROALGAE, PHANEROGAMS AND INVERTEBRATES	**Transitional water bodies**
While inter-calibrated evaluation methods are not available on a European level, the evaluation methods employed in the corresponding river basin district plan shall be used.	

*EUROPEAN COMMISSION DECISION (2013) establishing, pursuant to Directive 2000/60/EC of the European Parliament and of the Council, the values of the Member State monitoring system classifications as a result of the intercalibration exercise and repealing Decision 2008/915/EC.

Remarks

As far as possible, the sampling station number and localisation for physical-chemical quality (sediment and water), biological quality and chemical quality will coincide.

Final result:

The final result for the method will be the heavily modified PAMU biological quality in the PJA.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 12. EVALUATION OF WATER PHYSICAL-CHEMICAL QUALITY
Objective:
To establish heavily modified PAMU physical-chemical quality in the PJA.
Required information:
◆ Heavily modified PAMU delimitation ◆ River Basin District Plan corresponding to the Port River Basin District(Data 1 and 2)
Method description:

Indicator selection

◆ *General conditions of transparency, oxygenation, nutrients*
Indicators: those established in the corresponding river basin district plan (turbidity, suspended solids, oxygen saturation, nitrates, nitrites or ammonia etc).

Sampling design

◆ *Number of sampling stations (idem Method 10)*
The minimum number of required sampling stations for evaluation will be established according to PAMU surface:

PAMU surface (Ha)	Minimum number of sampling stations
<100	2
100-1000	3
>1000	4

As previously indicated, to establish the *optimum number* of required sampling stations for PAMU evaluation, it is recommended to take into account prior information about its spatial-temporal variability or consult specialists in the subject.

◆ *Sampling station localisation (idem Method 10)*
Sampling stations are localised at points considered representative of the general PAMU conditions.

◆ *Sampling frequency (idem Method 11)*
Three-monthly minimum frequency in order to have adequate representation of seasonal variability. However, independently of the proposed frequency, sampling will be adapted to recorded indicator variability in the port area.

◆ *Sample types*
UNE-EN ISO 5667-1:2007. Water quality. Sampling. Part 1: Guide for designing sampling programs and sampling techniques. (ISO 5667-1:2006)

1. Continued measurement:
Continuous vertical profiles. Multi-parametric sensor is recommended.

2. Periodic measurements:
Nutrient and suspended-solid samples are collected at three depths (surface, mid depth and bottom) using oceanographic bottle.

***List of methods for each ROM 5.1 Program** (Continuation)*

- *Sample conservation*
  UNE-EN ISO 5667-3. Water quality. Sampling. Part 3. Water sample conservation and handling.

Analytic methods

Periodic measurement determinations may be made according to the following analytic techniques, although adaptation is recommended to the corresponding River Basin District plans (UNE, Standard methods or EPA traceable methods, with equivalent results).

- *Suspended solids*
  UNE-EN-872:2006. Gravimetric analysis of the fraction retained in the fibre glass filter dried in a kiln at 105°C ±2°C.

- *Nitrates and Nitrites*
  UNE--EN ISO 13395:1997. Water quality. Nitrate and nitrite determination and the sum of both by flow injection (CFA and FIA) with spectrophotometric detection (ISO 13395:1996).

- *Ammonia*
  UNE-EN ISO 11732:2005. Water quality. Ammoniacal nitrogen determination. Flow analysis method (CFA and FIA) and spectrophotometric detection.

- *Phosphates*
  UNE-EN ISO 15681-2:2005. Water quality. Ortho-phosphate and total phosphate determination (FIA y CFA). Part 2. Continuous flow analysis method (CFA) (ISO 15681-2:2003).

Water physical-chemical quality evaluation

The water physical-chemical quality will be calculated for minimum yearly periods, although these evaluations may be extended to longer ones (for example, River Basin District Plan extension). The evaluation will be performed by applying the reference conditions and quality thresholds for water bodies heavily modified by ports established in the river basin district plan. If these are not available, then the thresholds established in the Spanish Hydrological Planning Instruction (Spanish Order ARM 2656/2008) may be applied for turbidity, oxygen saturation and total hydrocarbons. The following table contains the limits established in the Spanish Hydrological Planning Instruction for each ecological type: Max: maximum potential; Max-G: Limit between maximum potential and good; G-M: limit between good and moderate.

The physical-chemical quality assessment will be carried out following the more restrictive criterion. For example, Atlantic coastal waters with high renewal rate the 40% of oxygen saturation (boundary between Good and Moderate Quality) will correspond to a Moderate quality.

***List of methods for each ROM 5.1 Program** (Continuation)*

Spanish types		Heavily modified PAMU (1) (2)					
		High renewal			Low renewal		
		Max. Potential	Max. ≥ Good	Good ≥ Moderate	Max. Potential	Max. ≥ Good	Good ≥ Moderate
Turbidity (NTU)							
Atlantic							
Atlantic transitional waters Atlantic coastal waters	1,2 3,4	2,0	Not available 6,0	9,0	4,0	Not available 7,0	12,0
Mediterranean							
Mediterranean coastal waters	5,6	2,0	6,0	9,0	4,0	7,0	12,0
Oxygen saturation (%)							
Atlantic							
Atlantic transitional waters Atlantic coastal waters	1,2 3,4	90	Not available 70	40	70	Not available 50	30
Mediterranean							
Mediterranean coastal waters	5,6	90	70	40	70	50	30
Total hydrocarbons (mg/l)							
Atlantic							
Atlantic transitional waters Atlantic coastal waters	1,2 3,4	0,3	Not available 0,7	1,0	0,5	Not available 0,9	1,0
Mediterranean							
Mediterranean coastal waters	5,6	0,3	0,7	1,0	0,5	0,9	1,0

(1) These thresholds will be implemented by applying the most restrictive criteria (assigning, in case of doubt, the lowest quality level).

(2) Thresholds between Moderate-Deficient and Deficient-Poor quality levels are established from the corresponding EQRs according to the following expression: Threshold= Maximum potential (or reference condition) / EQR.

Remarks

As far as possible, the sampling station number and localisation for physical-chemical quality (sediment and water), biological quality and chemical quality will coincide.

Final result:

The final result for the method will be the heavily modified PAMU water physical-chemical quality in the JPA.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 13. EVALUATION OF WATER AND SEDIMENT CHEMICAL QUALITY (EQS)
Objective:
To establish the PAMU chemical quality in the PJA.
Required information:
◆ Heavily modified PAMU delimitation ◆ River Basin District Plan corresponding to the Port River Basin District (Data 1 and 2) ◆ Heavily modified PAMU pollutant source characterization (Method 6)
Method description:

Indicator selection

Indicator selection for a management unit is made from the list of priority substances and other pollutants of the Spanish RD 60/2011 (Appendix I, Section A; Table 6.1), the presence of which was recorded in some of the contaminant sources and will be measured in the management units affected by these, according to extension estimates performed in the Environmental Risk Assessment and Management Program (Section 5.2.3.2).

Sampling design

◆ *Number of sampling stations (idem Method 10)*

The *minimum number* of required sampling stations for the evaluation will be established according to PAMU surface:

PAMU surface (ha)	Minimum number of sampling stations
<100	2
100 -1000	3
>1000	4

As previously indicated, to establish the optimum number of required sampling stations for PAMU evaluation, it is recommended to take into account prior information about its spatial-temporal variability or consult specialists in the subject.

◆ *Sampling station localisation (idem Method 10)*

Sampling stations are localised at sites considered representative of the general management unit conditions.

◆ *Sampling frequency*

Minimum yearly frequency. This sampling spatial and temporal intensity can be modified according to the obtained data, together with the evaluated risk level for contaminant sources existing in the management unit.

◆ *Sampling types*

Pelagic environment: Surface sampling. Collection is carried out using direct sampling or an oceanographic bottle.

Benthic environment: Periodic surface sampling (15 cm), obtained with van-Veen drag sampler, gravity corer or Box Corer.

◆ *Sample conservation*

According to current legislation (RD 60/2011).

List of methods for each ROM 5.1 Program (Continuation)

Analytic methods

Technical specifications relating to water quality analysis and control in laboratories is adapted to Spanish RD 60/2011 Appendix V, or possible future modifications of this standard. Regarding sediment samples, while there is no associated European standard, consideration will be given to the analytic techniques in the dredging recommendations in force at the time of application for this Recommendation.

Chemical quality evaluation

Water chemical will be calculated at least yearly, although these evaluations may be extended for longer periods (for example, the River Basin District Plan extension). Evaluation will be performed according to the terms of RD 60/2011. The following table summarizes the Environmental Quality Standards (EQSs) in surface waters (RD 60/2011) for priority substances and other pollutants. Annual average value (AA-EQS); maximum allowable concentration (MAC-EQS).

Name of substance	AA-EQS surface waters (µg/l)	MAC-EQS Surface water (µg/l)
Alachlor	0,3	0,7
Anthracene*(1)	0,1	0,4
Antrazine	0,6	2
Benzene	8	50
Pentabromodiphenylether*	0,0002	not applicable
Cadmium	0,2	≤ 0,45 (Clase 1) 0,45 (Clase 2) 0,60 (Clase 3) 0,90 (Clase 4) 1,50 (Clase 5)
Tetrachloromethane	12	not applicable
C_{10-13}-chloroalkanes*	0,4	1,4
Chlorfenvinphos	0,1	0,3
Chlorpyrifos	0,03	0,1
Aldrin	Σ = 0,005	not applicable
Dieldrin		
Endrin		
Isodrin		
DDT	0,025	not applicable
p,p - DDT	0,01	not applicable
1,2 – Dichlorethane	10	not applicable
Dichloromethane	20	not applicable
Diethylhexylphthalate	1,3	not applicable
Diuron	0,2	1,8
Endosulfan*	0,0005	0,004
Fluoranthene (1)	0,1	1
Hexachlorobenzene*	0,01 (1)	0,05
Hexachlorobutadiene*	0,1	0,6

***List of methods for each ROM 5.1 Program** (Continuation)*

Name of substance	AA-EQS surface waters (µg/l)	MAC-EQS Surface water (µg/l)
Hexachlorocyclohexane*	0,002	0,02
Isoproturon	0,3	1
Lead(1)	7,2	Not applicable
Mercury*(1)	0,05	0,07
Naphtalene(1)	1,2	Not applicable
Nickel(1)	20	Not applicable
Nonylphenol*	0,3	2
4-Nonylphenol*	0,3	2
Para-tert-octyphenol	0,01	Not applicable
Pentachlorobenzene*	0,0007	Not applicable
Pentachlorophenol	0,4	1
Benzo(a)pyrene*(1)	0,05	0,1
Benzo(b)fluoroanthene*(1)	Σ = 0,03	Not applicable
Benzo(k)fluoroanthene*(1)		
Benzo(g, h, i)perylene*(1)	Σ = 0,002	Not applicable
Indeno(1, 2, 3-cd)pyrene*(1)		
Simazine	1	4
Tetrachloroethylene	10	Not applicable
Trichloroethylene	10	Not applicable
Tributyltin*	0,0002	0,0015
1,2,4-Trichlorobenzene	0,4	Not applicable
Trichloromethane	2,5	Not applicable
Trifluralin	0,03	Not applicable

* Priority substances

(1) Specific sediment evaluation indicators.

Remarks

As far as possible, the sampling station number and localisation for chemical quality (sediment and water), biological quality and physical-chemical quality will coincide.

Final result:

The final result for the method will be the heavily modified PAMU chemical quality in the PJA.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 14. ESTABLISHING VISUAL INSPECTION LEVELS

Objective:

To establish the visual inspection level suitable for the various port areas.

