WAMOS (Waterway Monitoring System)

# Overall Description

This chapter provides an overview of the system functionality and system interaction with other systems by means of a drafted business process, the product perspective and an overview of the needed use cases.

## Business Process

One of the main activities of WAMOS is the collection and integration of data from different sources. As shown in Figure 3 there are the IENC Data files, the NtS Web Service, the RIS Index Encoding Guide and finally the national authorities, who provide data for their national stretch directly. This bundle of data contains all necessary information (e.g. actual water levels, fairway dimensions, riverbed surveys etc.) as basis for WAMOS’ functionalities.

The data integration process shall be triggered in two different ways. One is to start it manually by an external message or input, the other is to call it periodically in a certain, configurable interval. Depending on the dependency of the data type, one of the two methods is called. After the data has been transmitted, it has to be checked, consolidated and stored in an internal database. The checks at this time of the import process are carried out automatically. The data is checked for structure, completeness and plausibility. Based on valid data the process activity is started, generating additional data. Manually imported data have to pass additional quality tests by the administrator in a staging area and can be manually checked. Then the release for the productive system is made. In contrast to this, automatically imported data are imported directly into the productive area of the database. Finally, depending on the data type to be updated, the data is transferred to the external systems e.g. the Danube FIS Portal and RIS COMEX. Afterwards the data integration process is finished and starts again from the beginning after a certain time, depending on the update interval of the data type. For example the update interval of riverbed surveys may be one month, whereas the water levels will be transferred at least once a day. The data transmission is done using well-defined interfaces.

The result of the data integration process is a database with valid, checked, homogeneous and harmonized data sets for visualization, analysis and export.

The main activities of the waterway users are displaying data in the map and generating reports and statistics based on WAMOS data. This includes among others the display of Riverbed Changes, Hydrological Conditions, Available Fairway Depths and Water Levels. WAMOS presents all actual joined data in a map and shows all detailed data in form of attributes, charts, statistics and reports.

Finally the updated map data shall be provided to the FIS-Portal or to the national authorities in form of OGC services. These external systems need the information for a seamless digitization of their data near the national borders. So it is guaranteed that both ends of a dataset fit together.

Also shown in Figure 3 are the different types of data sets transferred from each data source:

* (NWA)-Waterway Area
* (F)-Fairway dimensions
* (SD)-Sections and Stretches
* (RHM)-Distance Marks (Distance Marks along Waterway Axis and Distance Marks Ashore)
* (WA)-Waterway Axis
* (BN)-Bottleneck
* (G)-Waterway Gauge
* (GM)-Gauge Measurements
* (AF)-Available fairway depths
* (SR)-Sounding Results
* (FM)-Fairway Marks
* (RMM)-Rehabilitation and Maintenance Measures
* (WP)-Waterway Profile (including Water Level Reference Data)

