



# User Guide

## TRANSCO CLSG

### Baseline Environmental Database and Geographic Information System – Sierra Leone (BEDGIS-SL) v1.0

Environmental Database and GIS - Sierra Leone (BEDGIS-SL)

Developed by INTEGEMS, 2018

www.integems.com



*An integrated Geographic Information Systems (GIS) and Management Information System (MIS) system and mobile data collection technology to provide a family of sophisticated tools and Web services for collecting, managing, visualizing, mapping, analysing, monitoring, evaluating and reporting on various environmental components of the TRANSCO CLSG Project Area in Sierra Leone*

Prepared for:

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# 1 INTRODUCTION

## 1.1 Overview

The **Baseline Environmental Database and Geographic Information System – Sierra Leone (BEDGIS-SL)** Content Management System (CMS) Website (accessed via <http://bedgis-sl.website>) takes full advantage of the flexibility of features offered by Joomla CMS with an array of functions and modules that can be easily added to over time without costly redesigns to interfaces and templates. Designed with TRANSCO CLSG (end users) in mind, the BEDGIS – SL Website’s responsive web design (RWD) and multi-device design technologies use the gantry framework to ensure the site is highly mobile-accessible and viewable on all screen sizes (from desktops to smartphones).

Visitors to the BEDGIS – SL Website site can get access to relevant environmental data and information in a timely and consistent manner. Baseline environmental data and information are presented in a non-technical and visually appealing manner incorporating a well thought out site-flow and information architecture. Information is organised clearly to facilitate access to relevant information and content easily searchable. All pages feature similar and consistent navigation controls with a minimum number of clicks required for navigation. Clear and intuitive labels, controls are grouped into logical units.

An integrated and interactive BEDGIS-SL Web Mapping Application has been embedded in the BEDGIS-SL CMS Website’s Home Page and menu to allow TRANSCO to interactively and effectively create, edit, publish, review, and collaborate on baseline environmental mapping, updating and managing development project locations and attributes through a robust, easy-to-use Web browser.

The **BEDGIS-SL** integrates Geographic Information Systems (GIS) and Management Information System (MIS) systems and mobile data collection technology to provide a family of sophisticated tools and Web services for collecting, managing, visualizing, mapping, analysing, monitoring, evaluating and reporting on various environmental components of the TRANSCO CLSG Project Area in Sierra Leone.

A primary goal of the BEDGIS-SL is to allow people who are not GIS professionals to do self-service mapping on any device (i.e., desktop, tablets and smartphones using Internet browsers) and expand the creative use and sharing of baseline environmental data and information of the TRANSCO CLSG Project Area in Sierra Leone..

The BEDGIS’ easy-to-use widgets and tools can be interactively used to easily accomplish various queries, spatial analysis and mapping tasks using relevant environmental datasets and the following geospatial data layers for Sierra Leone:

- **Water Quality Monitoring Results** – Results of the water quality monitoring from Mano, Moa, Sewa, Little Scarcies, and Great Scarcies Rivers conducted between 18 November and 22 November 2017.
- **Noise Monitoring Results** – Results of the ambient environmental noise monitoring conducted in selected (10) town traversed by the TRANSCO CLSG Transmission Line.
- **Air Quality Monitoring Results** - Results of the ambient air quality monitoring conducted in selected (10) town traversed by the TRANSCO CLSG Transmission Line.
- **Air Quality and Noise Monitoring Locations** – Locations of the 10 towns in which Baseline ambient air quality and environmental noise were recorded between 17 November and 11 December 2017.
- **225 kV TRANSCO CLSG Transmission Line** - The proposed 225 kV high voltage transmission line that covers a distance of approximately 530 km from Bombahun in the Sorogbema Chiefdom (Pujehun District), south of Sierra Leone to Guinea border.
- **TRANSCO CLSG Substations** – Substations along the 225 kV TRANSCO CLSG Transmission Line.
- **Academic Institutions** - primary, secondary and tertiary institutions (Source: UNICEF, 2014)



- **Health Facilities** - clinics, hospitals and health centres (Source: MoHS, 2015)
- **Bumbuna Conservation Area** - Dam, Reservoir, Settlements (Source: INTEGEMS/BWMA, 2016)
- **Road networks** – Tertiary, primary and secondary roads, including residential streets in urban areas (Source: OSM, 2016)
- **Rivers and Streams** – major rivers and tributaries and streams (Source: OSM, 2016)
- **Lakes and other Water Bodies**
- **Protected Areas and National Parks** – The Protected areas of Sierra Leone, include national parks, game reserves, conservation areas and wetlands. These include the Gola Forest, Tiwai Island Sanctuary, Kambui Hills, Nimini Hills and Outamba-Kilimi t etc.
- **Sierra Leone Housing and Population Census 2015** – Districts and Chiefdom level demographics (Source: Statistics Sierra Leone, 2016)
- **Chiefdoms** - Third-tier administrative boundaries in Sierra Leone (Source: Statistics Sierra Leone, 2015; OSM 2015)
- **Sections** - Fourth-tier administrative boundaries in Sierra Leone (Source: Statistics Sierra Leone, 2015; OSM 2015)
- **Administrative Wards** - local administrative boundaries in Sierra Leone (Source: Statistics Sierra Leone, 2016)
- **District Boundaries** - Second-tier administrative boundaries in Sierra Leone (Source: Statistics Sierra Leone, 2015; OSM 2015)
- **Province Boundaries**– First-tier administrative boundaries in Sierra Leone (Source: Statistics Sierra Leone, 2015; OSM 2015)
- **Settlements** – cities, towns and villages in Sierra Leone (Source: OSM 2016)
- **Soils** - soils type, provinces and spatial distribution in Sierra Leone
- **Geology** - geological formations and distribution in Sierra Leone (Source: National Minerals Agency, Sierra Leone, 2014)
- **Building footprints** - detailed building footprints of structures (Source: OSM, 2016)
- **Earth Networks Automatic Weather Stations** – real-time meteorological information from 8 weather stations (Source: Earth Networks, 2016)

## 1.2 Access and Constraints

The **BEDGIS-SL** has been designed and developed by Integrated Geo-information and Environmental Management Services (INTEGEMS) using geospatial datasets from INTEGEMS' Enterprise Geodatabase, third parties, and environmental data acquired from field in-situ monitoring and laboratory grab sample analysis.

INTEGEMS has exercised due and customary care in conducting the "*Consulting Services for the Establishment of a Baseline Database of the Environmental Component of the CLSG Project Area in Sierra Leone*" but has not, save as specifically stated, independently verified information provided by third parties. No other warranty, expressed or implied is made in relation to the conduct of the environmental baseline database development study or the BEDGIS-SL.

The depiction or use of boundaries, geographic names and related data and information displayed by BEDGIS-SL and/or shown on the BEDGIS-SL maps and included in lists, tables, documents, and datasets in the BEDGIS-SL are not warranted to be error free nor do they necessarily imply official endorsement or acceptance by TRANSCO CLSG and INTEGEMS concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its boundaries.



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Contact the BEDGIS–SL Development Team ([info@integems.com](mailto:info@integems.com)) if you have any queries or data updates that can improve the BEDGIS–SL.

BEDGIS-SL has been designed and developed by INTEGEMS ([info@integems.com](mailto:info@integems.com)/[www.integems.com](http://www.integems.com)), Sierra Leone.

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## 2 BEDGIS-SL WEBSITE

The BEDGIS-SL Content Management System (CMS) Website (<http://www.bedgis-sl.website>) takes full advantage of the flexibility of features offered by Joomla CMS with an array of functions and modules that can be easily added to over time without costly redesigns to interfaces and templates. Designed with end users in mind, the BEDGIS-SL Website's responsive web design (RWD) and multi-device design technologies use the gantry framework to ensure the site is highly mobile-accessible and viewable on all screen sizes (from desktops to smartphones).

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An integrated and interactive BEDGIS-SL Web Mapping Application, an Environmental Monitoring Data Module and Dashboard has been embedded in the BEDGIS-SL CMS Website's Home Page and menu to allow users to interactively and effectively create, edit, publish, review, and collaborate on baseline environmental mapping, updating and managing development project locations and attributes through a robust, easy-to-use Web browser (see Figure 2-1- Figure 2-6).

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Figure 2-1: The BEDGIS-SL Website – Home page