Required information:

- Identification of activities carried out in the PJA (Chapter IV: Data 4).
- Log for pollutant incidents in the various port areas.
- Hazard levels for products handled during such activities (Chapter IV: Data 5).

Method description:

Firstly, according to the number of incidents produced by the activity, the *frequency* is classified as:

- Low: areas where incidents are recorded only *exceptionally or almost never* (≤ 1 incident per year).
- Intermediate: areas where incidents are *eventually* recorded (>1 incident per year).
- High: areas where pollutant incidents are *habitually* recorded (>1 incident per month).

In turn, according to the substance or material type that could be involved in a pollutant incident, the hazard level is classified as:

- Low: pollutant incidents related to physical water condition variations (temperature, turbidity, etc.). (Hazard level 1 according to Data 5. Chapter IV).
- Intermediate: pollutant incidents related to the discharge of bacteriological pollutants, oxygen consuming substances or potentially hazardous materials into the environment (Spanish RD 145/1989). (Hazard level 2 according to Data Table 5. Chapter IV).
- High: pollutant incidents largely related to the discharge of substances and pollutants according to Spanish RD 60/2011, hazardous materials (Spanish RD 145/1989) and substances and pollutants according to European Regulation (EC) No166/2006. (Hazard level 3-4 according to Data 5. Chapter IV).

The combination of both factors determines the required visual inspection level (green, yellow or red) as shown below. This will define the intensity and type of recommended measures to employ.

		Frecuency		
		High	Medium	Low
Hazard level	High			
	Medium			
	Low			

- *Green Level (represented by white fields on the previous chart)*: this will require the inspection of specific docks and water sheet contiguous to the activity area. Thus, it will be sufficient to carry out random land inspections, which should intensify during times of higher activity.
- *Yellow Level (represented by light gray fields on the previous chart)*: this will require the putting into operation of an inspection system organised into shifts and intensified during times of higher activity. As for the Green Level, the inspection will be carried out on land and may be supplemented by using cameras.
- *Red level (represented by dark gray fields on the previous chart)*: this will require a greater inspection degree than the previous level (higher frequency). The inspection will be carried out on land, but may be supplemented with maritime monitoring during hours of greater activity. Similarly, consideration will be given to elements subject to inspection, all ships which, due to their characteristics and their cargos have been declared as highly dangerous.

Final result:

The final result will be the obtaining of a visual inspection plan that considers hazard levels of substances handled in the various port activities that are liable to produce pollutant incidents as well as the frequencies at which they occur.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 15. COMPILING INFORMATION IN THE POLLUTANT INCIDENT LOG
Objective:
To compile the information to guarantee full logging of pollutant incidents.
Required information:
◆ Preliminary information is not required for applying this method.
Method description:
Compiling the information required during tracking of each pollutant incident may be carried out by completing a form. This would be systematically and uniformly completed with all the information relating to pollutant incident detection, the adopted action-operation plan and affected area recovery.
Final result:
The final result will be the homogeneous, standardised and systematised recording of pollutant incident information for their subsequent adequate management.

***List of methods for each ROM 5.1 Program** (Continuation)*

❑ Finished incident

1. POLLUTANT INCIDENT DETECTION

GENERAL INFORMATION
Name:
code:
Date:
Time: Shift:
Source:
Person responsible:
Affects the water sheet (Yes / No):
Graphic evidence (Yes / No):
Detection system:
❑ Visual inspection
❑ Complaint
❑ Direct communication from the actual person responsible

Supplementary information:

INCIDENT DESCRIPTION
Localisation:
Affected surface area (approx.):
Pollution appearance and dimensions:

Involved product:

Product nature: ❑ Solid ❑ Liquid
Incident cause:
❑ Human failure
❑ System failure
❑ Collision
❑ Operational discharge
❑ Unknown cause
❑ Other (specify):

2. PLAN OF ACTION - OPERATION

CLASSIFICATION

	Very high	High	Medium	Low
Magnitude				
Hazard level				
Vulnerability				

Emergency situation
❑ Situation 0 ❑ Situation 2
❑ Situation 1 ❑ Situation 3

Required measures and actions:

NOTIFICATION
Notified by: Addresse:

OPERATIONS
Incident managed by:
❑ Port Authorities
❑ Other organisation(s) with assistance from the PA

Contingency Plan activated:
Plan of action adopted:

DEACTIVATION Deactivation date:
Supplementary information:

3. ENVIRONMENTAL RECOVERY ASSESSMENT

Selected indicator(s):
Measurement period:
Sampling frequency:
Sampling intensity:
Sample type (water / sediment):
Sampling strategy:
Recovery evaluation: Recovery date:

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 16. LIST OF SPECIFIC PLANS OF ACTION IN FUNCTION OF PRODUCT TYPE INVOLVED IN THE POLLUTANT INCIDENT
Objective:
To determine the specific plan of action to apply in function of the pollutant incident characteristics and the affected area conditions.
Required information:
◆ Information compiled during pollutant incident logging (Method 15).
Method description:
When the need has been evaluated to apply *containment, collection* and *elimination* measures in function of the pollutant incident characteristics and of the affected area, a specific plan of action should be selected depending on the type of involved product, for example, hydrocarbons, inflammable or toxic chemical products, biological or solid products, according to the following criteria: ◆ Plan of action for priority substances: *hydrocarbons* • *Containment measures:* floating barriers or enclosures must be positioned, bubble or chemical barriers. • *Collection measures:* using skimmers and absorbent products. • *Elimination measures:* auxiliary techniques must be employed and treatments with dispersants, gelling and biological agents. Similarly, dispersion may be used by the mechanical action of boat propellers. As a last measure, in the case of a spill or discharge affecting the coastal area, cleaning operations must commence, together with affected docks and port installation cleaning. ◆ Plan of action for priority, preferential and pollutant substances, together with hazardous materials: *inflammable chemical products* • *Containment* measures: containment dykes should be constructed using soil, sand and sacks, among others. • *Collection* measures: these are aimed at product absorption with inert materials, for example diatomaceous earth. • *Elimination* measures: based on applying sprayed water in the wind direction to accelerate vapour dispersion. ◆ Plan of action for priority, preferential and pollutant substances, together with hazardous materials: *toxic chemical products* The same previous basic containment, collection and elimination measures may be applied. However, in this specific case, additional safety measures must be taken into account, establishing that personnel must be upwind from the spill to prevent vapour contact. Furthermore, it will be necessary to decontaminate the affected area. ◆ Plan of action for biological pollutants and potentially hazardous materials: *biological products* The principal objective in the plan of action against a bacteriological spill or discharge is to prevent personnel from coming into contact with the contaminated water or to consume contaminated fish products. For these reasons, recreational activities must immediately cease (close beaches) or the marketing of products that have not been previously purified (shellfish) for the length of time required for inactivating any possible pathogenic agents. ◆ Plan of action for hazardous and potentially hazardous products: *solid products* • *Containment* measures: barriers or dykes must be positioned, previously determining skirt size according to marine dynamics. • *Elimination* measures: biological or chemical treatments will be carried out to extract the pollutants, taking the product hazard level into consideration.
Final result:
The final result will be the determination of a specific plan of action suitable to tackle a pollutant incident of defined characteristics.

***List of methods for each ROM 5.1 Program** (Continuation)*

METHOD 17. ENVIRONMENTAL RECOVERY ASSESSMENT			
Objective:			
To evaluate environmental quality recovery of PAMU affected by the pollutant incident.			
Required information:			
◆ Information relating to the pollutant incident (Method 15).			
Method description:			

Indicator selection

This will be performed in function of:

- The substance or material type associated with the pollutant incident.
- The affected environmental compartment (water column and sediments).
- Affected area vulnerability.

		WATER	*SEDIMENTS*
SUBSTANCES	*Highly dangerous substances related to hydrocarbons*	Priority substances (Appendix I)[1] related to hydrocarbons (PAHs)	Priority substances (Appendix I)[1] related to hydrocarbons (PAH)
SUBSTANCES	*Highly dangerous substances related to chemical products (inflammable and toxic)*	Priority substances (Appendix I) [1] related to the involved chemical substance	Priority substances (Appendix I) [1] related to the involved chemical substance
SUBSTANCES	*Moderately dangerous substances related to oxygen-consuming agents and bacteriological pollutants*	Dissolved oxygen. Additionally: E-coli on beaches and SPZ[3]	ICO[2]
MATERIALS	*Potentially hazardous and other materials that could affect environmental conditions*	Dissolved oxygen. Turbidity	ICO[2]
MATERIALS	*Hazardous materials*	Priority substances (Appendix I) [1] related to the involved material	Priority substances (Appendix I) [1] related to the involved material ICO[2]

(1) Appendix I of RD 60/2011.
(2) Organic Quality Index (ICO) (Method 10).
(3) The evaluation of adequate microbiological indicator is required for the evaluation of those specific environment characteristics of the various types of affected protected areas.

Sampling design

After indicator selection, a series of directives is established relating to the when, how and where for performing the measurements to evaluate the progress of a determined incident considering factors, such as sampling frequency, intensity and strategy, together with a temporal environment that will determine sampling duration. This will extend until effective verification of environmental recovery.

***List of methods for each ROM 5.1 Program** (Continuation)*

If the expected recovery does not happen within three months, the same sampling scheme will continue within the Environmental Quality Monitoring Program. This means completing the corresponding sampling points, within the cited Program.

Frequency	First 7 days: Daily	Week 2 to 4: Weekly	Months 2 a nd 3: Monthly
Sampling intensity	3 samples/1000 m^2 + 1 sample reference conditions	2 sample/1000 m^2 + 1 sample reference conditions	1 sample/1000 m^2 + 1 sample reference conditions
*Sample types**	Water (surfacea ndbo ttom) Sediments (surface)	Water (surfacea ndbo ttom) Sediments (surface)	Water (surfacea ndbo ttom) Sediments (surface)
Sampling strategy	Gradient	Gradient	Gradient

(*) If the pollutant incident is related to hydrocarbon discharge, the water samples will only be taken at the surface level.

Analytic techniques

The analytic techniques for determining each selected variable will be based on methods established by state (Spanish RD 60/2011, etc.), European Community (WFD, Directive 2008/105/CE, etc.) and on acknowledged international standards, such as UNE, EPA, Standard Methods, etc., as specified in the Environmental Quality Monitoring Program.

Evaluation

In order to evaluate the degree of environmental recovery, control and tracking will be established for areas not affected by the pollutant incident in order to have actual reference conditions. However, the PAMU environmental quality evaluation for the year prior to the incident will be taken as the *reference condition*. When environmental recovery is attained, meaning the established reference condition is reached, a specific report will be issued (Method 15. Section 3) on process development.

Final result:

The final result will be environmental recovery assessment through a sampling program specifically designed for controlling each pollutant incident development.

Chapter IV
Data

Data

CHAPTER IV

The Data Chapter is designed to be a work tool to facilitate compilation of data required for applying the ROM 5.1 Chapter I. Articles. To this end, this document contains the data sources necessary to apply the Delimitation and Typification of Port Aquatic Management Units Program and the Environmental Risk Assessment and Management Program (Table 1).

Table 1. ***List of data for each Program***

Data	Program
1. List of general interest ports in the various River Basin Districts. 2. List of the River Basin District Plans. 3. List of water bodies categories and classes according to the River Basin Districts.	Delimitation and Typification of Port Aquatic Management Units Program
4. Classification of activities carried out in port areas. 5. Estimating hazard levels for discharged substances or handled materials. 6. Estimating the recovery of a port aquatic management unit. 7. List of densities for the discharged substances or handled materials. 8. Compiling guides on good general practices. 9. Compiling guides on specific good practices associated with port activities.	Environmental Risk Assessment and Management Program

***List of data for each Program** (Continuation)*

DATA 1. LIST OF GENERAL INTEREST PORTS IN THE VARIOUS RIVER BASIN DISTRICTS

Data description:

List of general interest ports in each River Basin District.