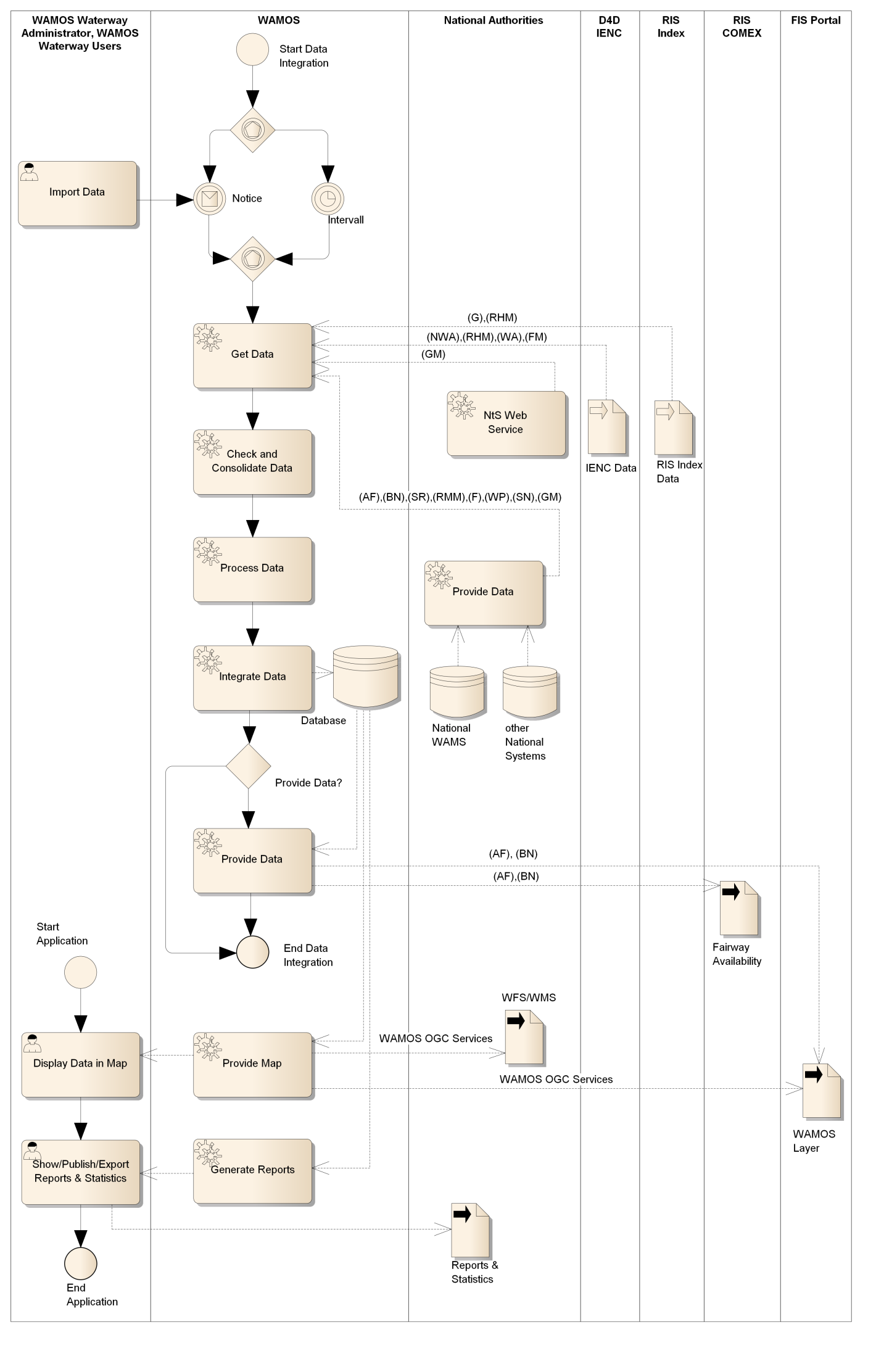


Figure 3: WAMOS Business Process

## Product Perspective

Based on the main functionality of WAMOS identified for the Business Process, Figure 3 shows all system components which are decisive for WAMOS, both internal and external.