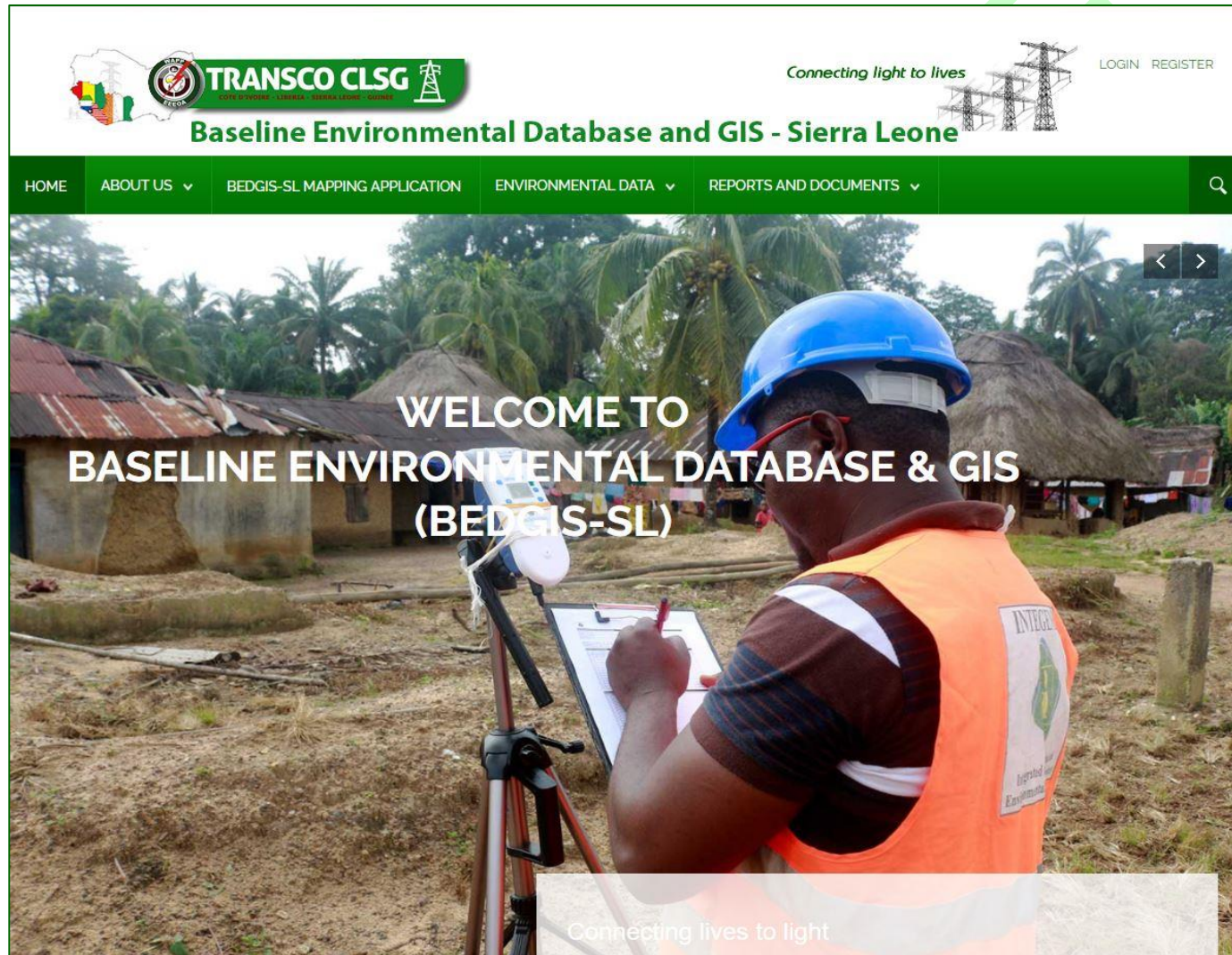




Figure 2-2: The BEDGIS-SL Environmental Monitoring Data Module

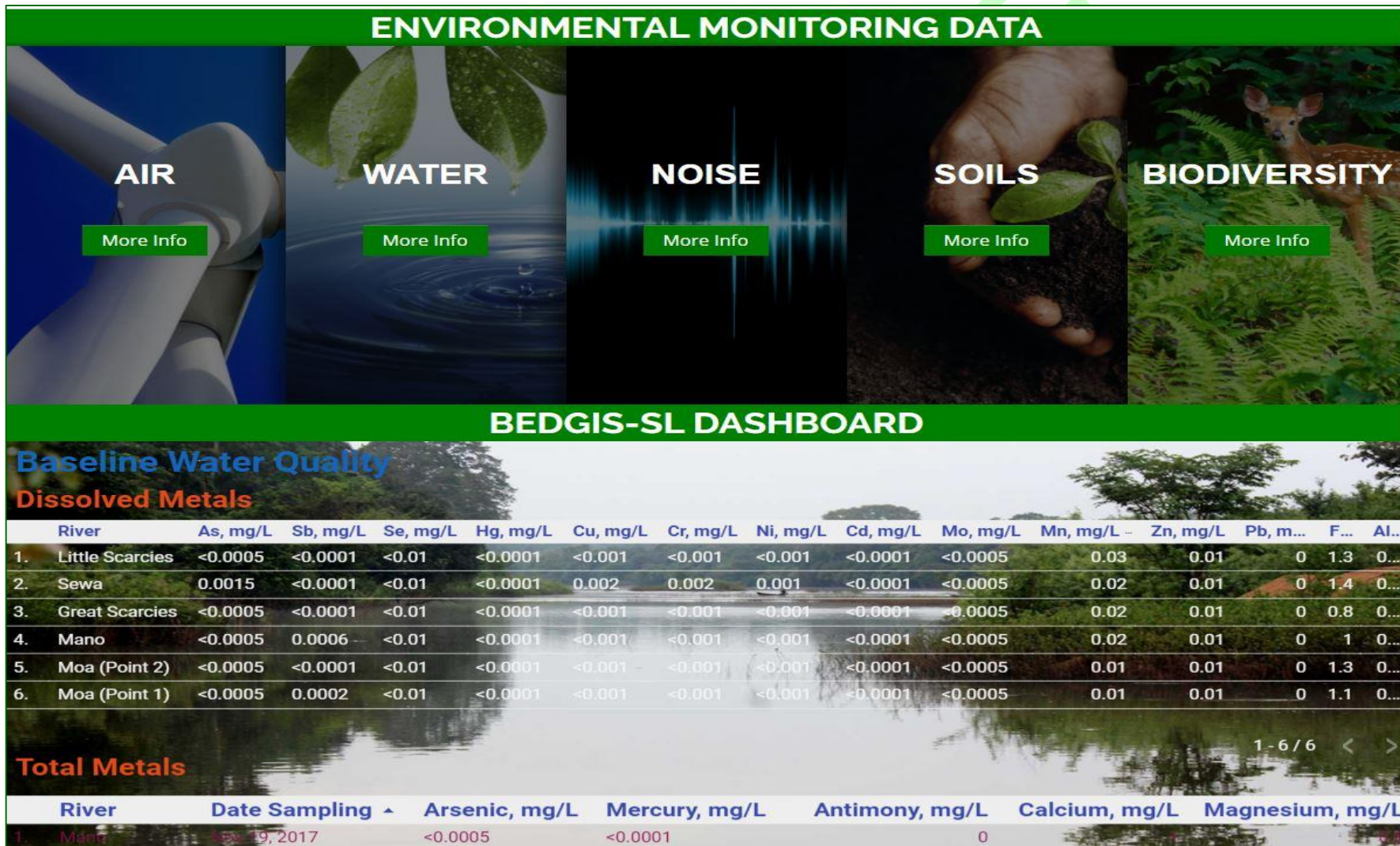


Figure 2-3: The BEDGIS-SL Infographics Dashboard

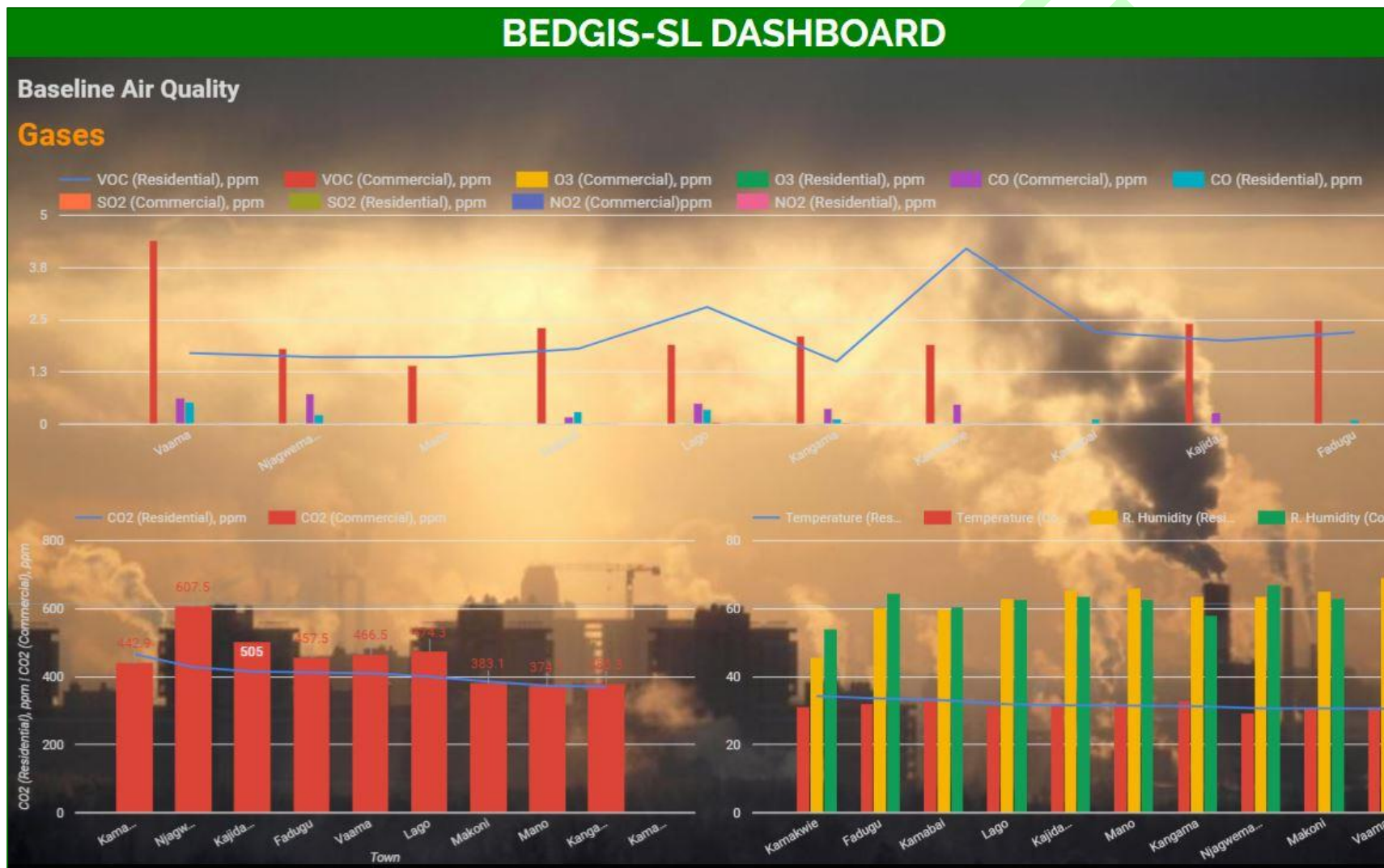


Figure 2-4: User Interface of the BEDGIS-SL Mapping Application on a Desktop

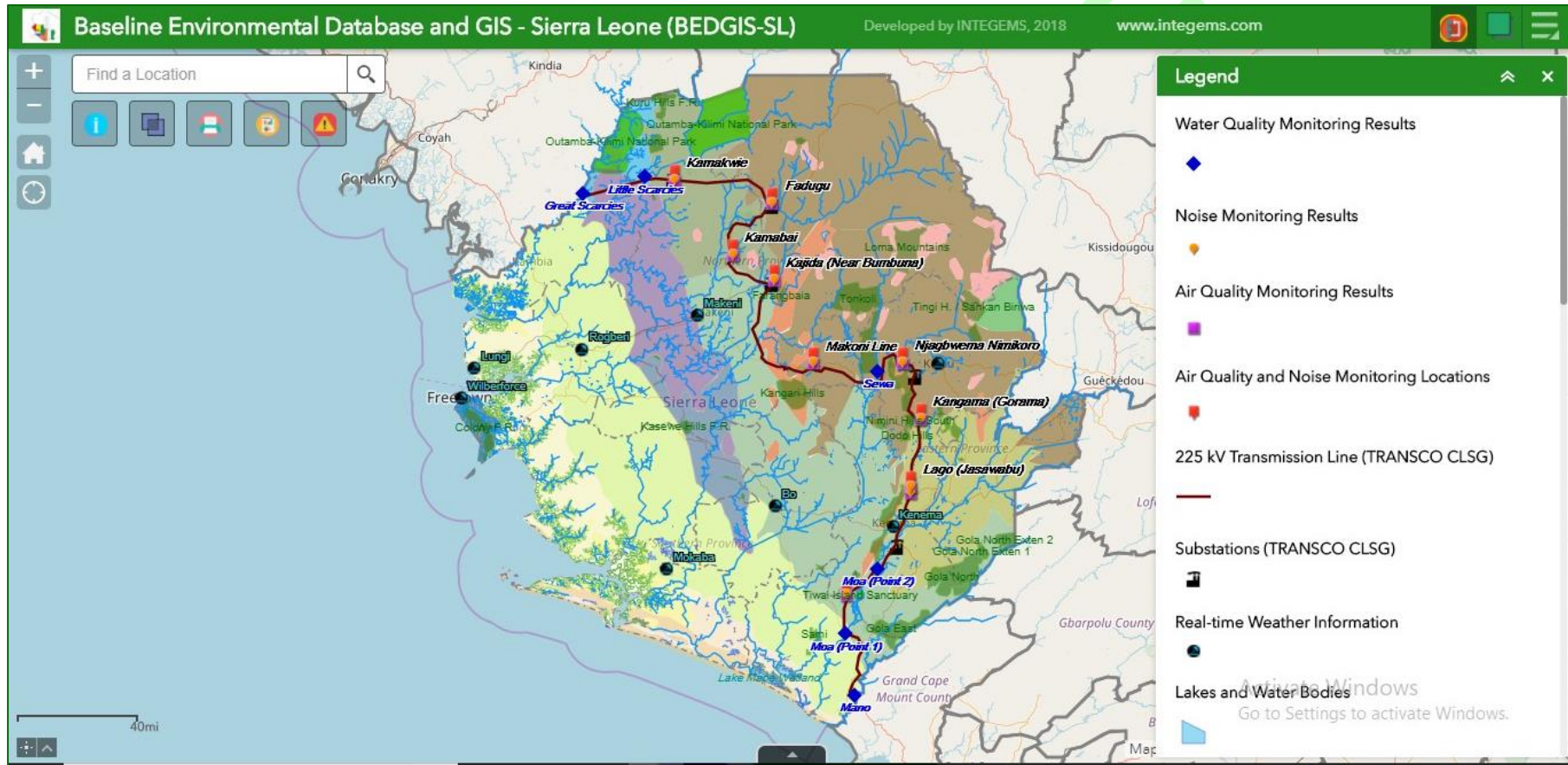
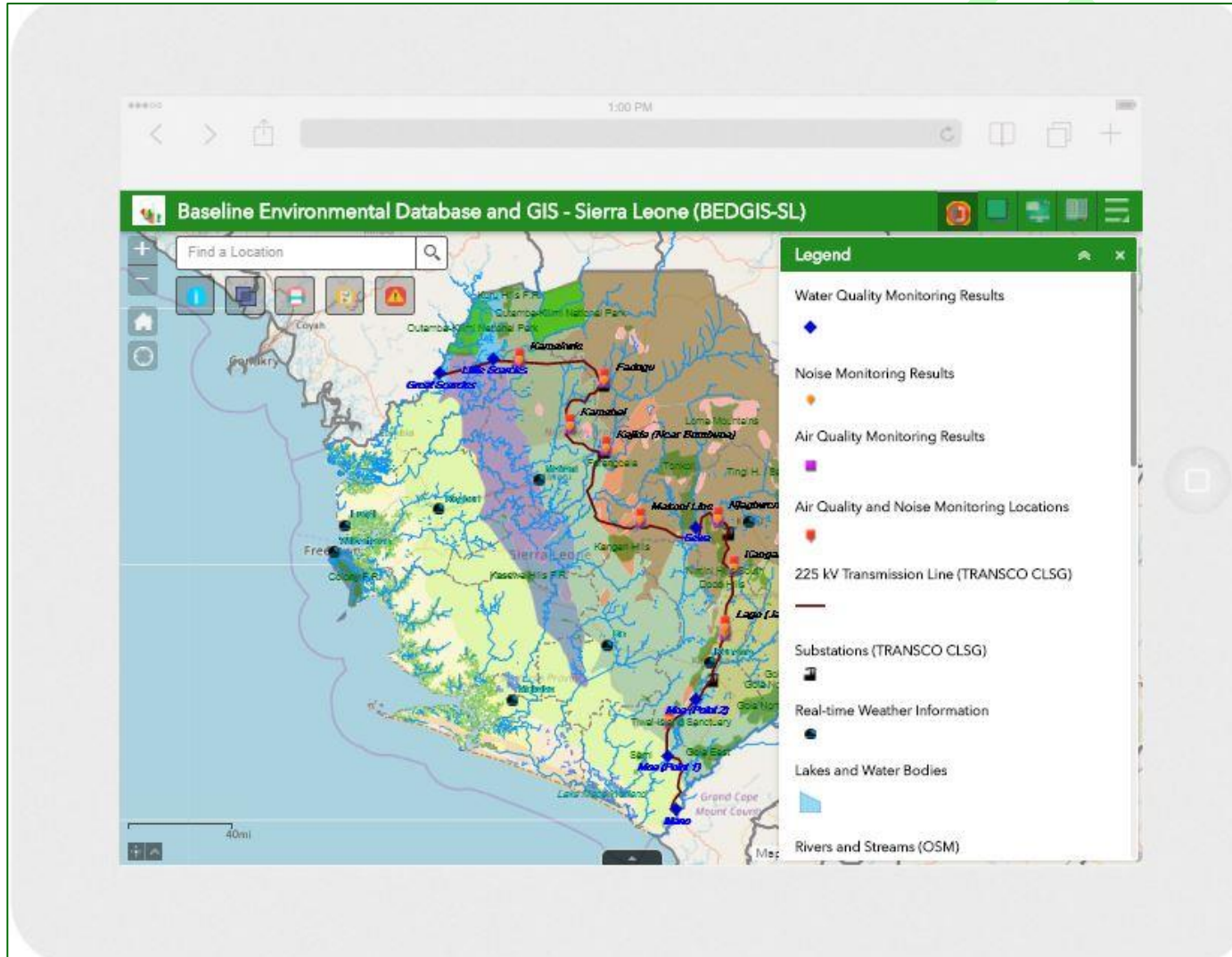
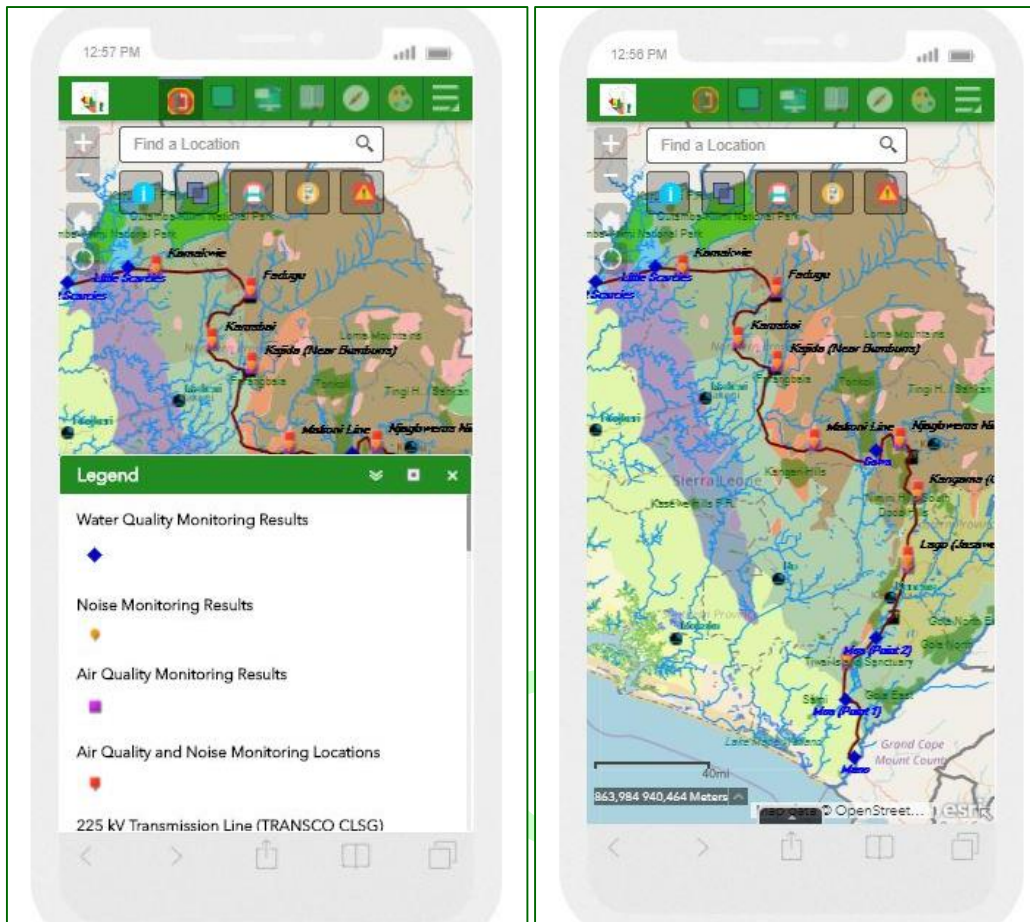


Figure 2-5: User Interface of the BEDGIS-SL Mapping Application on an iPad



**Figure 2-6: User Interface of the BEDGIS-SL Mapping Application on an iPhone**

## 2.1 Login and Managing Users

Access to the BEDGIS-SL CMS Website is managed through the use of a basic Access Control Level (ACL) mechanism called Groups. Certain groups have certain access level features and they are directly related to the creation, editing and publishing of content (through the Frontend and Backend interfaces) as well as to access to the Administrative (Backend) interface.

Each group has different levels of access control and once a user is made a member of that group, they inherit those rights.