River Basin District	Port Authority	General interest ports
Galicia-Costa	Vigo	Vigo
	Marín y Ría de Pontevedra	Marín
	Vilagarcía de Arousa	Vilagarcía
	A Coruña	A Coruña
	Ferrol-San Cibrao	Ferrol
		San Cibrao
Cantábrico Occidental	Avilés	Avilés
	Gijón	Gijón-Musel
		Puerto Deportivo
	Santander	Santander
Cantábrico Oriental	Bilbao	Bilbao
	Pasajes	Pasajes
Cuencas Internas de Cataluña	Barcelona	Barcelona
	Tarragona	Tarragona
Júcar	Castellón	Castellón
	Valencia	Sagunto
		Valencia
		Gandía
	Alicante	Alicante
Segura	Cartagena	Escombreras
		Cartagena
Cuenca Mediterránea Andaluza	Almería	Carboneras
		Almería
	Motril	Motril
	Málaga	Málaga
	Bahía de Algeciras	Algeciras-La Línea
		Tarifa
Guadalete y Barbate	Bahía de Cádiz	Cádiz
		Zona Franca de Cádiz
		Puerto Real
		Puerto M. de la Cabezuela
		Santa María
		Puerto Sherry

***List of data for each Program** (Continuation)*

River Basin District	Port Authority	General interest ports
Guadalquivir	Sevilla	Sevilla
Tinto, Odiel y Piedras	Huelva	Huelva
Ceuta	Ceuta	Ceuta
Melilla	Melilla	Melilla
Baleares	Balears	Palma de Mallorca
		Alcudia
		Mahón
		Eivissa
		La Savina
El Hierro	Santa Cruz de Tenerife	La Estaca
La Gomera		San Sebastián de la Gomera
La Palma		Santa Cruz de La Palma
Tenerife		Puerto Granadilla
		Puerto de los Cristianos
		Santa Cruz de Tenerife
Fuerteventura	Las Palmas	Puerto Rosario
Gran Canaria		Las Palmas, Salinetas y Arinaga
Lanzarote		Arrecife

***List of data for each Program** (Continuation)*

DATA 2. LIST OF THE RIVER BASIN DISTRICT PLANS		
Data description:		
List of River Basin District Plans with presence of general interest ports.		
River Basin District	Approval	URL
Galicia-Costa	Real Decreto 1332/2012, de 14 de septiembre, por el que se aprueba el Plan Hidrológico de la Demarcación Hidrográfica de Galicia-Costa.	http://www.planhidroloxicogc.com/
Cantábrico Occidental	Real Decreto 399/2013, de 7 de junio, por el que se aprueba el Plan Hidrológico de Cantabria Occidental	http://www.chcantabrico.es/
Cantábrico Oriental	Real Decreto 400/2013, de 7 de junio, por el que se aprueba el Plan Hidrológico de la parte española de la Demarcación Hidrográfica del Cantábrico Oriental	http://www.chcantabrico.es/
Cuencas Internas de Cataluña	Decreto 188/2010, de 23 de noviembre, de aprobación del Plan de Gestión del Distrito de Cuenca Fluvial de Cataluña.	http://aca-web.gencat.cat/aca/
Júcar	–	http://www.chj.es
Segura	–	http://www.chsegura.es
Cuenca Mediterránea Andaluza	Real Decreto 1331/2012, de 14 de septiembre, por el que se aprueba el Plan Hidrológico de la Demarcación Hidrográfica de las Cuencas Mediterráneas Andaluzas.	http://www.juntadeandalucia.es
Guadalete y Barbate	Real Decreto 1330/2012, de 14 de septiembre, por el que se aprueba el Plan Hidrológico de la Demarcación Hidrográfica del Guadalete y Barbate.	http://www.juntadeandalucia.es
Guadalquivir	Real Decreto 355/2013, de 17 de mayo, por el que se aprueba el Plan Hidrológico de la Demarcación Hidrográfica del Guadalquivir	http://www.chguadalquivir.es
Tinto, Odiel y Piedras	Real Decreto 1329/2012, de 14 de septiembre, por el que se aprueba el Plan Hidrológico de la Demarcación Hidrográfica del Tinto, Odiel y Piedras.	http://www.juntadeandalucia.es
Ceuta	–	http://www.chguadalquivir.es
Melilla	–	http://www.chguadalquivir.es
Baleares	–	http://www.caib.es
El Hierro	–	http://www.aguaselhierro.com
La Gomera	–	http://aguasgomera.es
La Palma	–	http://www.lapalmaaguas.es
Tenerife	–	http://www.planhidrologicodetenerife.org
Fuerteventura	–	http://www.aguasfuerteventura.com
Gran Canaria	–	http://www.aguasgrancanaria.com
Lanzarote	–	http://www.aguaslanzarote.com

***List of data for each Program** (Continuation)*

DATA 3. LIST OF WATER BODIES CATEGORIES AND CLASSES ACCORDING TO THE RIVER BASIN DISTRICTS

Data description:

Water body categories and classes according to current or in-review River Basin District Plans. Its future use is at the expense of possible changes, updates and/or revisions to such plans.
Coastal (C), Transitional (T), Natural (N), Heavily Modified (HM)