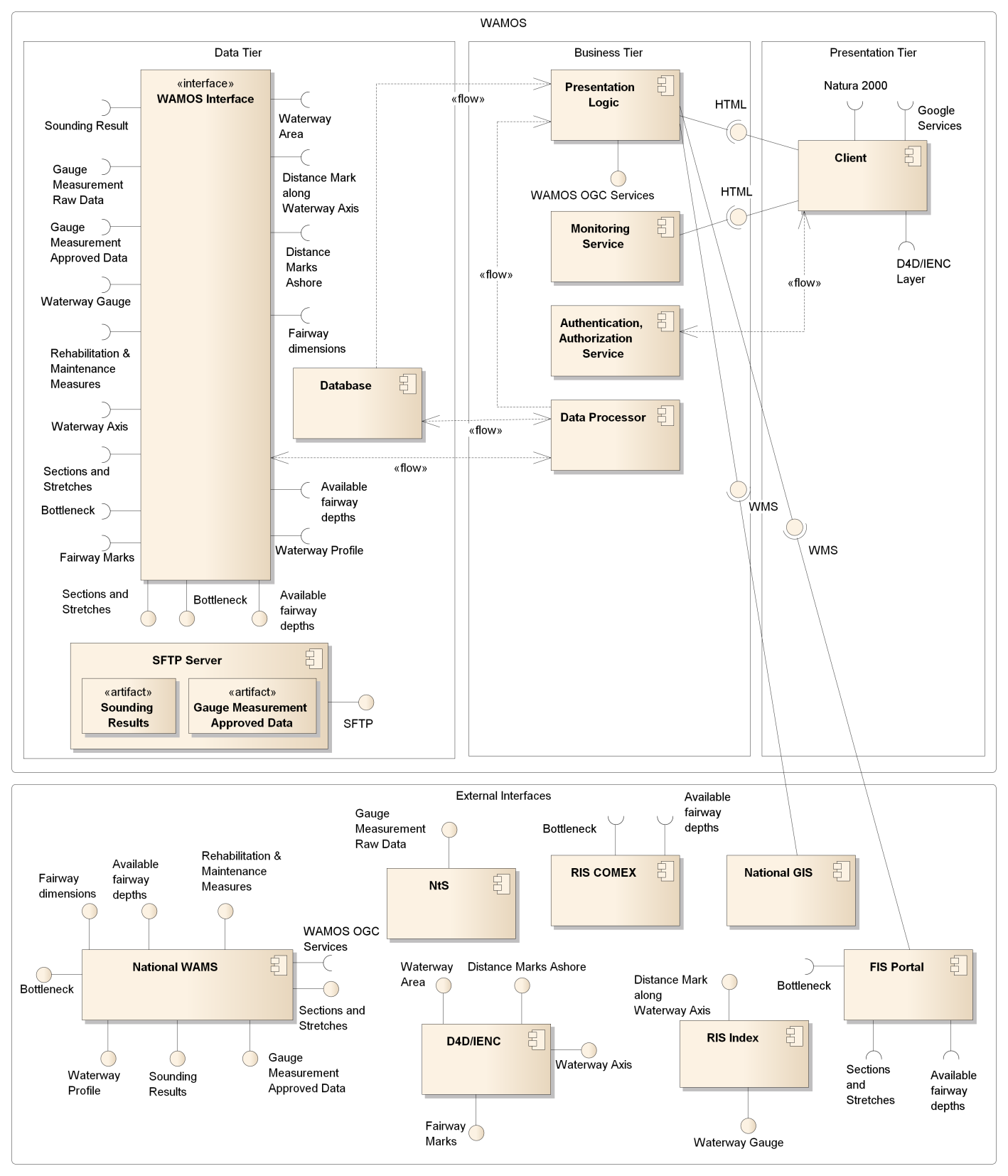


Figure 4: WAMOS System Context

Outside of the WAMOS System border resides the FIS Portal (<http://www.danubeportal.com>), the planned system(s) of RIS COMEX consuming the WAMOS data, the Notices to Skipper (NtS) Web Service, the National Data Providers, the D4D/IENC Data and RIS Index data.

The WAMOS System can be divided into three tiers: First the data tier holding the database and data related components, second the business tier holding all components related to the business and presentation logic and third the presentation tier that holds the client.

A very important and in the concept figure also large component in the data tier is the interface component holding the input interfaces. All of the imported input data will be checked, consolidated and additional data will be generated in the data process component (see also Chapter 2.4.4). Afterwards the data is integrated in the database.

Furthermore the business tier includes the components for authentication, authorization, monitoring, presentation and export.

The presentation itself is done by the client implemented as a web application. The client uses external web services (e.g. aerial images from Google services), but also WAMOS map data. All functionalities are backed by the presentation logic hosted at the WAMOS server.

## User Characteristics

There are five types of users interacting with modules of WAMOS (see Table 3: Actors). The first three are humans; the latter two are external systems. Users working with WAMOS shall be authenticated and authorized by the Authentication and Authorization Service, in order to constrain access to the information based on the role and privileges of the authenticated user:

Table 3: Actors

|  |  |
| --- | --- |
| Actor | Description |
|  | The WAMOS Waterway User is the primary target group of WAMOS. The system shall support this user in aligning national fairway improvement strategies and shall ease the reporting of needs to national and international decision makers.  Each WAMOS Waterway User from each country has read access to all user functions, maps, data and documents (see Table 4: Use Case assignment to the actors). Because there is no separation according to customer-specific information needed, a multi-tenant capability is not needed.  The only exception from this concept are the statistic templates or report templates. These are configured by the WAMOS System Administrator on user-level. |
|  | The WAMOS Waterway Administrator is a kind of super-user which has the same permissions as the WAMOS Waterway User. In addition, the administrator can also import data [APUC5] and follow the import process in a statutory page [APUC7]. These activities are restricted to his area of activity (=country), which ensures that only one person is responsible for the data import. In order to prevent false data import, the data entries are filtered by geographic regions. For example, importing data and monitoring the import process is only allowed for the country referenced to the WAMOS Waterway Administrator.  The responsibilities at the border sections must be allocated organizationally. For this reason, the spatial extent of the area of authority does not correspond exactly to the country's borders, it extends a certain distance into the respective neighboring country.  Per default each country is setup with one WAMOS Waterway Administrator account. |
|  | The WAMOS System Administrator is responsible for all administrative functional aspects of the system. The administrator creates users, assigns privileges to user roles, is - like the WAMOS Waterway Administrator - responsible for importing and publishing the data via the data interface and generates and publishes document templates. Typically, the WAMOS System Administrator coordinates the first and second level system support activities.  This WAMOS System Administrator is authorized to create other Waterway Users or Waterway Administrators and to assign user rights (see chapter 3.1.1). |
|  | The FIS portal is an existing web-portal to provide online transnational, fairway-related information from all Danube countries. WAMOS must publish relevant data to this portal. |
|  | The RIS COMEX services provide relevant information for fairway users in order to increase efficiency of inland navigation. Therefore the services of RIS COMEX need up-to-date data from WAMOS. |