There are four (4) Frontend user groups available:

- **Registered** - This group allows the user to login to the Frontend interface. Registered users can't contribute content, but this may allow them access to other areas, like a forum or download section if your site has one.
- **Author** - This group allows a user to post content, usually via a link in the User Menu. They can submit new content, select options to show the item on the front page and select dates for publishing but they cannot directly publish any content. When content is submitted by an Author-level user, they receive the message, "Thanks for your submission. Your submission will now be reviewed before being posted to the site." They can edit only their own articles but only when that article has been published and is visible.
- **Editor** - This group allows a user to post and edit any (not just their own) content item from the Frontend. They can also edit content that has not been published. If your site uses the default



installation's menu option "News", which is a Table List – Content Section type, Editors will see unpublished articles in the list that they can select for editing, where as an Author or Public (unregistered) user will not even see the unpublished items in the list. Still, Editor users cannot, publish or change the publishing status of any articles, even their own.

- **Publisher** - This group allows a user to post, edit and publish any (not just their own) content item from the Front-end. Publishers can review all articles, edit and change publishing options but they can also determine when an article is ready for publication, making it visible to Registered, Author and the Unregistered Public (depending on what visibility was chosen in the article).

There are three (3) Administration section user groups that allow access to Joomla:

- **Manager** - This group allows access to content creation and other system information from the Backend. Think of Manager users as Publishers, with Backend access. They can log in through the Administrator interface, but their rights and access are generally restricted to content management. They can create or edit any content, have access to some Backend only features like adding, deleting and editing Sections and Categories, editing the Front Page and Menus, but they don't have any access to the "Mechanics" of Joomla, like user management or the ability to install components or modules. Note that if a Manager logs in through the Frontend interface, they're treated just like a Publisher, with the same rights and access.
- **Administrator** - This group allows access to most administration functions. An Administrator user has all the privileges on the back end of a Manager, but they also have access to set options on, and install/delete components, modules and plugins, User Manager access and can view the site statistics. What they cannot do however, is change, edit or install Site Templates or make any changes to the sites Global configuration options. On login through the Frontend, they are treated as Publishers, just like the Manager users. Interesting to note; when an Administrator accesses the User Manager list, they will see all users at their access level or below; in other words they can modify any user EXCEPT a Super Administrator – in fact, they will not even see Super Administrator accounts in the list! Also, they cannot create additional Super Administrator level accounts, only a Super Admin can do that.
- **Super Administrator** - This group allows access to all administration functions. Only another Super Administrator can create or edit a Super Administrator user account. Full access to ALL AREAS is given to Super Administrators, and once created they cannot be as easily deleted. It might not be obvious, but you have to change the user's group to something other than Super Administrator first. Then you can delete them.

Because of this, give a bit of thought to who you need to grant this highest level of access to. Super Admins can block the user from logging in or change the password on another SA account. Like the other Backend user accounts, SA's are treated as Publishers when they login through the Frontend interface.

### 2.1.1 Frontend and Backend Login

You can log in to the BEDGIS-SL website via <http://www.bedgis-sl.website> (the Frontend for viewers) or <http://www.bedgis-sl.website/administrator> (the Backend for site administration) using the credentials provided by the BEDGIS-SL Admin (see Figure 2-7 and Figure 2-8).

Figure 2-7: BEDGIS-SL Frontend Login

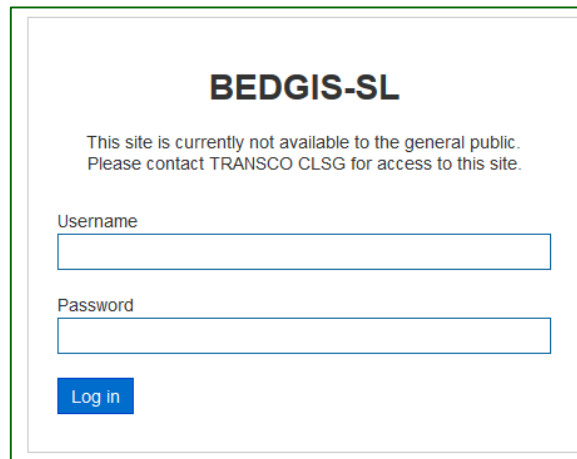


Figure 2-8: BEDGIS-SL Backend Login



### 2.1.2 Managing Users

To add Users to the BEDGIS-SL website:

1. Login to the administrator (Backend) view of the website via <http://www.bedgis-sl.website/administrator>;
2. On the main menu page that opens, click **Users** and hover the mouse over **Manage** and then click **Add New User** to open the page in Figure 2-9 below

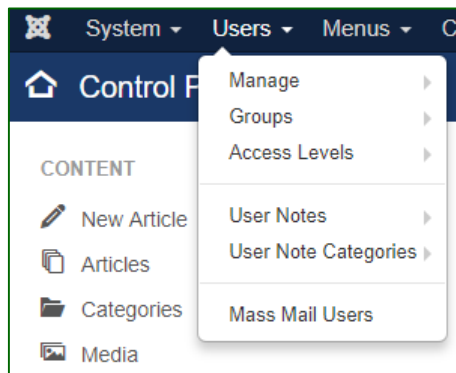


Figure 2-9: New User Details

Users: New

Save
 Save & Close
 Save & New
 Cancel

Account Details
Assigned User Groups
Basic Settings

Name *	<input type="text"/>
Login Name *	<input type="text"/>
Password	<input type="password"/>
Confirm Password	<input type="password"/>
Email *	<input type="text"/>
Registration Date	<input type="text"/>
Last Visit Date	<input type="text"/>
Last Reset Date	<input type="text"/>
Password Reset Count	<input type="text" value="0"/>
Receive System Emails	<input type="radio"/> Yes <input checked="" type="radio"/> No
Block this User	<input type="radio"/> Yes <input checked="" type="radio"/> No
Require Password Reset	<input type="radio"/> Yes <input checked="" type="radio"/> No
ID	<input type="text" value="0"/>





3. Assign New user to a User Group;

The screenshot shows the 'Users: New' form with the 'Assigned User Groups' tab selected. The form has three tabs: 'Account Details', 'Assigned User Groups', and 'Basic Settings'. At the top, there are four buttons: 'Save', 'Save & Close', 'Save & New', and 'Cancel'. Below the tabs, there is a list of user groups with radio buttons next to them:

- Public
- |—Manager
- |—|—Administrator
- |—Registered
- |—|—Author
- |—|—|—Editor
- |—|—|—|—Publisher
- |—Super Users

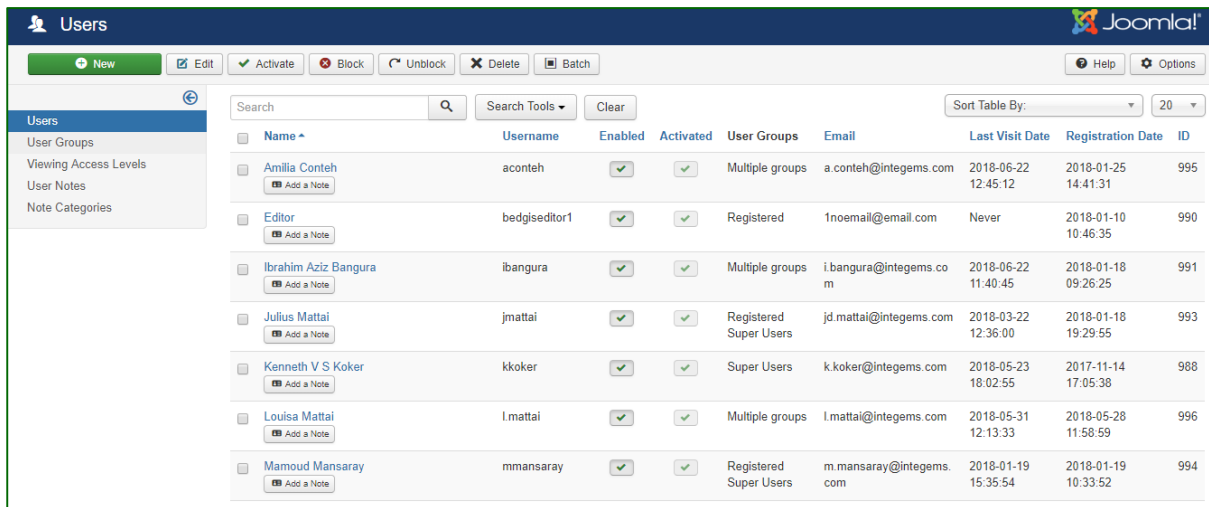
4. Select Use Default for all Basic Settings;

The screenshot shows the 'Users: New' form with the 'Basic Settings' tab selected. The form has three tabs: 'Account Details', 'Assigned User Groups', and 'Basic Settings'. At the top, there are four buttons: 'Save', 'Save & Close', 'Save & New', and 'Cancel'. Below the tabs, there are several settings with dropdown menus:

- Backend Template Style: - Use Default -
- Backend Language: - Use Default -
- Frontend Language: - Use Default -
- Editor: - Use Default -
- Help Site: - Use Default - (with a Refresh button)
- Time Zone: - Use Default -

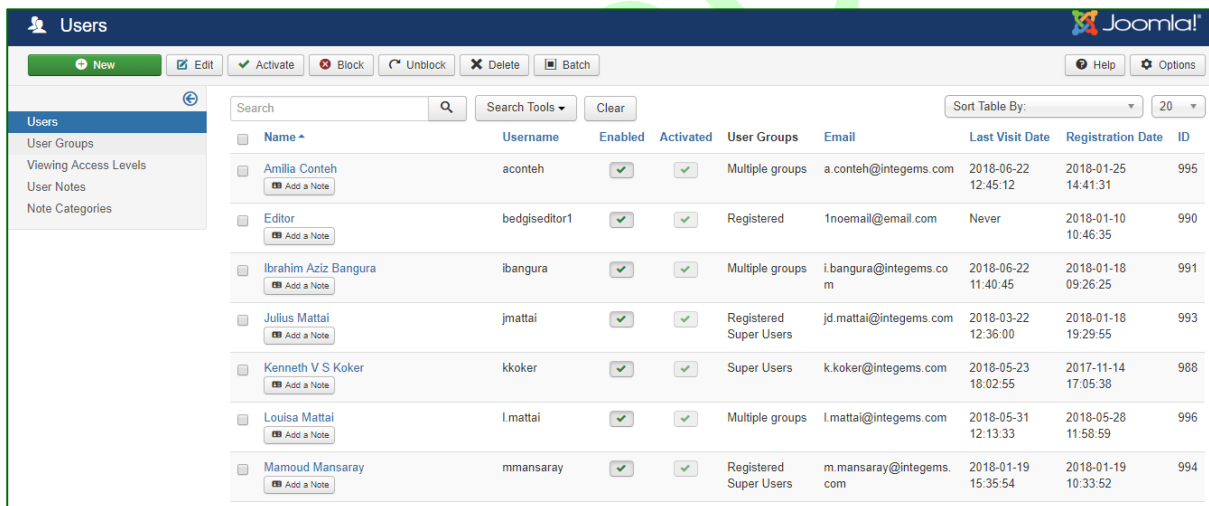
5. Save and Close.