River Basin Distric	Zone	Category	Class
Baleares	Punta de Na Bruna A Cap de Bajolí	C	N
Baleares	Badia de Fornells	C	N
Baleares	Port de Maó	C	N
Baleares	Punta Prima A Punta de Na Bruna	C	N
Baleares	Badia de Santa Ponça	C	N
Baleares	Badia de Soller	C	N
Baleares	Badia de Pollença	C	N
Baleares	Cap Pinar A Illa Alcudia	C	N
Baleares	Badia de Alcudia	C	N
Baleares	Colonia Sant Perea A Cap de Capdepera	C	N
Baleares	Cap de Capdepera A Portocolom	C	N
Baleares	Punta Des Jonc A Cala Figuera	C	N
Baleares	Cala Figuera A Cala Beltrán	C	N
Baleares	Cabrera	C	N
Baleares	Cala Beltran A Cap de Regana	C	N
Baleares	Cap de Regana A Cap Enderrocat	C	N
Baleares	Cap de Enderrocat A Cala Major	C	N
Baleares	Cala Major A Cala Falcó	C	N
Baleares	Badia de Sant Antoni	C	N
Baleares	Cap Des Mossons A Punta Grossa	C	N
Baleares	Punta Grossa A Cala Llenya	C	N
Baleares	Cala Llenya A Punta Blanca	C	N
Baleares	Punta Blanca A Punta Des Andreus	C	N
Baleares	Punta Des Andreus A Punta de Sa Mata	C	N
Baleares	Punta de Sa Gavina A Punta de Ses Pesqueres	C	N
Baleares	Punta de Ses Pesqueres A Punta de Ses Pedreres	C	N
Baleares	Cala Falcó A Punta Negra	C	N
Baleares	Punta Jondal A Cap Mossons	C	N
Baleares	Els Freus D'eivissa I Formentera	C	N
Baleares	Punta Negra A Illa de Formentor	C	N
Baleares	Riu de Santa Eulària	T	N
Baleares	Ses Feixes de Vila I Talamanca	T	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
Baleares	Ses Salines d'Eivissa	T	N
Baleares	S'espalmador	T	N
Baleares	Estany Pudent	T	N
Baleares	Estany Des Peix	T	N
Baleares	Ses Salines de Formentera	T	N
Baleares	La Gola	T	N
Baleares	Prat de l'Ullal	T	N
Baleares	Torrent de Sant Jordi	T	N
Baleares	Albufereta de Pollença	T	N
Baleares	Prat de Maristany	T	N
Baleares	S'estany Des Ponts	T	N
Baleares	Albufera de Mallorca	T	N
Baleares	Estany de Son Bauló	T	N
Baleares	Estany de Son Real	T	N
Baleares	Estany de Na Borges	T	N
Baleares	Estany de Canyamel	T	N
Baleares	Riuet de S'illot	T	N
Baleares	Riuet del Port de Manacor	T	N
Baleares	Estany D'en Mas	T	N
Baleares	Bassa de Cala Magraner	T	N
Baleares	Bassa de Cala Murada	T	N
Baleares	Torrent Des Caló D'en Marçal	T	N
Baleares	Prat de Porto Petro	T	N
Baleares	Estany de Sa Font de N'alis	T	N
Baleares	S'amarador	T	N
Baleares	Salines de la Colònia de Sant Jordi	T	N
Baleares	Es Salobrar de Campos	T	N
Baleares	Prat Des Pil·Larí	T	N
Baleares	Ses Fontanelles	T	N
Baleares	Prat de l'Aeroport de Son Sant Joan	T	N
Baleares	Prat de la Font de la Vila	T	N
Baleares	Sa Porrassa	T	N
Baleares	Prat de Son Amer	T	N
Baleares	Prats de Tirant I Lluriach	T	N
Baleares	Salines de Fornells	T	N
Baleares	Salines de la Concepció	T	N
Baleares	Prat de Cala Rotja	T	N
Baleares	Albufera de Mercadal	T	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
Baleares	Bassa de Cala Molí	T	N
Baleares	Prat I Salines de Mongrofe-Addaia	T	N
Baleares	Prat de Morella	T	N
Baleares	Albufera Des Grau	T	N
Baleares	la Mola	T	N
Baleares	Maresme de Cala Canutells	T	N
Baleares	Cala En Porter	T	N
Baleares	Prat de Son Bou	T	N
Baleares	Gola del Torrent de Trebalúger	T	N
Baleares	Aiguamolls de Cala Galdana	T	N
Baleares	Prat de Macarella	T	N
Baleares	Son Saura del Sud	T	N
Baleares	Gola del Torrent d'Algaiarens	T	N
Baleares	Gola I Maresma de Binimel·Là	T	N
Baleares	Port de Sa Nitja	T	N
Baleares	Prat de Sa Torreta	T	N
Baleares	Basses de Sa Mesquida, Es Murtar I Binisarmenya	T	N
Baleares	Cap de Bajolí A Punta Prima	C	N
Baleares	Prat de Ses Dunes de Sa Ràpita	T	N
C.I. de Cataluña	Platja Castell	T	N
C.I. de Cataluña	Aiguamolls de L'alt Empordà-Riu Vell	T	N
C.I. de Cataluña	Aiguamolls de L'alt Empordà-la Rogera. La Serpa I la Fonda	T	N
C.I. de Cataluña	Aiguamolls de L'alt Empordà - La Llarga	T	N
C.I. de Cataluña	Aiguamolls de L'alt Empordà-Aiguamolls de la Rubina Nord	T	N
C.I. de Cataluña	Desembocadura del Torrent de Santes Creus	T	N
C.I. de Cataluña	Desembocadura del Riu Gaià	T	N
C.I. de Cataluña	Desembocadura del Riu Llastres	T	N
C.I. de Cataluña	Desembocadura del Riu Tordera	T	N
C.I. de Cataluña	Desembocadura del Torrent de L'estany	T	N
C.I. de Cataluña	Desembocadura del Torrent del Pi	T	N
C.I. de Cataluña	Aiguamolls de L'alt Empordà - la Massona	T	N
C.I. de Cataluña	Aiguamolls de L'alt Empordà - Estany D'en Túries	T	N
C.I. de Cataluña	Aiguamolls del Baix Empordà-El Ter Vell	T	N
C.I. de Cataluña	Delta de Llobregat-Cal Tet	T	N
C.I. de Cataluña	Delta de Llobregat-Ca l'Arana	T	N
C.I. de Cataluña	Delta del Llobregat-Estany de la Ricarda	T	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
C.I. de Cataluña	Delta del Llobregat-la Roberta	T	N
C.I. de Cataluña	Delta del Llobregat-El Remolar. Les Filipines I la Vidala	T	MM
C.I. de Cataluña	Delta del Llobregat-Riera de Sant Climent	T	N
C.I. de Cataluña	Delta del Llobregat-Estany de la Murtra	T	MM
C.I. de Cataluña	Delta del Llobregat - la Magarola	T	N
C.I. de Cataluña	Aiguamolls del Baix Empordà-Bassa del Frare Ramon	T	N
C.I. de Cataluña	Platja de Torredembarra	T	N
C.I. de Cataluña	Aiguamolls del Baix Empordà-Basses D'en Coll	T	MM
C.I. de Cataluña	Vandellòs I l'Hospitalet de l'Infant	C	N
C.I. de Cataluña	Portbou - Llançà	C	N
C.I. de Cataluña	Badia del Port de la Selva	C	N
C.I. de Cataluña	Cap de Creus	C	N
C.I. de Cataluña	Badia de Cadaqués	C	N
C.I. de Cataluña	Cap Norfeu	C	N
C.I. de Cataluña	Roses - Castelló d'Empúries	C	N
C.I. de Cataluña	Canyelles	C	N
C.I. de Cataluña	Sant Pere Pescador - Fluvià	C	N
C.I. de Cataluña	L'Escala	C	N
C.I. de Cataluña	Montgrí	C	N
C.I. de Cataluña	Torroella de Montgrí - El Ter	C	N
C.I. de Cataluña	Pals - Sa Riera	C	N
C.I. de Cataluña	Begur - Blanes	C	N
C.I. de Cataluña	Blanes - Pineda de Mar	C	N
C.I. de Cataluña	Pineda de Mar - Mataró	C	N
C.I. de Cataluña	Mataró - Mongat	C	N
C.I. de Cataluña	Montgat - Badalona	C	N
C.I. de Cataluña	Sant Adrià de Besòs - Barceloneta	C	MM
C.I. de Cataluña	Barceloneta - Zona II Port de Barcelona	C	MM
C.I. de Cataluña	Port de Barcelona	C	MM
C.I. de Cataluña	Llobregat	C	MM
C.I. de Cataluña	El Prat de Llobregat - Castelldefels	C	N
C.I. de Cataluña	Sitges	C	N
C.I. de Cataluña	Vilanova I la Geltrú	C	N
C.I. de Cataluña	Cubelles - Altafulla	C	N
C.I. de Cataluña	Tarragona Nord	C	N
C.I. de Cataluña	Port de Tarragona	C	MM
C.I. de Cataluña	Tarragona - Vilaseca	C	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
C.I. de Cataluña	Cap de Salou	C	N
C.I. de Cataluña	Salou - Cambrils	C	N
C.I. de Cataluña	Cambrils - Montroig del Camp	C	N
C.I. de Cataluña	L'Ametlla de Mar	C	N
C.M. de Andalucia	Marismas del Palmones	T	MM
C.M. de Andalucia	Estuario del Guadarranque	T	MM
C.M. de Andalucia	Estuario del Guadiaro	T	N
C.M. de Andalucia	Punta del Carnero - Desembocadura del Getares	C	N
C.M. de Andalucia	Puerto Pesquero de Algeciras - Parque de Contenedores	C	MM
C.M. de Andalucia	Puerto de la Línea de la Concepción	C	MM
C.M. de Andalucia	Muelle de Campamento - Aeropuerto de Gibraltar	C	N
C.M. de Andalucia	Desembocadura del Getares - Límite del Pn de Los Alcornocales	C	N
C.M. de Andalucia	Límite del Pn de Los Alcornocales- Muelle de Campamento	C	N
C.M. de Andalucia	Gibraltar - Desembocadura del Guadiaro	C	N
C.M. de Andalucia	Punta de Calaburra - Torremolinos	C	N
C.M. de Andalucia	Torremolinos - Puerto de Málaga	C	N
C.M. de Andalucia	Puerto de Málaga	C	MM
C.M. de Andalucia	Puerto de Málaga - Rincón de la Victoria	C	N
C.M. de Andalucia	Límite Pn Acantilados de Maro - Salobreña	C	N
C.M. de Andalucia	Puerto de Adra - Guardias Viejas	C	N
C.M. de Andalucia	Calahonda - Puerto de Adra	C	N
C.M. de Andalucia	Ámbito del Pn Acantilados de Maro	C	N
C.M. de Andalucia	Rincón de la Victoria - Límite Pn de Acantilados de Maro	C	N
C.M. de Andalucia	Límite del Pn Cabo de Gata - Limite Demarcacion Mediterránea Andaluza / Segura	C	N
C.M. de Andalucia	Desembocadura del Guadiaro - Punta de Calaburra	C	N
C.M. de Andalucia	Cabo de Gata - Límite del Pn Cabo de Gata	C	N
C.M. de Andalucia	Rambla de Morales - Cabo de Gata	C	N
C.M. de Andalucia	Puerto de Almería	C	MM
C.M. de Andalucia	Puerto de Motril	C	MM
C.M. de Andalucia	Salobreña - Calahonda	C	N
C.M. de Andalucia	Charcones de Punta Entinas	T	N
C.M. de Andalucia	Salinas de Los Cerrillos	T	MM
C.M. de Andalucia	Guardias Viejas - Rambla de Morales	C	N
C.M. de Andalucia	Albufera del Cabo de Gata	T	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
C.M. de Andalucia	Desembocadura del Guadarranque	C	MM
C.M. de Andalucia	Desembocadura del Guadalhorce	T	N
C.M. de Andalucia	División Ecorregiones Atlántica / Mediterránea - Punta del Carnero	C	N
Cantábrico Occidental	Avilés Costa	C	N
Cantábrico Occidental	Navia Costa	C	N
Cantábrico Occidental	Costa Oeste	C	N
Cantábrico Occidental	Eo Costa	C	N
Cantábrico Occidental	Costa Este	C	N
Cantábrico Occidental	Ribadesella Costa	C	N
Cantábrico Occidental	Gijón	C	MM
Cantábrico Occidental	Nalón Costa	C	N
Cantábrico Occidental	Oyambre	C	N
Cantábrico Occidental	Castro	C	N
Cantábrico Occidental	Santoña	C	N
Cantábrico Occidental	Suances	C	N
Cantábrico Occidental	Santander	C	N
Cantábrico Occidental	Virgen del Mar	C	N
Cantábrico Occidental	Noja	C	N
Cantábrico Occidental	Eo	T	N
Cantábrico Occidental	Avilés	T	MM
Cantábrico Occidental	Esva	T	N
Cantábrico Occidental	Villaviciosa	T	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
Cantábrico Occidental	Ribadesella	T	N
Cantábrico Occidental	Navia	T	MM
Cantábrico Occidental	Nalón	T	N
Cantábrico Occidental	Tina Mayor	T	N
Cantábrico Occidental	Ría de Ajo	T	N
Cantábrico Occidental	Bahía de Santander-Interior	T	MM
Cantábrico Occidental	Bahía de Santander-Páramos	T	N
Cantábrico Occidental	Marismas de Joyel	T	N
Cantábrico Occidental	Santoña	T	N
Cantábrico Occidental	Oriñón	T	N
Cantábrico Occidental	Oyambre	T	N
Cantábrico Occidental	San Vicente de la Barquera	T	N
Cantábrico Occidental	Tina Menor	T	N
Cantábrico Occidental	Ría de San Martín de la Arena	T	N
Cantábrico Occidental	Bahía de Santander-Puerto	T	MM
Cantábrico Occidental	Ría de Mogro	T	N
Cantábrico Occidental	Marismas Victoria	T	N
Cantábrico Oriental	Nerbioi Interior	T	MM
Cantábrico Oriental	Nerbioi Exterior	T	MM
Cantábrico Oriental	Oiartzun	T	MM
Cantábrico Oriental	Cantabria-Matxitxako	C	N
Cantábrico Oriental	Matxitxako-Getaria	C	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
Cantábrico Oriental	Mompas-Pasaia	C	N
Cantábrico Oriental	Getaria-Higer	C	N
Cantábrico Oriental	Bidasoa	T	N
Cantábrico Oriental	Barbadun	T	N
Cantábrico Oriental	Butroe	T	N
Cantábrico Oriental	Oka Exterior	T	N
Cantábrico Oriental	Oka Interior	T	N
Cantábrico Oriental	Lea	T	N
Cantábrico Oriental	Artibai	T	N
Cantábrico Oriental	Urola	T	N
Cantábrico Oriental	Oria	T	N
Cantábrico Oriental	Deba	T	N
Cantábrico Oriental	Urumea	T	MM
Ceuta	Zona Norte de la Bahía de Ceuta	C	N
Ceuta	Zona Sur de la Bahía de Ceuta	C	N
Ceuta	Zona del Puerto	C	MM
Ebro	Mar Mediterráneo	C	N
Ebro	Bahía del Fangal	T	MM
Ebro	Bahía de Los Alfaques	T	MM
Ebro	Delta del Ebro	T	N
Ebro	Delta del Ebro	T	N
Ebro	Delta del Ebro	T	N
Ebro	Delta del Ebro	T	N
Ebro	Río Ebro Desde Tortosa Hasta Desembocadura (Aguas de Transición)	T	N
Galicia-Costa	A Guarda	C	N
Galicia-Costa	Cíes-Ons	C	N
Galicia-Costa	Muros	C	N
Galicia-Costa	Oia	C	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
Galicia-Costa	Marín	C	N
Galicia-Costa	Moaña	C	N
Galicia-Costa	Noia	C	N
Galicia-Costa	Rande	C	N
Galicia-Costa	Ría de Aldán	C	N
Galicia-Costa	Ría de Corcubión	C	N
Galicia-Costa	Ribeira	C	N
Galicia-Costa	Vigo	C	N
Galicia-Costa	Vilagarcía	C	N
Galicia-Costa	Costa Ártabra	C	N
Galicia-Costa	Costa Da Morte	C	N
Galicia-Costa	Dexo	C	N
Galicia-Costa	A Coruña	C	N
Galicia-Costa	Ares	C	N
Galicia-Costa	A Mariña Este	C	N
Galicia-Costa	Bens	C	N
Galicia-Costa	Ferrol	C	N
Galicia-Costa	A Mariña Oeste	C	N
Galicia-Costa	A Mariña Centro	C	N
Galicia-Costa	Puerto de A Coruña	C	MM
Galicia-Costa	Puerto de Vilagarcia	C	MM
Galicia-Costa	Puerto de Marin	C	MM
Galicia-Costa	Puerto de Vigo	C	MM
Galicia-Costa	Puerto de Ferrol	C	MM
Galicia-Costa	Punta Langosteira	C	MM
Galicia-Costa	Puerto de San Cibrao	C	MM
Galicia-Costa	Umia	T	N
Galicia-Costa	Anllóns	T	N
Galicia-Costa	Eo (Ribadeo)	T	N
Galicia-Costa	Eume (Pontedeume)	T	N
Galicia-Costa	Lérez (Pontevedra)	T	N
Galicia-Costa	Mendo-Mandeo (Betanzos)	T	N
Galicia-Costa	Oitavén-Verdugo (San Simón)	T	N
Galicia-Costa	Tambre (Noia)	T	N
Galicia-Costa	Ulla	T	N
Galicia-Costa	Grande	T	N
Galicia-Costa	Grande de Xubia	T	N
Galicia-Costa	Landro (Viveiro)	T	N
Galicia-Costa	Masma (Ría de Foz)	T	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
Galicia-Costa	Mera (Ortigueira)	T	N
Galicia-Costa	Mero (Ría Do Burgo)	T	N
Galicia-Costa	Miñor (A Ramallosa)	T	N
Galicia-Costa	Porto Do Cabo (Ensenada de Estei)	T	N
Galicia-Costa	Sor (O Barqueiro)	T	N
Galicia-Costa	Baldaio	T	N
Galicia-Costa	Carnota-Caldebarcos	T	N
Galicia-Costa	Corrubedo (Artes-Carregal)	T	N
Galicia-Costa	Frouxeira	T	N
Galicia-Costa	Rio O Castro (Ría de Lires)	T	N
Guadalete-Barbate	Punta de San Sebastián - Frente A San Fernando	C	N
Guadalete-Barbate	Ámbito de la Desembocadura del Guadalete	C	MM
Guadalete-Barbate	Bahía Externa de Cádiz	C	N
Guadalete-Barbate	Límite Demarcación Guadalquivir / Guadalete - Punta de Rota	C	N
Guadalete-Barbate	Marismas del Río San Pedro	T	MM
Guadalete-Barbate	Puerto de Santa María	T	MM
Guadalete-Barbate	Puerto de Cádiz - Bahía Interna de Cádiz	C	MM
Guadalete-Barbate	Marismas de Cádiz Y San Fernando	T	MM
Guadalete-Barbate	Desembocadura del Guadalete 2	T	N
Guadalete-Barbate	Desembocadura del Guadalete 1 (Puerto de Santa María)	T	N
Guadalete-Barbate	Curso Fluvial del Guadalete 1	T	MM
Guadalete-Barbate	Curso Fluvial del Guadalete 2	T	MM
Guadalete-Barbate	Marismas de Barbate 3 (Vejer de la Frontera)	T	MM
Guadalete-Barbate	Marismas de Barbate 2	T	MM
Guadalete-Barbate	Marismas de Barbate 1 (Barbate)	T	MM
Guadalete-Barbate	Punta de Tarifa - División Ecorregiones Atlántica / Mediterránea	C	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
Guadalete-Barbate	Cabo de Gracia - Punta de Tarifa	C	N
Guadalete-Barbate	Límite de Las Marismas de Barbate - Cabo de Gracia	C	N
Guadalete-Barbate	Ámbito Costero Parque N Marismas de Barbate	C	N
Guadalete-Barbate	Frente A San Fernando - Cabo de Trafalgar	C	N
Guadalquivir	Desembocadura Guadalquivir - Bonanza	T	MM
Guadalquivir	Marismas de Bonanza	T	MM
Guadalquivir	La Esparraguera - Tarfia	T	MM
Guadalquivir	La Mata - la Horcada	T	MM
Guadalquivir	Brazo del Este	T	MM
Guadalquivir	Guadiamar Y Brazo del Oeste	T	MM
Guadalquivir	Encauzamiento del Guadaira	T	MM
Guadalquivir	Cortas de la Isleta, Merlina, Punta del Verde Y Vega de Triana	T	MM
Guadalquivir	Dársena Alfonso Xii	T	MM
Guadalquivir	Corta de la Cartuja	T	MM
Guadalquivir	Rivera de Huelva	T	MM
Guadalquivir	Corta San Jerónimo - Presa de Alcalá del Río	T	MM
Guadalquivir	Cortas de Los Jerónimos, Los Olivillos Y Fernandina	T	MM
Guadalquivir	Pluma del Guadalquivir	C	N
Guadalquivir	Parque Nacional de Doñana	C	N
Guadalquivir	Doñana - Matalascañas	C	N
Guadiana	Marismas de Isla Cristina	T	MM
Guadiana	Puerto de la Loja	T	N
Guadiana	Sanlucar de Guadiana	T	N
Guadiana	Desembocadura Guadiana (Ayamonte)	T	N
Guadiana	Pluma del Guadiana	C	N
Guadiana	Isla Cristina	C	N
Júcar	Límite Cv-Sierra de Irta	C	N
Júcar	Sierra de Irta	C	N
Júcar	Sierra de Irta-Cabo de Oropesa	C	N
Júcar	Cabo de Oropesa-Burriana	C	N
Júcar	Puerto de Castellón	C	MM
Júcar	Burriana-Canet	C	N
Júcar	Puerto de Sagunto	C	MM