## Product Functions

The product functions of WAMOS can be divided into primary use cases, which are started directly from the user and secondary use cases which are called indirectly by a primary use case. In order to ensure a clearer overview, the primary use cases were categorized in three categories – administrative, general and special.

The initial assignment of the use cases to the user roles is shown in Table 4, the assignment shall be able to be changed by the WAMOS System administrator.

Table 4: Use Case assignment to the actors

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **UseCase** | **WAMOS  System  Administrator** | **WAMOS  Waterway  Administrator** | **WAMOS  Waterway  User** | **FIS-Portal** | **RIS COMEX** |
| Administration Login [APUC1] | x | x |  |  |  |
| Administration Logout [APUC2] | x | x |  |  |  |
| Manage Users [APUC3] | x |  |  |  |  |
| Manage Roles and Privileges [APUC4] | x |  |  |  |  |
| Import Data [APUC5] | x | x |  |  |  |
| Manage Templates for Printing, Statistics and Reports [APUC6] | x | x |  |  |  |
| Display Interface and Process Status [APUC7] | x | x |  |  |  |
| Display System Logs [APUC8] | x |  |  |  |  |
| System Notification [APUC9] | x |  |  |  |  |
| Manage System Configuration [APUC10] | x |  |  |  |  |
| Login [GPUC1] |  | x | x | x | x |
| Logout [GPUC2] |  | x | x | x |  |
| Reset Password [GPUC3] |  | x | x |  |  |
| Choose Language [GPUC4] |  | x | x |  |  |
| Overview of Base Data [GPUC5] |  | x | x |  |  |
| Navigate in Map [GPUC6] |  | x | x |  |  |
| Print Map Content [GPUC7] |  | x | x |  |  |
| Identify Tool [GPUC8] |  | x | x |  |  |
| Measure on Map [GPUC9] |  | x | x |  |  |
| Search Features [GPUC10] |  | x | x |  |  |
| Manipulate Map Content [GPUC11] |  | x | x |  |  |
| Identify Map Content [GPUC12] |  | x | x |  |  |
| Download User Manual [GPUC13] |  | x | x |  |  |
| Display Riverbed Morphology [SPUC1] |  | x | x |  |  |
| Display Riverbed Changes [SPUC2] |  | x | x |  |  |
| Display Fairway Dimensions [SPUC3] |  | x | x |  |  |
| Display Available Fairway Depths [SPUC4] |  | x | x |  |  |
| Display Available Fairway Depths vs. LNWL [SPUC5] |  | x | x |  |  |
| Timeline Availability/Measures [SPUC6] |  | x | x |  |  |
| Display Water Level [SPUC7] |  | x | x |  |  |
| Display Hydrological Conditions [SPUC8] |  | x | x |  |  |
| Display Rehabilitation & Maintenance Measures [SPUC9] |  | x | x |  |  |
| Evaluate Rehabilitation & Maintenance Measures [SPUC10] |  | x | x |  |  |
| Display current and historic Fairway Marks [SPUC11] |  | x | x |  |  |
| Availability/Accuracy of Data [SPUC12] |  | x | x |  |  |
| Generate Reports & Statistics [SPUC13] |  | x | x |  |  |
| Provide Data for RIS COMEX [SPUC14] |  |  |  |  | x |
| Provide Map Content for FIS Portal [SPUC15] |  |  |  | x |  |

### Overview of Administrative Primary Use Cases

Administrative primary use cases are actions to setup the system from the initial installation and maintain the system user accounts and the privileges.