- Click **Users** and **Manage** in the drop-down menu to see the new user you have just created in the list of Users.

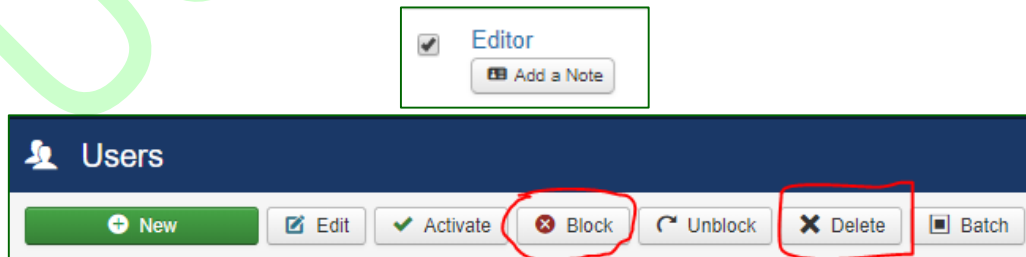


**To delete or block Users from the BEDGIS-SL website:**

- Click **Users** and **Manage** in the drop-down menu to open the page as in the figure below:



- Tick the box beside the user you want to remove and select **Delete**

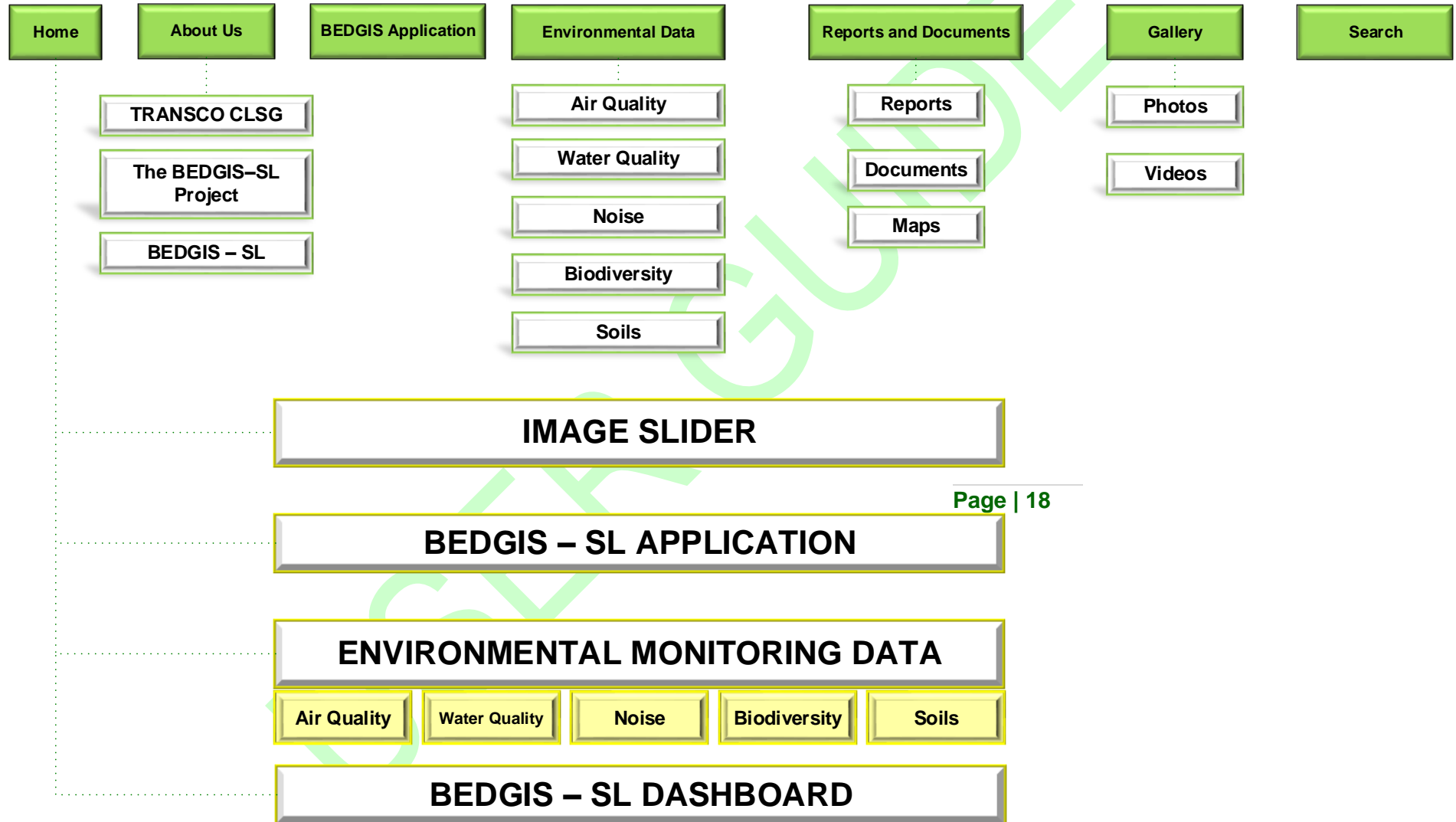


**2.2 Site Map**

Figure 2-10 below presents the BEDGIS-SL Website Map, which presents a list of human-visible listings, typically hierarchical, of the pages on a site.



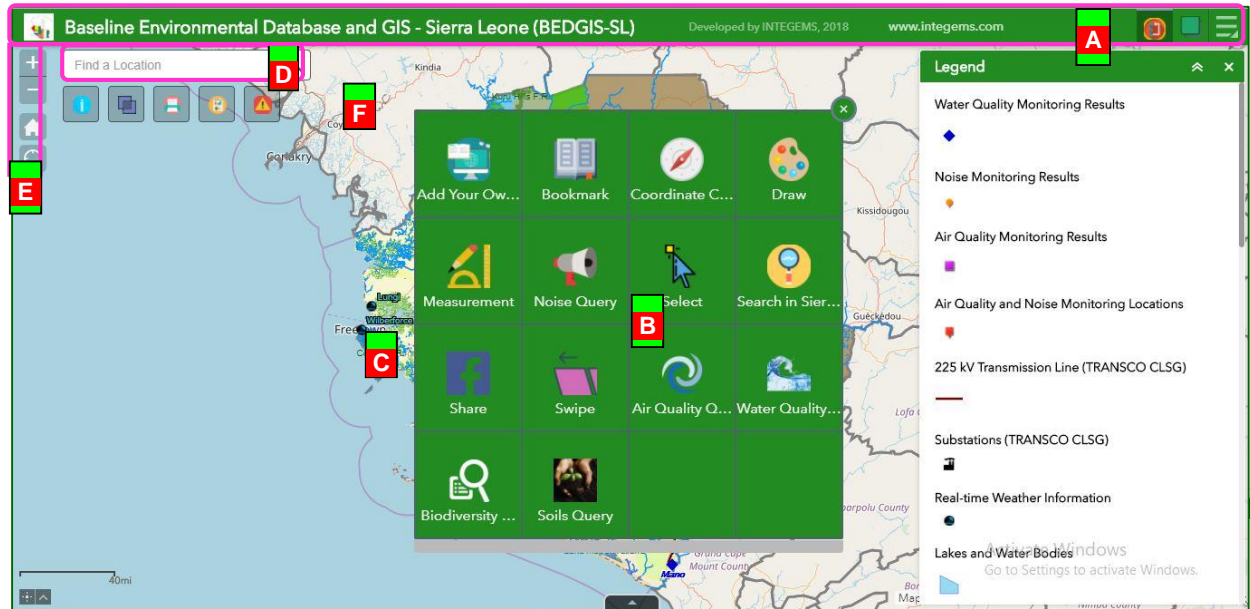
Figure 2-10: BEDGIS-SL CMS Website Map



### 3 THE BEDGIS-SL MAPPING APPLICATION

#### 3.1 Mapping Application User Interface

Figure 3-1: User Interface of the BEDGIS – SL Mapping Application with Key Tools and Widgets



##### 3.1.1 Top Bar (A)

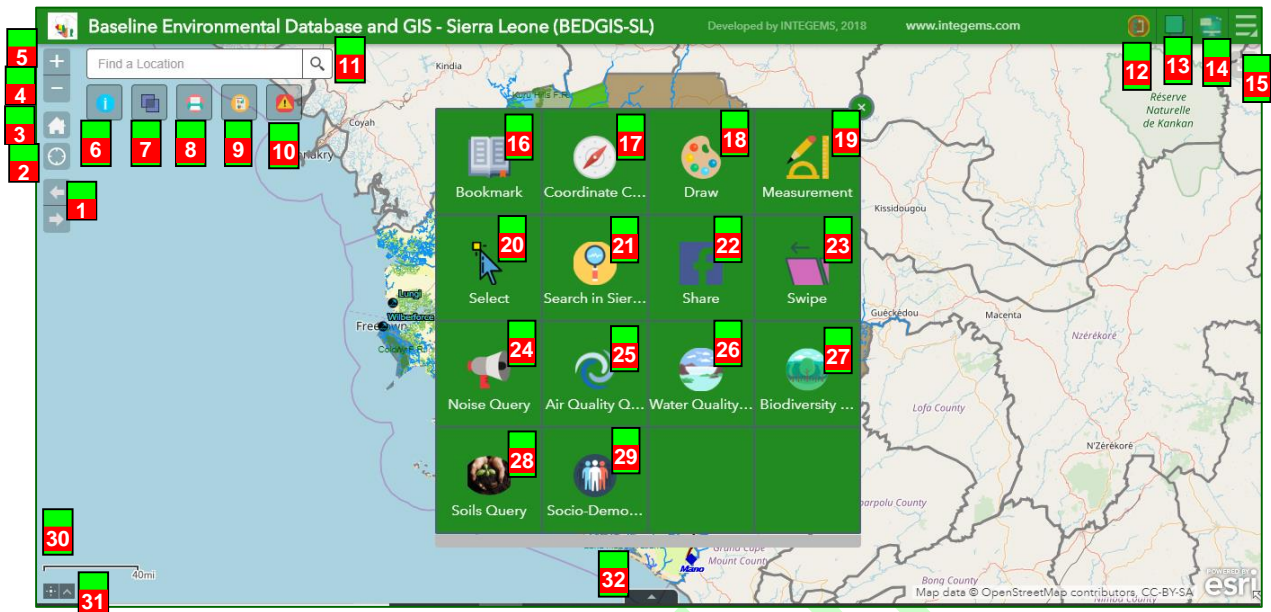
The top bar includes pre-configured set of widgets (B) that give BEDGIS–SL functionality, such as Layer List, Legend, Add Your Own Data, Bookmark, Coordinate Conversion, Share, Air Quality Query, Noise, Water Quality, Biodiversity, and Soils Query, Socio-Demographic, Select, Swipe, Draw, and Measurement.