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
Júcar	Costa Norte de Valencia	C	N
Júcar	Puerto de Valencia-Cabo de Cullera	C	N
Júcar	Puerto de Valencia	C	MM
Júcar	Cabo Cullera-Puerto de Gandía	C	N
Júcar	Puerto de Gandia-Cabo de San Antonio	C	N
Júcar	Puerto de Gandía	C	MM
Júcar	Puerto de Denia	C	MM
Júcar	Cabo San Antonio-Punta de Moraira	C	N
Júcar	Punta de Moraira-Peñon de Ifach	C	N
Júcar	Peñon de Ifach-Punta de Les Caletes	C	N
Júcar	Punta de Les Caletes-Barranco de Aguas de Busot	C	N
Júcar	Barranco de Aguas de Busot-Cabo Huertas	C	N
Júcar	Cabo Huertas-Santa Pola	C	N
Júcar	Puerto de Alicante	C	MM
Júcar	Santa Pola-Guardamar del Segura	C	N
Júcar	Desembocadura del Jucar	T	MM
Júcar	Estany de Cullera	T	MM
Júcar	Salinas de Calpe	T	MM
Júcar	Salinas de Santa Pola	T	MM
Melilla	Aguadú – Punta del Morillo	C	N
Melilla	Punta del Morillo – Dique de abrigo del Puerto	C	N
Melilla	Puerto de Melilla	C	MM
Miño-Sil	A Guarda	C	N
Miño-Sil	Estuario del Miño_Tramo1	T	N
Miño-Sil	Estuario del Miño_Tramo2	T	N
Miño-Sil	Estuario del Miño_Tramo3	T	N
Miño-Sil	Estuario del Miño_Tramo4	T	N
Segura	Límite Cuenca Mediterránea/Comunidad Autónoma de Murcia	C	N
Segura	Guardamar del Segura-Cabo Cervera	C	N
Segura	Mojón-Cabo Palos	C	N
Segura	Cabo de Palos-Punta de la Espada	C	N
Segura	Mar Menor	C	N
Segura	La Podadera-Cabo Tiñoso	C	N
Segura	Puntas de Calnegre-Punta Parda	C	N
Segura	Mojón-Cabo Negrete	C	N
Segura	Punta Espada-Cabo Negrete	C	N
Segura	Punta de la Azohía-Punta de Calnegre	C	N

***List of data for each Program** (Continuation)*

River Basin Distric	Zone	Category	Class
Segura	Cabo Tiñoso-Punta de la Azohia	C	N
Segura	La Manceba-Punta Aguilones	C	N
Segura	La Manceba-Punta Parda	C	N
Segura	Cabo Negrete-la Manceba (Profundidad Menor A -30 MSNM)	C	MM
Segura	Cabo Negrete-la Manceba (Profundidad Mayor A de -30 MSNM)	C	MM
Segura	Punta Aguilones-La Podadera	C	MM
Segura	Cabo Cervera-Límite Cv	C	N
Segura	Lagunas de la Mata-Torrevieja	T	MM
Tinto-Odiel-Piedras	Canal del Padre Santo 2 (Marismas del Odiel-Punta de la Canaleta)	T	MM
Tinto-Odiel-Piedras	Puerto de El Terrón - Desembocadura del Piedras	T	MM
Tinto-Odiel-Piedras	Río Odiel 2 (Puerto de Huelva)	T	MM
Tinto-Odiel-Piedras	Marismas del Odiel	T	N
Tinto-Odiel-Piedras	Cartaya - Puerto de El Terrón	T	MM
Tinto-Odiel-Piedras	Río Tinto 2 (Moguer)	T	N
Tinto-Odiel-Piedras	Embalse de Los Machos - Cartaya	T	MM
Tinto-Odiel-Piedras	Río Tinto 3 (San Juan del Puerto)	T	N
Tinto-Odiel-Piedras	Río Odiel 1 (Gibraleón)	T	N
Tinto-Odiel-Piedras	Punta Umbría - 1500 m Antes de la Punta del Espigón de Huelva	C	MM
Tinto-Odiel-Piedras	Límite de la Demarcación Guadiana/Tinto-Odiel - Punta Umbría	C	N
Tinto-Odiel-Piedras	Mazagón - Límite Demarcación Tinto - Odiel / Guadalquivir	C	N
Tinto-Odiel-Piedras	1500 m Antes de la Punta del Espigón de Huelva - Mazagón	C	MM
Tinto-Odiel-Piedras	Canal del Padre Santo 1	T	MM
Tinto-Odiel-Piedras	Río Tinto 1 (Palos de la Frontera)	T	N

***List of data for each Program** (Continuation)*

DATA 4. CLASSIFICATION OF ACTIVITIES CARRIED OUT IN PORT AREAS
Data description:
Definition of activities carried out in port areas.

Port infrastructure and installation works
New works and improvement of existing infrastructures and installations, including construction and demolition.
Dredging
Extraction of marine sediment to increase depth, maintaining navigation channels, foundations, cleaning and obtaining material for port works.
Maritime traffic
Ship transit through port waters.
Land traffic
Heavy traffic through the land service area (highway and railway networks).
Loading, unloading and storage of bulk solids
Bulk solids transfer operations from the docks to the ships or vice versa, together with storage in the land port jurisdiction area, with or without special installations.
Loading, unloading and storage of bulk liquids
Bulk liquid transfer operations from the docks to the ships or vice versa, together with storage in tanks.
Fuel and victualling supply
Services provided for ships from the port, such as supplying fuel, water, electricity, food and spare parts, etc.
Ship construction, repairs and breaking
Activities that are carried out in shipyards and on slipways within the port land service area.
MARPOL waste reception, transport and management
Waste reception and treatment activities under the MARPOL 73/78 Protocol Appendices (Appendix I hydrocarbons; Appendix II toxic substances; Appendix III harmful substances; Appendix IV bilge water; Appendix V rubbish)
Reception, transport and management of ships' ballast water and sediment
Activities for extracting or neutralising harmful aquatic organisms and pathogenic agents in ballast water and sediments and avoiding their capture or discharge.
Machinery and installation cleaning and maintenance
A group of operations and tasks required so that machinery and installations are able to continue operating properly.
Urban activities
Urban type activities not related to port activities that are carried out in the port land jurisdiction area, such as discharge of urban waste water.
Industrial activities
Industrial activities carried out in the port land jurisdiction area.

***List of data for each Program** (Continuation)*

Fishing and aquiculture activities
Fishing boat activities of loading and unloading tasks, discharges, handling fish on land and activities relating to aquiculture in the port jurisdiction area.
Nautical-recreational activities
Activities relating to recreational ports or basins located within the port jurisdiction area.
Public usage areas
Activities carried out within the port land jurisdiction area and mainly intended for collective use or enjoyment.
Military installations
Enclosures fitted out with the means required for carrying out military activities.
Others
Any activity carried out in the port area that might affect port water quality and which is not included above.

***List of data for each Program** (Continuation)*

DATA 5. ESTIMATING HAZARD LEVELS FOR DISCHARGED SUBSTANCES OR HANDLED MATERIALS

Data description:

Classification of discharged substances or handled materials in order to estimate hazard levels for the contaminant source.