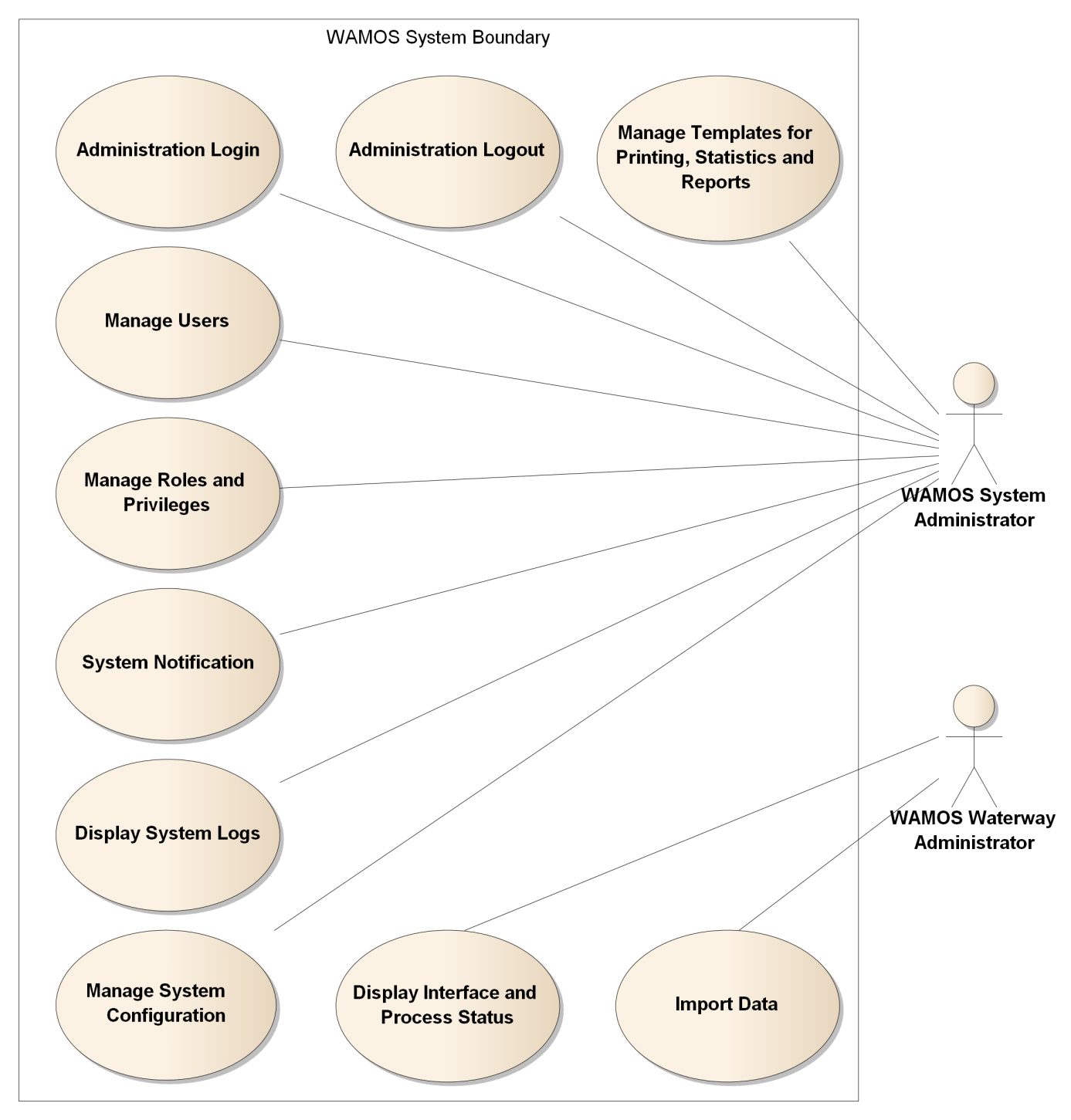


Figure 5: Administrative Primary Use Cases

* Administration Login [APUC1]
* Administration Logout [APUC2]
* Manage Users [APUC3]
* Manage Roles and Privileges [APUC4]
* Import Data [APUC5]
* Manage Templates for Printing, Statistics and Reports [APUC6]
* Display Interface and Process Status [APUC7]
* Display System Logs [APUC8]
* System Notification [APUC9]
* Manage System Configuration [APUC10]

### Overview of General Primary Use Cases

The general primary use cases cover all actions which form a standard web-GIS application.