##### 3.1.2 Map Display (C)

The map display shows the current map. The Search (D), About BEDGIS-SL, Print, Basemap, Incident Analysis and Situation Awareness widgets (F) are located immediately below the top bar in the upper left corner of the map display. The map display changes as the user navigates around the map displays additional layers and shows the results of various widget/tools requests.

##### 3.1.3 Navigation Buttons and Zoom Slider Bar (E)

The map display also includes several navigation tools, including a Home, Current Location and Zoom In and Zoom out buttons.

**Figure 3-2: The BEDGIS–SL Mapping Application Showing Widgets and Tools**

**Table 3:1 List of BEDGIS – SL Functionality Widgets**

ID	BEDGIS-SL Functionality Widget	ID	BEDGIS-SL Functionality Widget
1	Extent Navigation	17	Coordinate Conversion
2	My Location	18	Draw
3	Home Button	19	Measurement
4	Zoom Out Button	20	Select
5	Zoom In Button	21	Search in Sierra Leone
6	About BEDGIS-SL	22	Share
7	Basemap Gallery	23	Swipe
8	Print a Map Yourself	24	Noise Query
9	Screening	25	Air Quality Query
10	Incident Analysis	26	Water Quality Query
11	Search	27	Biodiversity Query
12	Map Layer List	28	Soils Query
13	Map Legend	29	Socio-Demographic
14	Add Your Own Data	30	Scale Bar
15	Widget Dropdown	31	Coordinate
16	Bookmark	32	Attribute Table



## 3.2 Overview of the BEDGIS-SL Widgets

### 3.2.1 Extent Navigate

The Extent Navigate widget (1) allows you to navigate the map to its previous or next extent.

### 3.2.2 My Location

The **My Location** widget (2) allows the network to detect a user's physical location and zooms the map to it. The location can be highlighted if necessary. The widget takes advantage of HTML geo-location. When the app runs on desktops, it uses the browser on the network to detect the location. When the app runs on mobile devices, by default, it uses GPS on the device to determine a location.

### 3.2.3 Home Button

The **Home Button** widget (3) zooms the map to the initial map extent. Clicking it resets the map extent to the map initial extent.

### 3.2.4 Zoom Out

The **Zoom Out** widget (4) zooms out on the map, using the centre as its focus. The Minus (-) zooms out.

### 3.2.5 Zoom In

The **Zoom In** widget (5) zooms in on the map, using the centre as its focus. The Plus (+) zooms in.

### 3.2.6 About BEDGIS-SL

The About BEDGIS-SL widget (6) provides a brief summary description of the BEDGIS-SL and its Mapping Application, including its functionalities and purpose of its development.

### 3.2.7 Basemap Gallery

The Basemap Gallery widget (7) presents a gallery of basemaps and allows users to select one from the gallery as the BEDGIS-SL basemap.

### 3.2.8 Print a Map Yourself

The Print a Map Yourself widget (8) connects the BEDGIS-SL web application with a printing service to allow the current map to print. The Map scale/extent section defines the method that the print service should use to calculate the printed extent of the map.

### 3.2.9 Screening

The Screening widget (9) allows you to define an area of interest and analyse specified layers for potential impacts. The area of interest can be defined through a place name search, by drawing on the map, by uploading a shapefile, or by entering a traverse with coordinate and distance pairs. Analysis results can be inspected in the widget and, optionally, shared via a printed report, CSV file download, or feature download.

### 3.2.10 Incident Analysis

The Incident Analysis widget (10) allows you to locate an incident on the map and analyse information from different feature layers within a specified distance of the incident.

### 3.2.11 Search

The Search widget (11) enables end users to find locations or search features on the map.

### 3.2.12 Map Layer List

The Layer List widget (12) provides a list of operational layers and their symbols and allows users to turn individual layers on and off. Each layer in the list has a checkbox that allows users to easily control its visibility. Layers having expansion arrows indicate that they contain sub-layers or subtypes. The order in which layers appear in this widget corresponds to the layer order in the map. This widget provides functionality allowing you to change the order of layers in the map.



### 3.2.13 Map Legend

The Map Legend widget (13) displays labels and symbols for layers in the map. It supports dynamic, tiled, image, feature, KML layer types, and WMS layers with an associated legend URL. The Legend widget can be set to automatically update when the visibility of a layer or sublayer changes. When no operational layers are rendered in the map, the Legend widget is blank.

### 3.2.14 Add Your Own Data

The Add Your Own Data widget (14) enables end users to add data to the map by searching for layers in ArcGIS Online or Portal for ArcGIS content, entering URLs or uploading local files, including shapefiles, CSV, GPX, and GeoJSON. In this way, end users can temporarily add layers to the map and remove them from the map. However, they cannot save them to the map.

### 3.2.15 Widget Dropdown

The Widget Dropdown (15) allows users to view other widgets that are not displayed on the main display and top bar of the mapping application.

### 3.2.16 Bookmark Widget

The Bookmark widget (16) stores a collection of map view extents (that is, spatial bookmarks) displayed in the app. It also allows users to create and add spatial bookmarks through configuration or at runtime after the app starts. In addition, if there are any existing bookmarks defined for the web map used in the app, they are used automatically.

### 3.2.17 Coordinate Conversion Widget

The Coordinate Conversion widget (17) allows users to input coordinates using one coordinate system and output to different coordinate systems using multiple notation formats.

### 3.2.18 Draw Widget

The Draw widget allows (18) users to create graphics that display on the map. It optionally adds line distance or polygon area to the feature as text. It enables users to draw basic graphics and text onto the map. It provides basic sketching and redlining functionality for the web application. It also displays some measurements for drawn features, such as lengths for lines, and areas and/or perimeters for polygons. When the widget initially activates, a dialogue box shows containing 11 feature creation tools.

### 3.2.19 Measurement Widget

The Measurement widget (19) allows the user to measure the area of a polygon, length of a line, or find the coordinates of a point.

### 3.2.20 Select Widget

The Select widget (20) enables users to interactively select features on the map and take actions on the selected features. The selected features can be passed on to other widgets as input, such as the Geoprocessing widget, Attribute Table widget, Directions widget, and so on.

### 3.2.21 Search in Sierra Leone

The Search in Sierra Leone (21) enables users to find locations or search features in Sierra Leone on the map.

### 3.2.22 Share Widget

The Share widget (22) allows users to share an app by posting it to a social media account, sending an email with a link, or embedding it in a website or blog. It also provides an easy way to define URL parameters for the app.

### 3.2.23 Swipe Widget

The Swipe widget (23) enables users to easily compare the content of different layers in a map. It provides horizontal, vertical and spyglass view modes. Users can slide the swipe tool or move the mouse around to reveal the content of another layer.



### 3.2.24 Noise Query Widget

The Noise Query Widget (24) allows you to extract the baseline residential and commercial noise level result for both day and night time for each of the ten towns in which air baseline environmental data was collected.

### 3.2.25 Air Quality Query Widget

The Air Quality Query widget (25) allows you to extract the baseline air quality result from each of the ten towns in which baseline data were collected. After selecting the town that you want to extract the result from and then click apply, the map will automatically zoom the map to the extent of the town that you selected with the result of all the air quality parameters.

### 3.2.26 Water Quality Query Widget

The Water Quality Query Widget (26) allows you to extract the baseline water quality result from each of the 6 points from Mano, Moa, Sewa, Little Scarcies, and Great Scarcies Rivers from which baseline data were collected. After selecting the point on the river that you want to extract the result from and then click apply, the map will automatically zoom the map to the extent of the point that you selected with the result of all the water quality parameters.

### 3.2.27 Biodiversity Query Widget

The Biodiversity Query Widget (27) gives a general classification of the land cover types and biodiversity hotspots in Sierra Leone, applying a query to any biodiversity layers (Land Cover, Forest Reserves and National Parks) will automatically zoom the map to the extent where that feature is located in Sierra Leone.

### 3.2.28 Soils Query Widget

The Soils Query Widget (28) gives a general classification of the soil provinces and types in Sierra Leone, applying a query to any soil province will automatically zoom the map to the extent where that province is located in Sierra Leone.

### 3.2.29 Socio-Demographics

The Socio-Demographics widget (29) allows users to retrieve information on the 2015 Population and Housing Census from source data by executing a predefined socio-demographic query such as chiefdom total population, female and male population, and locate settlements.

### 3.2.30 Coordinate Widget

The Coordinate widget (30) displays x and y coordinate values on the map. With the default coordinate system of the BEDGIS-SL web map, the coordinate values change dynamically when the mouse pointer moves to different locations on the map.

### 3.2.31 Scale Bar Widget

The Scale Bar widget (31) displays a scale bar on the map. When working with Web Mercator or geographic coordinate systems, the scalebar takes into account projections and dynamically adjusts.

### 3.2.32 Attribute Table Widget

The Attribute Table widget (32) displays a tabular view of operational layers' attributes. It displays at the bottom of the BEDGIS-SL web application and can be opened, resized, or closed. When more than one layer's attributes display, multiple tabs automatically generate in the attribute panel allowing users to switch among the attribute tables.

## 3.3 Working with BEDGIS Mapping Application

### 3.3.1 Extent Navigate



Click the arrows on the screen to navigate the map to its previous or next extent.







### 3.3.2 My Location

When the application starts, the **My Location** widget is automatically enabled to access your physical location. Clicking **Find my location** zooms the map to your current location. The My Location widget allows the network to detect your physical location and zoom the map to it. The location can be highlighted if necessary.