Fp_{ij}	Substances and materials		
4	Anthracene[1]	Dichloromethane[1]	Naphthalene[1]
	Atrazine[1]	Di(2-ethylhexyl)phthalate[1]	Nickel[1]
	Benzene[1]	Diuron[1]	4-nonylphenol[1]
	Brominated1 Diphenylether[1]	Endosulfan[1]	4-(1,1',3,3'-tetramethylbutyl)-phenol[1]
	Pentabromodiphenylether[1]	Fluoranthene[1]	Pentachlorobenzene[1]
	Cadmium[1]	Hexachlorobenzene[1]	Pentachlorophenol[1]
	Chloroalkanes, C10-13[1]	Hexachlorobutadiene[1]	Benzo(a)pyrene[1]
	Chlorfenvinphos[1]	Hexachlorocyclohexane[1]	Benzo(b)fluoranthene[1]
	Chlorpyrifos ethyl[1]	Isoproturon[1]	Benzo(g,h,i)perylene[1]
	1,2-Dichloroethane[1]	Mercury [1]	Benzo(k)fluoranthene[1]
3	1,1,2,2-tetrachloroethanol[4] Aluminium ferro-silicon powder [3] Aluminium silicate in powder, uncovered[3] Asbestos[4] Mineral antimony and waste (stibine) [3] Sulphur (in lumps or coarse grain poweder) [3] Non-activated organic carbon[3] Total organic carbon[3] Zinc ash[3] Chlordane[4] Chlordecone[4] Vinyl chloride[4] Chlorides[4] Copra, dry[3] DQO[4] Phenols[4] Ferro-silicon, 30-90% silicon[3] Total phosphorus[4] Fish meal and waste (with antioxidant treatment): moisture content between 5-11% by weight[3] Fish meal and waste (with antioxidant treatment): fat content 18% by weight[3] Fish meal and waste: moisture content 6-12% by weight[3]		Fish meal and waste: fat content 12% Heptachloride[4] Hexabromobiphenyl[4] Mirex[4] Ammonium nitrate, type A fertiliser Ammonium nitrate, type A fertiliser Ammonium nitrate, type A fertiliser Ammonium nitrate, type A fertiliser Ammonium nitrate, type B fertiliser [3] Barium nitrate[3] Magnesium nitrate[3] Lead nitrate[3] Potassium nitrate[3] Sodium nitrate (Chilean sodium nitra Mixed sodium nitrate and potassium Total nitrogen[4] o,p'-DDT[4] Ethylene oxide[4] Spent iron oxide and spent iron spor p,p-DD[4] p,p'-DDD[4] p,p'-DDE[4] Polychlorobiphenyl [4]
2	Mineral oils[5] Alfalfa grain[5] Granulated tar[5] Aluminium (slag)[5] Cracked rice[5] Organic carbon in briquettes[5] Carbon[5] Petroleum coke (calcined)[5] Petroleum coke (nor calcined) [5] Intestinal enterococcus [6] Escherichia coli [6]		Fluorspar (calcium fluoride)[5] Ferro phosphorus[5] Gluten in granules[5] Toasted meals [5] Meal[5] Wood splinters[5] Maize[5] Barley malt in granules[5] Chromium mineral[5] Vanadium mineral[5] Concentrated minerals[5]
1	Other substances or materials		

[1]Priority substances(Spanish RD 60/2011) [2]Preferential substances(Spanish RD 60/2011) [3]Hazardous materials (Spanish RD 145/1989) [4]Substances/pollutants (Eu

	Indeno(1,2,3-cd)pyrene[1]	Endrin[2]	
	Simazine[1]	Isodrin[2]	
	Tributyltin-cation[1]	DDT-total[2]	
	Trichlorobenzenes[1]	p,p'-DDT[2]	
	Chloroform[1]	Tetrachlorethylene[2]	
	Trifluralin[1]	Trichlorethylene[2]	
	Lead[1]		
	Alachlor[5]		
	Aldrin[2]		
	Dieldrin[2]		
% by weight [3] (A1) [3] (A2) [3] (A3) [3] (A4) [3] ate) [3] nitrate (Chilean potassium nitrate) [3] nge [3]		Raw ammonia waste with more than 7% moisture[3] Fertiliser waste with more than 8% moisture[3] Low specific activity radioactive substance (BAE) [3] Seed cake with proportion of vegetable oil (waste from Extraction of oil from seeds with solvents, with less than 1.5% oil and 11% moisture) [3] Seed cake with proportion of vegetable oil, waste from Extraction of oil from seeds with solvents or by pressing that contains less than 10% oil or moisture exceeding10% less than 20% combined oil and moisture[3] Seed cake with proportion of vegetable oil, seed waste pressed mechanically, with more than 10% oil or more than 20% combined oil and moisture[3] Toxaphene[4] Trichloroethylene[4] Triphenyltin acetate and compounds[4] Iron or steel chips from drilling, cutting, perforation, filing, rasping, metal turning. ferrous[3]	
		Pre-reduced iron-Dri, with high iron content, in briquettes and pellets[5] Citric fruit pulp[5] Wood pulp in pellets[5] Rubbish waste (contains less than 8% moisture) [5] Floating waste and materials[5] Rice bran[5] Bran[5] Sawdust[5]	

uropean Regulation (EC)No 166/2006).) [5]Potentially hazardous materials (Spanish RD 145/1989) [6]bacteriological indicators (European Directive 2006/7/EC)

***List of data for each Program** (Continuation)*

DATA 6. ESTIMATING THE RECOVERY OF A PORT AQUATIC MANAGEMENT UNIT
Data description:

Substance classification for estimating recovery of management units affected by a contaminant source in function of its persistence.

Fr_{ij}	Substance	P (days)	Substance	P (days)
4	1,2-Dichloroethane	180	Hexachlorocyclohexane	140
	Aldrin	590	Indeno(1,2,3-cd)pyrene	730
	Atrazine	7400	Lindane	410
	Benzo(a)pyrene	530	Naphthalene	230
	Benzo(g,h,i)perylene	650	Nonylphenol	150
	Benzo(k)fluoranthene	2100	o,p'-DDT	5700
	Chlordane	1400	p,p'-DDD	5800
	Vinyl chloride	180	p,p'-DDE	5800
	DDT-total	5700	p,p'-DDT	5700
	Dieldrin	1100	Pentabromodiphenylether	150
	Fluoranthene	4400	Trichlorobenzenes	180
	Hexachlorobenzene	1500	Trichlorethylene	370
	Hexachlorobutadiene	180	Trichloromethane	180
3	Tributyltin-cation	30-90	Isoproturon	20-61
	Diuron	90	Simazine	12-77
	Heptachloride	65	Toluene	90
2	Alachlor	23,7	Endosulfan	14
	Chlorfenvinphos	49	Ethylbenzene	20
	Chloroalkanes, C10-13	26,4-29,8	Pentachlorophenol	48
	Dichlorobenzene	18	Tetrachlorethylene	25
	Dichloromethane	28	Trifluralin	13
1	Anthracene	6,3	Di(2-ethylhexyl)phthalate	0,8
	Benzene	6	Phenols	0,13
	Chlorpyrifos	3-6	Other substances and materials	<10

P: Persistence

***List of data for each Program** (Continuation)*

DATA 7. LIST OF DENSITIES FOR THE DISCHARGED SUBSTANCES OR HANDLED MATERIALS

Data description:

A compilation was made of the densities for the materials that are habitually handled in port activities so that the contaminant source extension using GIS may be calculated (Method 8)

Material/substance	D ($\times 10^{-3}$)	Material/substance	D ($\times 10^{-3}$)
Fertilisers (various types)	1.20	Hexane	0.65
Phosphated fertilisers	1.20	Iron	3.00
Biodiesel oil	0.88	Soft coal, briquettes and ovoid	0.85
Oils and greases	0.88	Ilmenite	4.45
Acetate and Acrylonitrile	1.05	Maize	0.70
Acetylene	0.73	Manganese and slag	2.40
Acetone	0.79	Methanol	0.79
Sulphuric acid	1.85	Iron mineral	3.00
Acetic acid	1.05	Manganese mineral	2.40
Waste waters	1.00	Naphtha	0.73
Ethyl alcohol	0.79	Octane	0.70
Acyclic alcohols	0.94	Petroleum	0.85
Aniline, ketones and quinones	1.02	Polyvinyl acetate	0.93
Anthracite	1.65	Kerosene	0.74
Asphalt	1.00	Oily waste	1.00
Wood splinters	0.30	Cereal waste	0.65
Oats	0.45	Common salt	1.20
Sugars and treacle	1.59	Cotton seeds	0.40
Sulphur	1.96	Iron silicate (slag)	1.80
Benzene	0.88	Caustic soda	1.53
Butadiene	0.65	Iron sulphate	1.03
Kaolin	2.60	Granulated iron sulphate	1.31
Carbon	0.40	Titanium	4.50
Soft coal	1.30	Wheat	3.43
Sodium carbonate	2.50	Liquid urea fertiliser	0.77
Carbonates	1.25	Solid urea fertiliser	0.70
Carbonates-Percarbonates	1.25	Ether derivatives	0.79
Barley	0.65	Maize derivatives	0.75
Bulk cement	1.60	Slag	1.10
Hydraulic cements	1.20	Natural soapstone	3.10
Pyrite ash (clinker)	1.60	Ethers	0.74
Cereals	0.65	Phosphates	1.84
Clinker	1.50	Fuel oil	0.97

***List of data for each Program** (Continuation)*

Material/substance	D (x10^{-3})	Material/substance	D (x10^{-3})
Vinyl chloride	0.90	Gasoil	0.85
Copper	8.93	Petrol	0.68
Nickel concentrate	2.51	Gravel	1.70
Petroleum coke	0.50	Peas	0.80
Petroleum coke not calcined	0.50	Soy meal	0.77
Soft coal coke and semi-coke	0.50	Meals	0.80

D: density in kg/m^3

***List of data for each Program** (Continuation)*

DATA 8. COMPILING GUIDES ON GOOD GENERAL PRACTICES

Data description:

List of general environmental good practice guides.

Organisation	Scope	Title	URL
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Handbook	www.aapa-ports.org
ABP	United Kingdom	ABP's Environmental Management Framework-ABP's Environmental Policy-ABP's Environmental Risk Register	www.ukmarinesac.org.uk
ABP	United Kingdom	Good Practice Guidelines for Ports and Harbours Operating within or near UK Europan Marine Sites	www.ukmarinesac.org.uk
British Standards	United Kingdom	Maritime structures — Part 1: Code of practice for general criteria	www.dpea.scotland.gov.uk
CEDRE	Europe	Ecological Monitoring of Accidental Water Pollution	www.cedre.fr
CEDRE	Europe	Response to Small-Scale Pollution in Ports and Harbours	www.cedre.fr
Comisión Europea	Europe	An Integrated Maritime Policy for the European Union	www.ecoports.com
Department for Transport	United Kingdom	A Guide to Good Practice on Marine Operations	www.dft.gov.uk
Department for Transport	United Kingdom	Modernising Trust Ports	www.dft.gov.uk
Department for Transport	United Kingdom	Port Marine Safety Code	www.dft.gov.uk
Department for Transport	United Kingdom	Trust Port Advice	www.dft.gov.uk
EPA	United States	An Environmental Management System (EMS) Primer for Ports: Advancing Port Sustainability	www.epa.gov

***List of data for each Program** (Continuation)*

Organisation	Scope	Title	URL
ESPO	Europe	Environmental Code of Practice	www.espo.be
ESPO	Europe	ESPO / EcoPorts Port Environmental Review 2009	www.espo.be
ESPO	Europe	ESPO Environmental Review. Follow-up to the ESPO Code of Practice.	www.espo.be
ESPO	Europe	Overview of EU & International Environmental Rules & Policies Which Affect the Port Sector	www.espo.be
ESPO	Europe	ESPO Green Guide; Towards excellence in port environmental management and sustainability	www.espo.be
Experts on the Scientific Aspects of Marine Environmental Protection	International	Protecting the Oceans from Land-based Activities	www.jodc.go.jp
HR Wallingford	United Kingdom	Guidelines for Port Environmental Management	www.dft.gov.uk
ILO	International	Safety and health in ports	www.ilo.org
Marine Accident Investigation Brach	United Kingdom	Recommendations Annual Report 2008	www.maib.gov.uk
Maritime Safety Authority of New Zealand	New Zealand	New Zealand Port and Harbour Marine Safety Code	www.maritimenz.govt.nz
Puertos del Estado	Spain	Guía de buenas prácticas ambientales	www.puertos.es
Solent Forum	United Kingdom	First Edition of the Marine Consents Guide	www.solentforum.org

***List of data for each Program** (Continuation)*

DATA 9. COMPILING GUIDES ON SPECIFIC GOOD PRACTICES ASSOCIATED WITH PORT ACTIVITIES

Data description:

List of environmental good practice guides relating to various types of port activity.