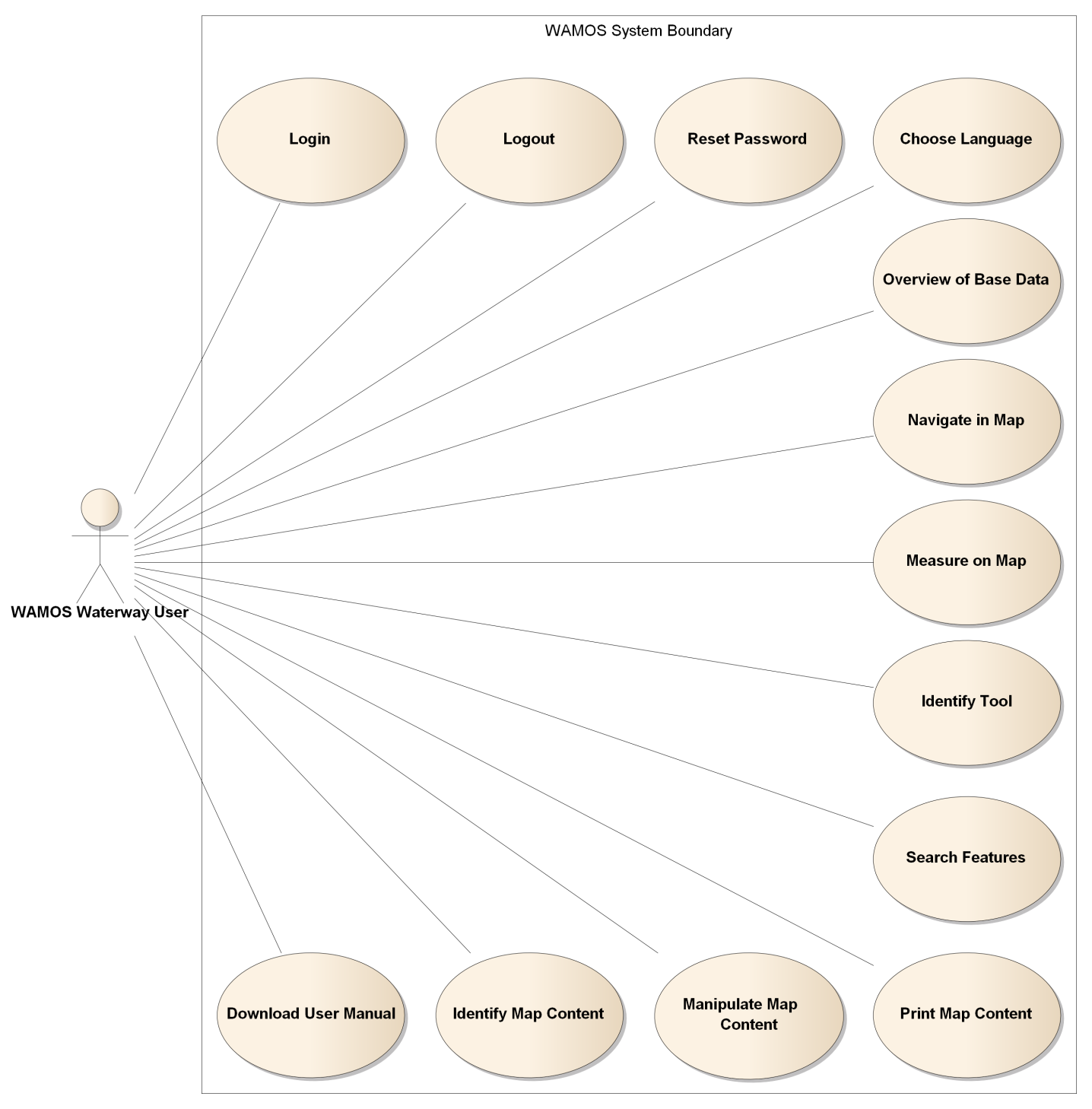


Figure 6: General Primary Use Cases

* Login [GPUC1]
* Logout [GPUC2]
* Reset Password [GPUC3]
* Choose Language [GPUC4]
* Overview of Base Data [GPUC5]
* Navigate in Map [GPUC6]
* Print Map Content [GPUC7]
* Identify Tool [GPUC8]
* Measure on Map [GPUC9]
* Search Features [GPUC10]
* Manipulate Map Content [GPUC11]
* Identify Map Content [GPUC12]
* Download User Manual[GPUC13]

### Overview of Special Primary Use Cases

The special primary use cases cover all activities which are used to manage the waterway monitoring issues.