The widget takes advantage of HTML geolocation. When the app runs on desktops, it uses the browser on the network to detect the location. When the app runs on mobile devices, by default, it uses GPS on the device to determine your location.

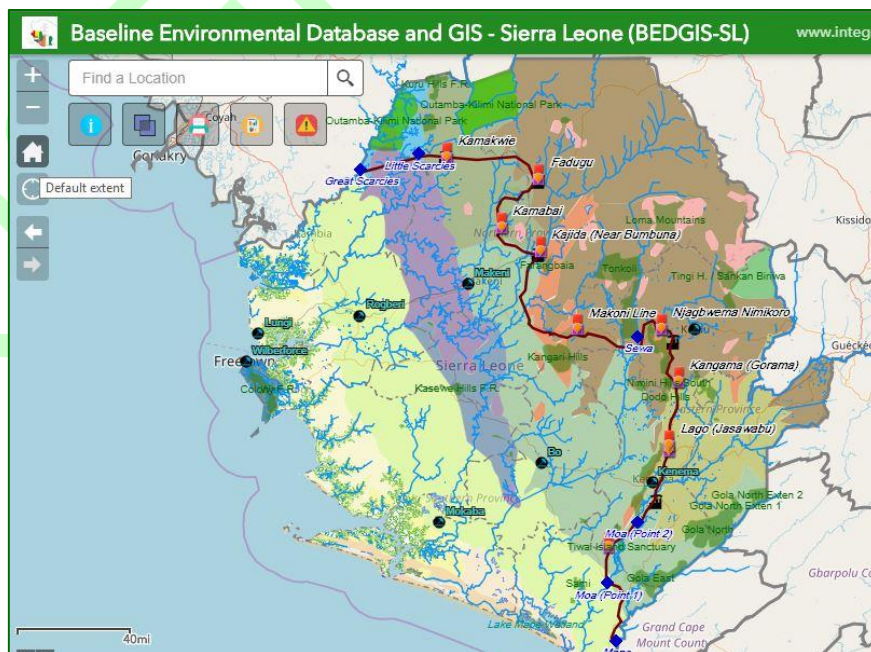


Tip: You may get an error message after clicking **Find my location**. The error is often caused by the browser's security. Configure your browser's pop-up settings to allow sharing of your location. Click **Yes** to find your location.

### 3.3.3 Home Button

When the application starts, the Home Button widget is automatically enabled. Clicking it resets the map extent to the default map extent.

Figure 3-3: BEDGIS–SL Home Button





### 3.3.4 Zoom Slider (Zoom Out & Zoom In)

The Zoom Slider widget provides interactive zoom controls on the map display. Using the Zoom Slider widget, Click the plus or minus button to zoom in or out of the map.

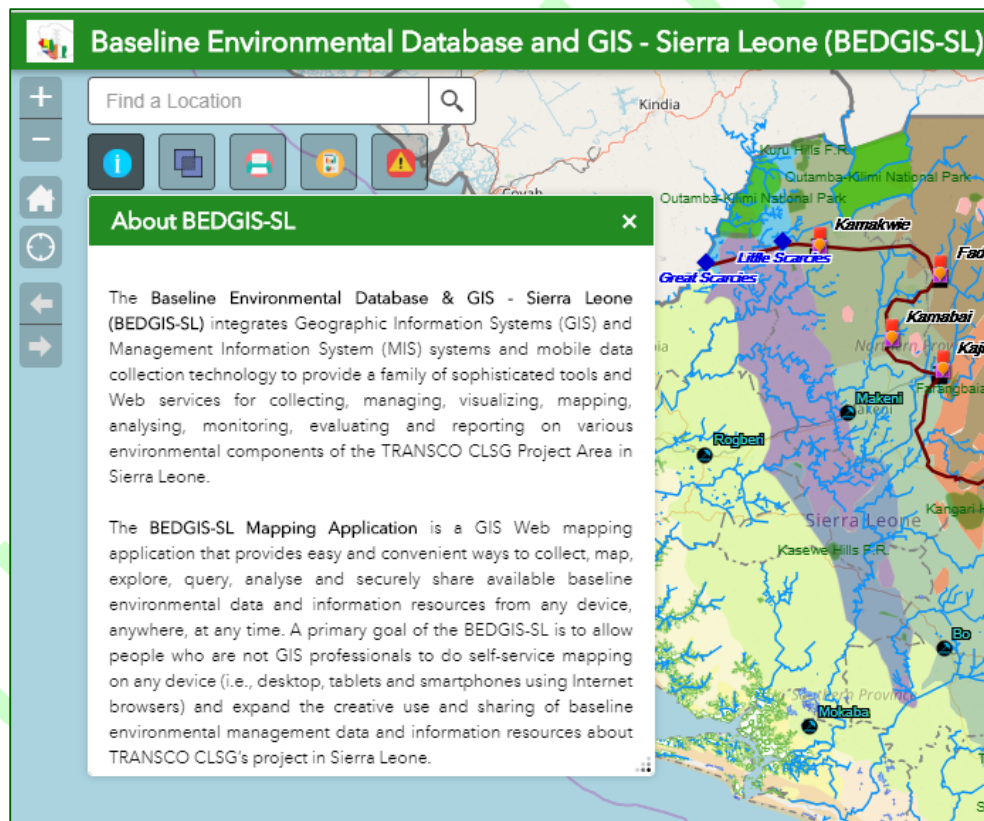


### 3.3.5 About BEDGIS-SL

The Baseline Environmental Database & GIS - Sierra Leone (BEDGIS-SL) integrates Geographic Information Systems (GIS) and Management Information System (MIS) systems and mobile data collection technology to provide a family of sophisticated tools and Web services for collecting, managing, visualizing, mapping, analysing, monitoring, evaluating and reporting on various environmental components of the TRANSCO CLSG Project Area in Sierra Leone.

The BEDGIS-SL Mapping Application is a GIS Web mapping application that provides easy and convenient ways to collect, map, explore, query, analyse and securely share available baseline environmental data and information resources from any device, anywhere, at any time. A primary goal of the BEDGIS-SL is to allow people who are not GIS professionals to do self-service mapping on any device (i.e., desktop, tablets and smartphones using Internet browsers) and expand the creative use and sharing of baseline environmental management data and information resources about TRANSCO CLSG’s project in Sierra Leone.

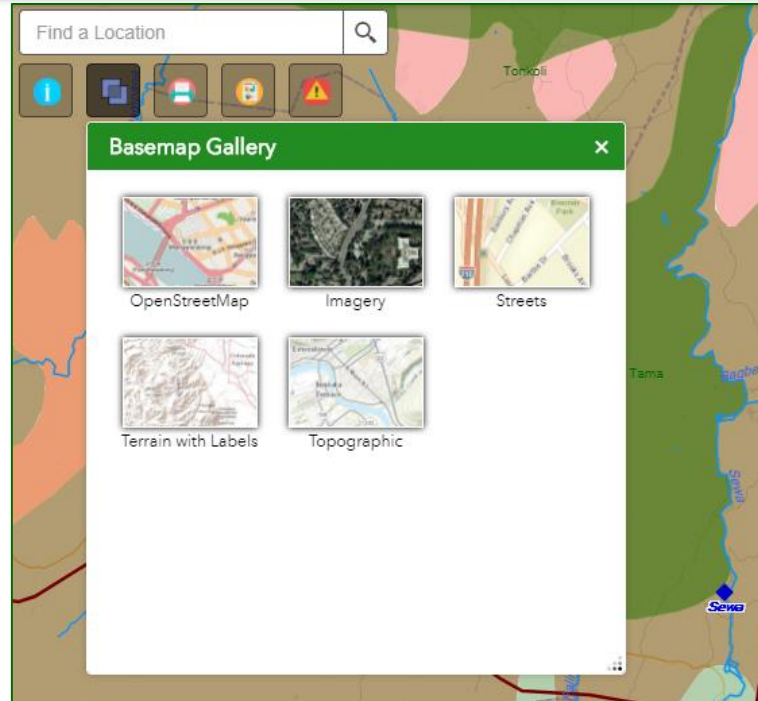
Figure 3-4: About BEDGIS-SL



### 3.3.6 Basemap Gallery

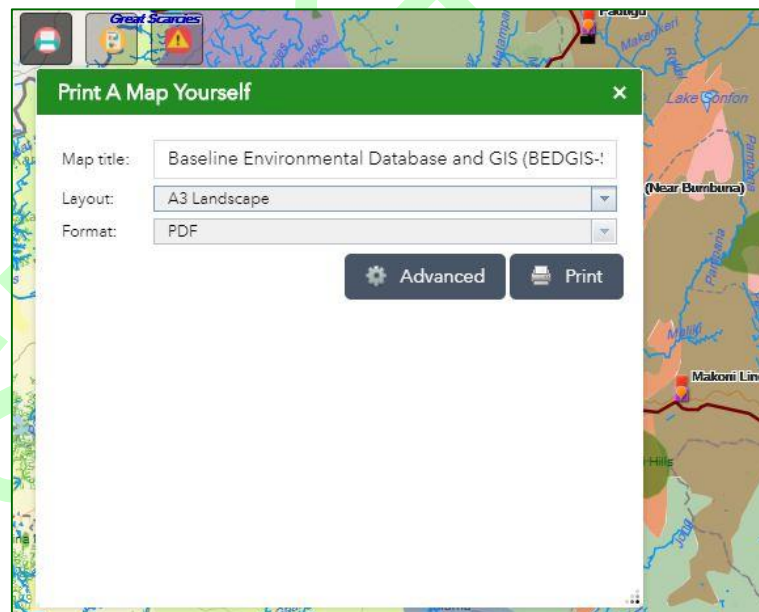
Clicking the Basemap Gallery widget displays all the basemaps configured for this widget. Clicking one of the basemap thumbnails sets it as the active basemap for the app. Click the X button in the upper right corner of the Basemap Gallery window to close it.