PORT INFRASTRUCTURE AND INSTALLATION WORKS

Organisation	Scope	Title	URL
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Building and Grounds Maintenance	www.aapa-ports.org
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Bulkhead, Pier, and Dock Construction	www.aapa-ports.org
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Buildings Renovation and Demolition	www.aapa-ports.org
British Standards	United Kingdom	Maritime structures — Part 7: Guide to the design and construction of breakwaters	shop.bsigroup.com
British Standards	United Kingdom	Maritime works – Part 2: Code of practice for the design of quay walls, jetties and dolphins	shop.bsigroup.com
CIRIA	United Kingdom	Coastal and marine environmental site guide (C584)	www.thenbs.com
CIRIA	United Kingdom	Biological methods for assessment and remediation of contaminated land: case studies (C575)	www.contaminate-land.org
CIRIA	United Kingdom	Coastal and marine environmental pocket book (C954)	www.ciria.org
CIRIA	United Kingdom	A comparison of quay wall design methods: (TN54)	openlibrary.org
CIRIA	United Kingdom	Use of concrete in maritime structures (RP764)	www.ciria.org
CIRIA	United Kingdom	A guide for safe working on contaminated sites (R132)	www.ciria.org

***List of data for each Program** (Continuation)*

Organisation	Scope	Title	URL
CIRIA	United Kingdom	Whole-life infrastructure asset management: good practice guide for civil infrastructure. (C677)	www.ciria.org
PIANC	International	The use of alternative materials in marine structure construction WG 105-2009	www.pianc.org
Puertos del Estado	Spain	ROM 0.5-05-Recomendación Geotécnica para las Obras Marítima y/o Portuaria	www.puertos.es
Puertos del Estado	Spain	ROM 0.0-Procedimiento General con Bases de Cálculo para el Proyecto - ROM - en las Obras portuarias o/y Marítimas	www.puertos.es/en/programa_rom/
Puertos del Estado	Spain	ROM 0.2-90-Acciones al proyectar Obra Marítima y Portuaria	www.puertos.es
Puertos del Estado	Spain	ROM 4.1-94-Recomendaciones para proyectar y construir Pavimentos Portuarios	www.puertos.es
Puertos del Estado	Spain	Guía de buenas prácticas para la ejecución de obras marítimas	www.puertos.es
Puertos del Estado	Spain	ROM 3.1-99-Configuración marítima del Puerto: canal de acceso y área de flotación	www.puertos.es
SECBE	United Kingdom	An Introductory Guide to Best Practice in Construction	www.secbe.org.uk
URGARBI	Spain	Guías de buenas prácticas para la gestión de escorrentías en el ámbito portuario	www.urgarbi/guias

***List of data for each Program** (Continuation)*

DREDGING

Organisation	Scope	Title	URL
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Dredging and Dredge Material Disposal	www.aapa-ports.org
British Standards	United Kingdom	Maritime structures — Part 5: Code of practice for dredging and land reclamation	shop.bsigroup.com
CEDA	International	Dredging and the environment: moving sediments in natural systems	www.dredging.org
CEDA	International	Specific guidelines for assessment of dredged material	www.dredging.org
CEDEX	Spain	Recomendaciones para la gestión del material dragado en los puertos españoles	www.cedex.es
Comisión Europea	Europe	The implementation of the birds and habitats directives in estuaries and coastal zones, with particular attention port development and dredging	ec.europa.eu
HELCOM	International	Revised guidelines for the disposal of dredged spoils	www.dredging.org
OSPAR	Northeast Atlantic	Revised OSPAR Guidelines for the Management of Dredged Material	www.dredging.org
PIANC	International	El aprovechamiento de los productos de dragado	www.pianc.org
PIANC	International	Environmental risk assessment of dredging and disposal operations. Grupo ENVICOM. Report of WG 10-2006	www.pianc.org
PIANC	International	Dredged material as a resource options and constraints. Report nº 104 -2009	www.pianc.org
PIANC	International	Dredging and management practices for the environment. A structured selection approach WG100-2009	www.pianc.org

***List of data for each Program** (Continuation)*

Organisation	Scope	Title	URL
PIANC	International	Long term management of confined disposal facilities for dredged material	www.pianc.org
PIANC	International	Dredging management practices for the environment - A structured selection approach	www.pianc.org

MARITIME TRAFFIC

Organisation	Scope	Title	URL
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Ship and Shore Generated Solid Waste Handling	www.aapa-ports.org
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Ship Air Emissions	www.aapa-ports.org
European Maritime Safety Agency	Europe	Safer and Cleaner Shipping in the European Union	www.ecoports.com
IMO	International	Air Pollution and Greenhouse Gas (GHG) Emissions from International Shipping	www.imo.org
IMO	International	Information resources on recycling of ships	www.imo.org
IMO	International	Guidelines on minimum training and education for mooring personnel	www.imo.org
IMO	International	Código Internacional de gestión de la seguridad operacional del buque y la prevención de la contaminación (Código Internacional de gestión de la seguridad (CGS)	www.imo.org
IMO	International	Código técnico relativo al control de las emisiones de óxidos de nitrógeno de los motores diesel marinos (Código sobre los NOx)	www.imo.org

***List of data for each Program** (Continuation)*

IMO	International	Convenio internacional para el control y la gestión del agua de lastre y los sedimentos de los buques, 2004	www.imo.org
IMO	International	Resolución msc.176(79) código internacional para la construcción y el equipo de buques que transporten productos químicos peligrosos a granel (código CIQ)	www.imo.org
IMO	International	Resolución MSC (91)45 Código para la construcción y el equipo de buques que transporten productos químicos peligrosos a granel (Código CGrQ)	www.imo.org
IMO	International	Resolución MSC 176(73) código para la construcción y el equipo de buques que transporten gases licuados a granel	www.imo.org
IMO	International	Código IMDG de mercancías peligrosas	www.imo.org
IPIECA	International	Maritime air emissions & MARPOL Annex VI, 2007	www.ipieca.org
PIANC	International	Towards a sustainable waterborne transportation industry. ENVICOM task group 2	www.pianc.org
PIANC	International	Sustainable waterways within the context of navigation and flood management WG 107-2009	www.pianc.org
PIANC	International	Consideration to reduce environmental impacts of vessels WG99-2008	www.pianc.org
REMPEC	Mediterranean Sea	Basic documents, recommendations, principles and guidelines concerning accidental and mutual assistance as well as prevention of pollutions from ships.	www.rempec.org

***List of data for each Program** (Continuation)*

LAND TRAFFIC

Organisation	Scope	Title	URL
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Vehicle and Equipment Washing	www.aapa-ports.org
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Automobile Storage and Transport	www.aapa-ports.org
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Vehicle and Equipment Maintenance	www.aapa-ports.org
Port Authority of Melilla	Spain	Directrices ambientales para la circulación de vehículos	www.puertodemelilla.es
Port Authority of Valencia	Spain	Guía de buenas prácticas ambientales en puertos: Transporte terrestre por carretera	www.valenciaport.com
NOAA	United States	Shoreline countermeasures manual	response.restoration.noaa.gov

LOADING, UNLOADING AND STORAGE OF BULK SOLIDS

Organisation	Scope	Title	URL
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Bulk Storage and Handling ~ Dry	www.aapa-ports.org
AMSA	Australia	Code Of Practice For The Safe Loading And Unloading Of Bulk Carriers	www.amsa.gov.au
Health and Safety Executive Books	Australia	Health hazards from dusty cargoes during the loading and unloading of ships Docks Information	www.hse.gov.uk
Autoridad Portuaria de Santander	Spain	Guía de buenas prácticas para la zmanipulación y almacenamiento de graneles pulverulentos	www.puertosantander.es

***List of data for each Program** (Continuation)*

Autoridad Portuaria de Valencia	Spain	Guías de buenas prácticas en Puertos: Manipulación y almacenamiento de graneles sólidos	www.valenciaport.com
CEDRE	Europa	Containers and packages lost at sea	www.cedre.fr
Health and Safety Executive Books	United Kingdom	Health hazards from dusty cargoes during the loading and unloading of ships Docks Information	www.hse.gov.uk
Puertos del Estado	Spain	Caracterización de graneles sólidos. Proyecto HADA.	www.puertos.es
Puertos del Estado	Spain	Guía de buenas prácticas y medidas atenuantes de las emisiones a la atmósfera, provocadas por la actividad portuaria. Proyecto HADA	www.puertos.es
Puertos del Estado	Spain	Estudio de Medidas Atenuantes y correctoras de las emisiones a la atmósfera provocadas por actividades portuarias	www.puertos.es

LOADING, UNLOADING AND STORAGE OF BULK LIQUIDS

Organisation	Scope	Title	URL
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Chemical Storage and Handling ~ Non Bulk	www.aapa-ports.org
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Bulk Storage and Handling ~ Liquid	www.aapa-ports.org
Port Authority of A Coruña	Spain	Instrucción técnica nº 3 Operaciones sobre graneles líquidos	www.puertocoruna.com
CEDRE	France	Ammonia: pratical guide information decision-making response	www.cedre.fr

***List of data for each Program** (Continuation)*

Organisation	Scope	Title	URL
CEDRE	France	Ethyl Acrylate: pratical guide information decision-making response	www.cedre.fr
CEDRE	France	Dimethyl disulphide: pratical guide information decision-making response	www.cedre.fr
CEDRE	France	Sulphuric acid: pratical guide information decision-making response	www.cedre.fr
CEDRE	France	Stabilised methyl methacry late: pratical guide information decision-making response	www.cedre.fr
CEDRE	France	Benzene: pratical guide information decision-making response	www.cedre.fr
CEDRE	France	1,2-Dichloroethane: pratical guide information decision-making response	www.cedre.fr
CEDRE	France	Sodium hydroxide 50% solution: pratical guide information decision-making response	www.cedre.fr
CEDRE	France	Styrene: pratical guide information decision-making response	www.cedre.fr
CEDRE	France	Xylenes: pratical guide information decision-making response	www.cedre.fr
CEDRE	France	Vinyl chloride: pratical guide information decision-making response	www.cedre.fr
CEDRE	France	Phosphoric acid: pratical guide information decision-making response	www.cedre.fr
CEDRE	Europe	Use of Sorbents for Spill Response	www.cedre.fr

***List of data for each Program** (Continuation)*

Health and Safety Executive Books	United Kingdom	Guidance on permit-to-work systems: A guide for the petroleum, chemical and allied industries (HSG250)	books.hse.gov.uk
Health and Safety Executive Books	United Kingdom	The cleaning and gas freeing of tanks containing flammable residues Chemical Safety Guidance Note CS15	books.hse.gov.uk
IMO	International	The Revised GESAMP Hazard Evaluation Procedure for Chemical Substances Carried by Ships	www.gesamp.org
International Chamber of Shipping	United Kingdom	The International Safety Guide for Oil Tankers and Terminals	www.nauticalmind.com/
Maritime Coastguard Agency	United Kingdom	Fires and explosions resulting from welding and flame cutting operations. Merchant Shipping Notice.	www.mcga.gov.uk