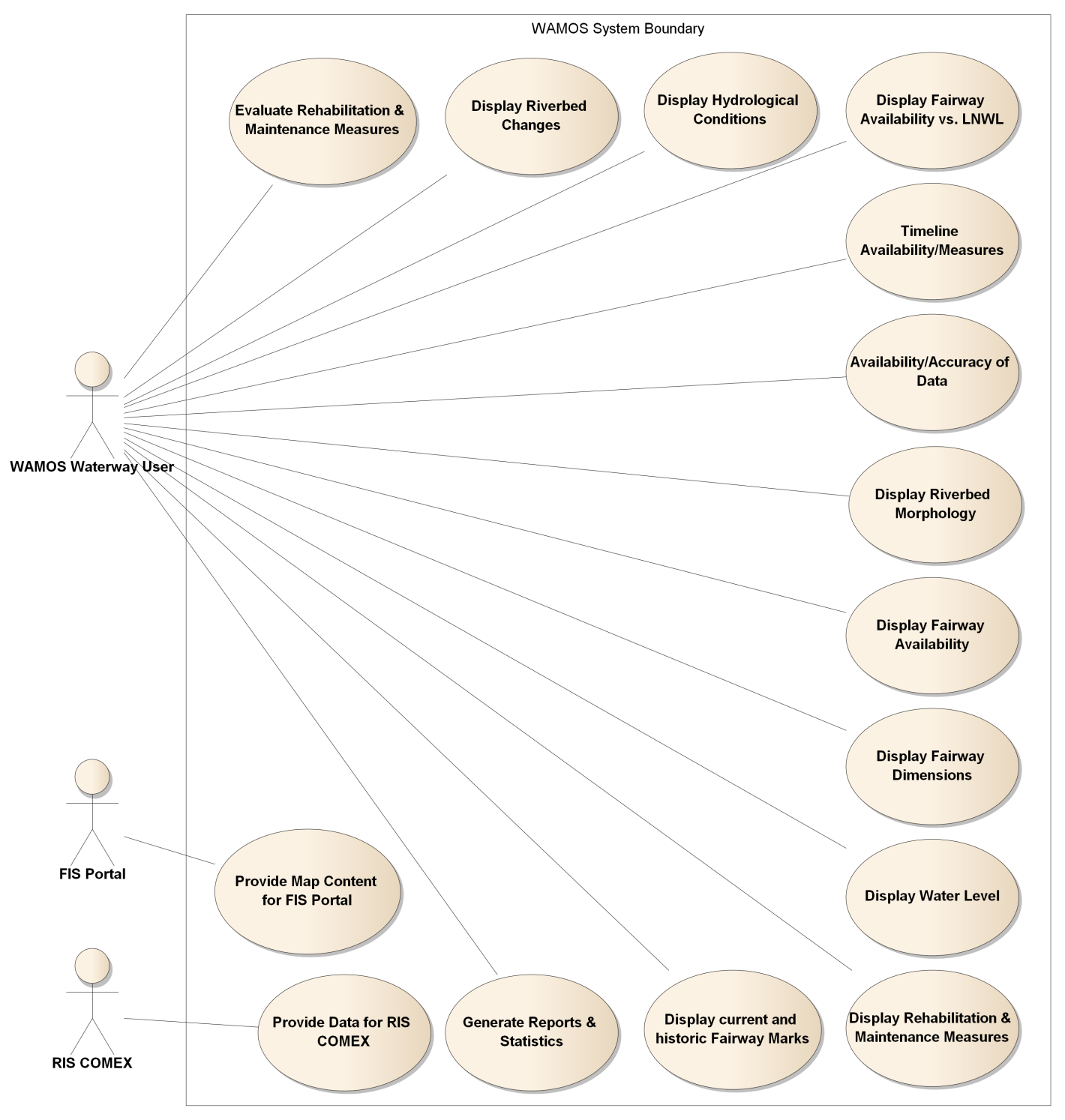


Figure 7: Special Primary Use Cases

* Display Riverbed Morphology [SPUC1]
* Display Riverbed Changes [SPUC2]
* Display Fairway Dimensions [SPUC3]
* Display Available Fairway Depths [SPUC4]
* Display Available Fairway Depths vs. LNWL [SPUC5]
* Timeline Availability/Measures [SPUC6]
* Display Water Level [SPUC7]
* Display Hydrological Conditions [SPUC8]
* Display Rehabilitation & Maintenance Measures [SPUC9]
* Evaluate Rehabilitation & Maintenance Measures [SPUC10]
* Display current and historic Fairway Marks [SPUC11]
* Availability/Accuracy of Data [SPUC12]
* Generate Reports & Statistics [SPUC13]
* Provide Data for RIS COMEX [SPUC14]
* Provide Map Content for FIS Portal [SPUC15]