FUEL AND VICTUALLING SUPPLY

Organisation	Scope	Title	URL
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Fueling	www.aapa-ports.org
Port Authority of A Coruña	Spain	Instrucción técnica nº 1 Estancia del buque en el puerto	www.puertocoruna.com
Port Authority of A Coruña	Spain	Instrucción técnica nº 7. Suministro de combustible y lubricantes	www.puertocoruna.com
Port Authority of Vigo	Spain	Guía de buenas prácticas para el suministro de combustible y aceite lubricante a buques	www.apvigo.com

***List of data for each Program** (Continuation)*

Organisation	Scope	Title	URL
Port Authority of Vigo	Spain	Instrucciones provisionales de seguridad para el suministro de combustibles	www.apvigo.com
Autoridad Portuaria de Melilla	Spain	Directrices ambientales para el suministro de combustible a buques	www.puertodemelilla.es
CEDRE	Europe	Oil Spill Waste Management	www.cedre.fr
CEDRE	Europe	Vegetable oil spills at sea	www.cedre.fr
CEDRE	Europe	Using dispersant to treat oil slicks at sea	www.cedre.fr
CEDRE	France	Unleaded gasoline: pratical guide information decision-making response	www.cedre.fr
EMSA	Europe	Manual on the applicability of oil spill dispersants	www.emsa.europa.eu
HELCOM	Baltic Sea	Guidelines for carrying out oil bunkering operations and ship to ship liquid bulk cargo transfer in the territorial seas of the Baltic Sea States	www.helcom.fi
IMO	International	Guide to Oil Spill Exercise Planning	www.ipieca.org
IMO	International	Manual sobre la contaminación ocasionada por hidrocarburos. (partes I, II, III, IV)	www.imo.org
International Shipping Federation	International	Ship to ship transfer guide (petroleum and liquefied gases)	www.ics-shipping.org
IPIECA	International	A Guide to Contingency Planning for Oil Spills on Water	www.ipieca.org
IPIECA	International	Guide to Tiered Preparedness and Response	www.ipieca.org

***List of data for each Program** (Continuation)*

IPIECA	International	Dispersants and their Role in Oil Spill Response	www.ipieca.org
IPIECA	International	Guidelines for Oil Spill Waste Minimisation and Management	www.ipieca.org
Oil company marines forum	International	International safety guide for oil tankers and terminals	www.ocimf.com

SHIP CONSTRUCTION, REPAIRS AND BREAKING

Organisation	Scope	Title	URL
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Vessel and Equipment Painting and Paint Stripping	www.aapa-ports.org
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Vessel Repair and Maintenance	www.aapa-ports.org
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Ship Breaking	www.aapa-ports.org
Port Authority of Barcelona	Spain	Condiciones para los trabajos de pintado de buques en las dársenas portuarias	www.portdebarcelona.cat
Port Authority of Melilla	Spain	Directrices ambientales para varaderos	www.puertodemelilla.es
Port Authority of Vigo	Spain	Guía de Buenas Prácticas para la reparación y chorreo de buques a flote y en varadero	www.apvigo.com
IMO	International	Directrices de la OMI sobre reciclaje de buques. Resolución A.962(23).	www.armada.mil.uy
International Shipping Federation	International	Industry code of practice on ship recycling	www.ics-shipping.org

***List of data for each Program** (Continuation)*

MARPOL WASTE RECEPTION, TRANSPORT AND MANAGEMENT

Organisation	Scope	Title	URL
Port Authority of Melilla	Spain	Directrices ambientales para la recogida de residuos MARPOL	www.puertodemelilla.es
Port Authority of la Bahía de Cádiz	Spain	Procedimiento de entrega de residuos de buques	www.puertocadiz.com
Port Authority of Vigo	Spain	Instrucciones provisionales para el servicio MARPOL de buque a tierra	www.apvigo.com
Puertos del Estado	Spain	Directrices para la redacción de los planes de recepción y manipulación de desechos en puerto	www.puertos.es
Maritime and Coastguard Agency	United Kingdom	Port waste management planning - a guide to good practice	www.dft.gov.uk
IMO	International	Guidelines for the implementation of annex V of MARPOL	www.imo.org
IMO	International	Comprehensive manual on port reception facilities	www.imo.org
IMO	International	Guidelines for ensuring the adequacy of port waste reception facilities	www.imo.org
ESPO	Europe	A waste management plan for ship generated waste	www.espo
IMO	International	Guidelines on the provision of adequate reception facilities in ports	www.imo.org
IMO	International	Directrices OMI/ PNUMA sobre aplicación de los dispersantes de derrames de hidrocarburos y consideraciones ambientales	www.imo.org

***List of data for each Program** (Continuation)*

RECEPTION, TRANSPORT AND MANAGEMENT OF SHIPS' BALLAST WATER AND SEDIMENT

Currently, due to the new character of this activity type, examples of guides on good practices for the reception, control and management of ship ballast water and sediment are not available.

INDUSTRIAL ACTIVITIES

Organisation	Scope	Title	URL
Comisión Europea	Europe	BREF de diferentes actividades industriales	www.prtr-es.com

FISHING AND AQUICULTURAL ACTIVITIES

Organisation	Scope	Title	URL
GESAMP	United Kingdom	Towards safe and effective use of chemical coastal aquaculture	www.gesamp.org

NAUTICAL-RECREATIONAL ACTIVITIES

Organisation	Scope	Title	URL
Port Authority of A Coruña	Spain	Instrucción técnica nº 11. Instalaciones náutico deportivas	www.puertocoruna.com
Generalitat Valenciana	Spain	Guía de buenas prácticas ambientales para puertos deportivos en la Comunitat Valenciana	www.cma.gva.es
PIANC	International	Protecting water quality in marinas. WG98-2008	www.pianc.org
PIANC	International	Recreational navigation and nature. WG12-2002	www.pianc.org

***List of data for each Program** (Continuation)*

PUBLIC USAGE AREAS

Organisation	Scope	Title	URL
AAPA	Canada, Latin America, Caribbean, United States	Environmental Management Practices. Activity: Public Access and Recreation	www.aapa-ports.org
ESPO	Europe	Code of Practice on Societal Integration of Ports	www.espo.be
ESPO	Europe	ESPO Code of Practice on the Birds and Habitats Directives	www.espo.be

MILITARY INSTALLATIONS

Examples of guides on good practices for military installation are not available because of the singular nature of such installations.

MACHINERY AND INSTALLATION CLEANING AND MAINTENANCE

Examples of guides on good practices for machinery and installation cleaning are not available.

URBAN ACTIVITIES

Examples of guides on good practices for urban activities are not available.

Chapter V
Tools

Tools

CHAPTER V

The Tools Chapter is intended to be an aid in identifying those computer applications that may be employed with the ROM 5.1 programs. To this end, this document describes the tools, identifies the methods that require their use and also lists certain applications that may be used.

Table 1. ***List of tools for each Program***

TOOL 1. PORT ENVIRONMENTAL INFORMATION MANAGEMENT SYSTEM
What is it?
It is a flexible, interactive information system, with a user-friendly interface and developed to support solutions to environmental management in order to improve decision making.
What's its purpose?
◆ To provide access management to port environmental information. ◆ To hold, update and query data. ◆ To standardise data quality control. ◆ To optimise record traceability. ◆ To automate data querying.
What must be provided?
◆ Entering of data on management unit, contaminant sources, environmental quality and pollutant incidents, as well as other useful documents. ◆ Performing queries relating to contaminant sources, stations, samples, measurements and pollutant incidents. ◆ Automatic environmental risk assessment and management. ◆ Automatic unit environmental quality assessment. ◆ Generation of environmental indicator graphics. ◆ Organisation of useful documents into a library. ◆ Display of georreferenced information (management units, contaminant sources, sampling stations and pollutant incidents).
Recommended applications:
◆ ROM 5.1 – www.rom51.ihcantabria.com ◆ Portonovo - www.portonovoproject.org

TOOL 2. GEOGRAPHIC INFORMATION SYSTEMS
What is it?
An organised suite of computer applications and geographical data designed to capture, store, manipulate, analyse and deploy geographically referenced data in all its forms in order to resolve geographic planning and management problems.
What's its purpose?
◆ To store and calculate specific parameters. ◆ To display geographically referenced information. ◆ To handle various types of information coding. ◆ Spatially discretise and localise information. ◆ Interpolate, handle, integrate, organise and analyse data from the various sources and in various formats under a common environment. ◆ To provide an intuitive graphical user interface that is easy to access.

***List of tools for each Program** (Continuation)*

TOOL 2. GEOGRAPHIC INFORMATION SYSTEMS
What must be provided?
◆ Cartographic information integration to delimit the PAMU (Method 1). ◆ Bathymetric data interpolation to generate the grid calculation (Method 2). ◆ The generation of surrounding areas and the study of particle paths to estimate the contaminant source extension (Method 8). ◆ Cartographic information integration to calculate the surface percentage affected by a contaminant source (Method 9). ◆ Display of geographically referenced information (management units, contaminant sources, sampling stations and pollutant incidents).
Recommended applications:
◆ ArcGIS ESRI – www.esri.com ◆ GvSIG (open source) - www.gvsig.com ◆ QGIS (open source) - www.qgis.org

TOOL 3. NUMERICAL MODELS
What is it?
A tool that resolves the equations of a mathematical model in order to study the behaviour of complex systems in a numerical manner.
What's its purpose?
◆ To estimate the physical, chemical and biological processes in the environment. ◆ To increase the predictive capacity regarding the various scenarios. ◆ To optimise sampling design of environmental quality monitoring.
What must be provided?
◆ The spatial-temporal development of the hydrodynamic currents produced by the various dispersive agents (Method 3). ◆ The spatial-temporal development of the transport of a conservative tracer concentration for calculating the heavily modified PAMU flushing time (Method 4). ◆ The spatial-temporal development of the transport of those indicators that allow the study of the PAMU effects due to bacteriological contamination, dissolved oxygen reduction or chemical pollution (Method 7).
Recommended numerical models:
◆ Two-dimensional hydrodynamic models: H2D, H2DZ, BFHYDRO, LAMFE, SHYFEM, LMT2D. ◆ Three-dimensional hydrodynamic models: H3D, FVCOM, ROMS, POM, EFDC, MIKE3, COHERENS, MOHID, SELFE, MARS3D, LMT3D. ◆ Two-dimensional transport models: EMITE2D, TOX2D, SOLTOX2D, CE-QUAL-W2, MIKE21. ◆ Three-dimensional transport models: EMITE3D, TOX3D, SOLTOX3D, MIKE3, EFDC, WASP5, MOHID, COHERENS, ROMS.

REGISTRO EN EL PROGRAMA ROM

Al objeto de poder tenerle informado de las posibles correcciones, nueva edición, de la publicación de la ROM 5.1-13 y de otras **Recomendaciones para Obra Marítima y Portuaria**, le agradecemos su registro en el Programa ROM, mediante el envío de la ficha adjunta a:

REGISTRO PROGRAMA ROM
Dirección Técnica
PUERTOS DEL ESTADO
(***http://www.puertos.es***)
Avda. del Partenón, 10. Campo de las Naciones
28042 Madrid (ESPAÑA)

También puede enviar sus comentarios sobre esta publicación ROM 5.1-13 a la siguiente dirección de correo electrónico: **programarom@puertos.es**

Muchas gracias

RECOMENDACIONES PARA OBRAS MARÍTIMAS

NOMBRE			
DIRECCIÓN			
EMPRESA U ORGANISMO			
D.E.P.T./SECCIÓN			
POBLACIÓN	*C.P.*	*PROVINCIA*	*PAÍS*
TELÉFONO	*FAX*	*E-MAIL*	

REGISTRO PROGRAMA ROM
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ROM 5.1-13