### Overview of Secondary Use Cases

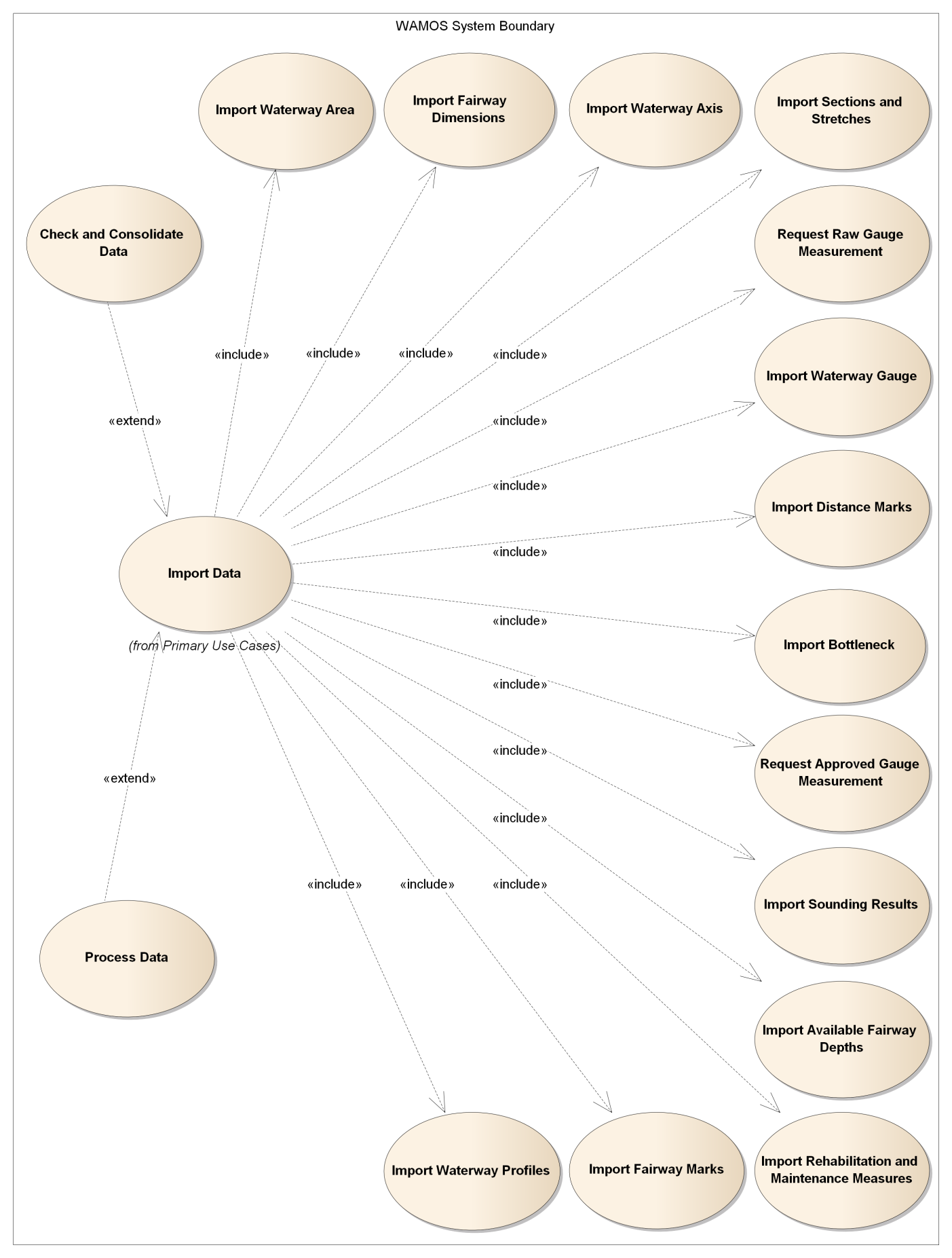


Figure 8: Secondary Use Cases

* Import Waterway Area[SUC1]
* Import Fairway Dimensions [SUC2]
* Import Waterway Axis [SUC3]
* Import Sections and Stretches [SUC4]
* Request Raw Gauge Measurement [SUC5]
* Import Waterway Gauge [SUC6]
* Import Distance Marks[SUC7]
* Import Bottleneck [SUC8]
* Request Approved Gauge Measurement [SUC9]
* Import Sounding Results [SUC10]
* Import Available Fairway Depths [SUC11]
* Import Rehabilitation and Maintenance Measures [SUC12]
* Import Fairway Marks [SUC13]
* Import Waterway Profiles [SUC14]
* Check and Consolidate Data [SUC15]
* Process Data [SUC16]