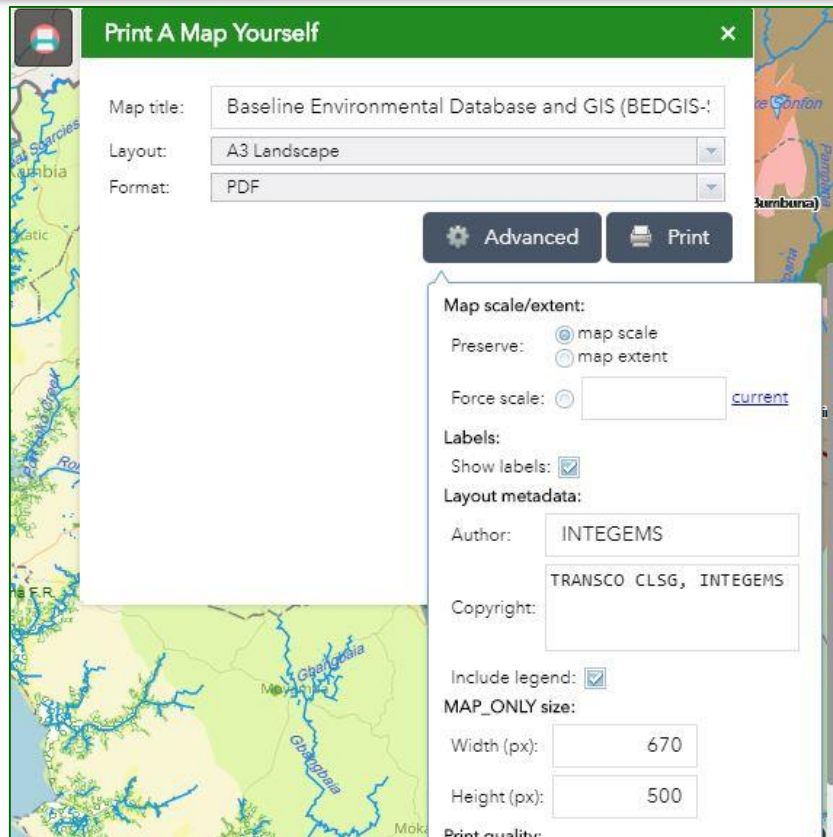


### 3.3.7 Print A Map Yourself

1. Click the print icon to open the Print widget.



2. Enter a title for the map in the Map Title text box.
3. Select the applicable Layout and Format for the exported map.
4. Click Advanced to open a menu with advanced print options.



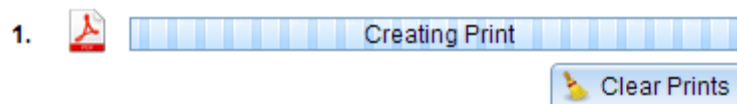
The **Map scale/extent** section defines the method that the print service should use to calculate the printed extent of the map. Preserving map scale may cause the printed map to maintain its scale while recalculating the extent around the existing centre point, while preserving the map extent may cause the scale to adjust to fit the current map extent into the printed map. You may also force a specific scale by checking the Force scale option and entering a scale. Click current to populate the value with the present scale of the map.

The Layout metadata allows you to override the default values set by the configuration. Enter values for the Author and Copyright fields to provide current information to the print service. Check the Include legend check box to display the legend on the printed map.

The **Layout metadata** allows you to override the default values set by the configuration. Enter values for the **Author** and **Copyright** fields to provide current information to the print service. Check the **Include legend** check box to display the legend on the printed map.

The **Print quality** section allows you to update the resolution of the printed map. Provide an updated value for the DPI (dots per inch) in the text box.

5. After all options have been set with the applicable values, click **Print** to submit all information to the print service. A progress bar displays next to the executing task.



6. Upon the completion of the print job, a link to the print output displays. Click the task to open the file in a new window.



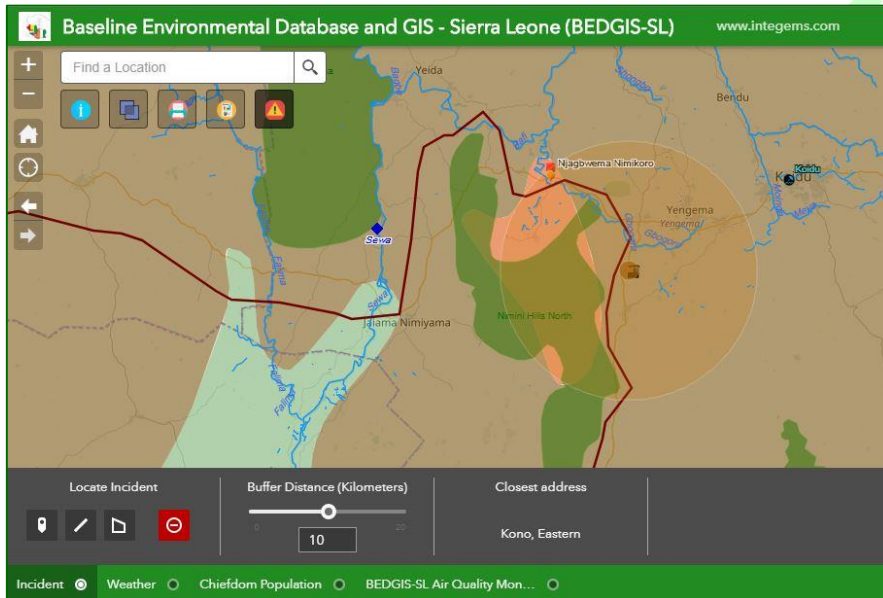
1.  Baseline Environmental Database and GIS (BEDGIS-SL)



7. Click **Clear Prints** to clear the print history.

### 3.3.8 Incident Analysis

1. Click the Incident Analysis widget icon to open it. The widget displays at the bottom of the map.
2. The Incident tab is selected by default.



3. To specify a buffer distance to the incident, drag the slider or manually input a value and press the enter key.

**Note:** When you manually input a distance value, the buffer slider will not dynamically change until you press the enter key to submit the actual buffer value.

4. Locate an incident on the map by using one of the **Locate Incident** drawing tools. Click the

Clear Incident icon  to clear the incident.

### 3.3.9 Air Quality Query

The air quality query widget allows you to extract the baseline air quality result from each of the ten towns in which baseline data were collected. After selecting the town that you want to extract the result from and then click apply, this will automatically zoom the map to the extent of the town that you selected with the result of all the air quality parameters.



Figure 3-5: Air Quality Query

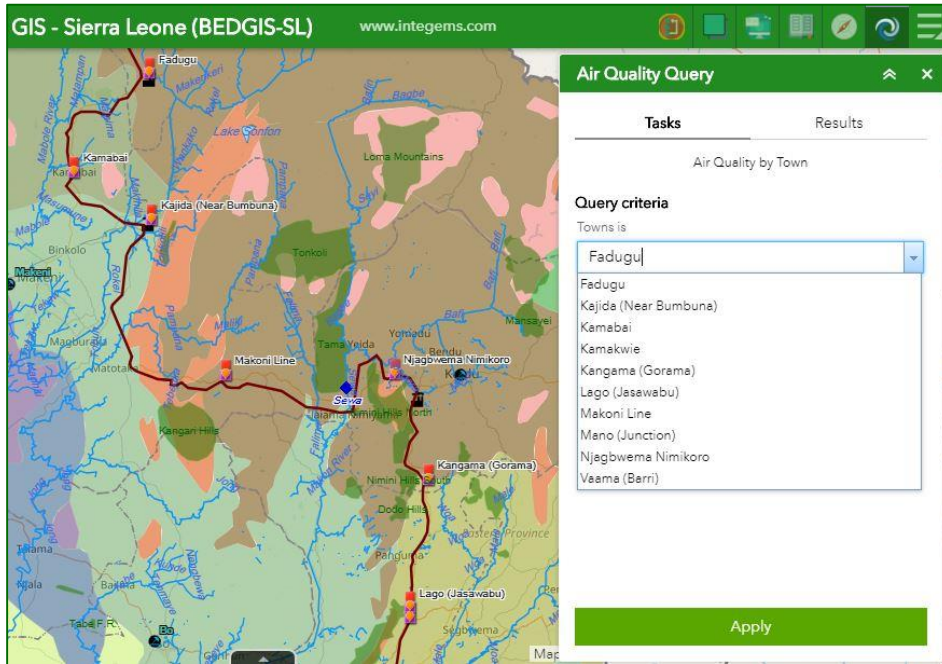
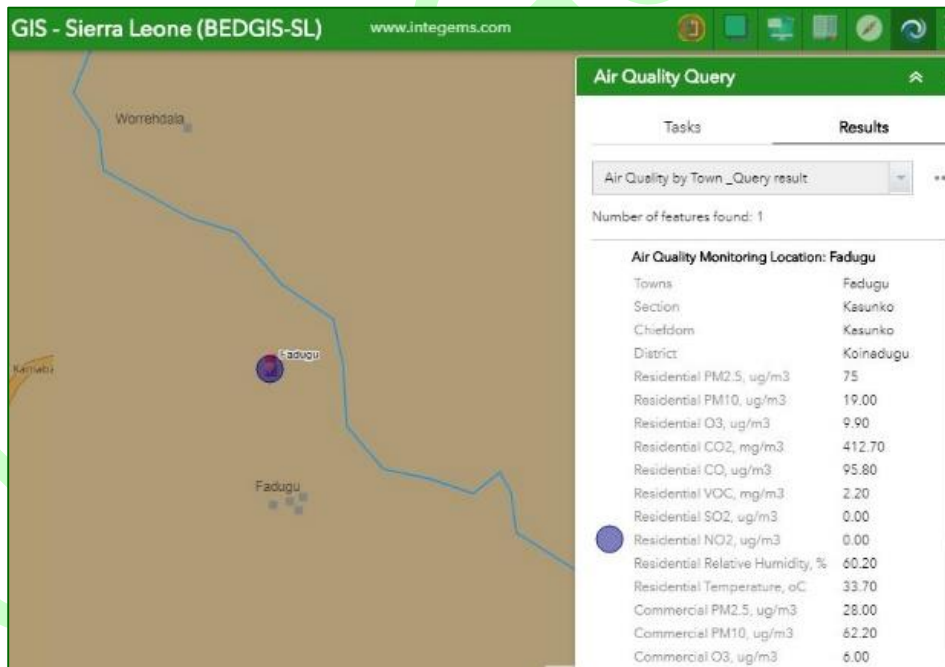


Figure 3-6: Air Quality Query Result





### 3.3.10 Noise Query

The noise query widget allows you to extract the baseline residential and commercial noise level result for both day and night time for each of the ten towns in which air baseline environmental data was collected by INTEGEMS along the TRANSCO CLSG transmission line. The widget also allows users to compare the noise level to the World Bank Guideline noise level values for both residential and commercial day-time and nighttime noise levels.

Figure 3-7: Noise Query

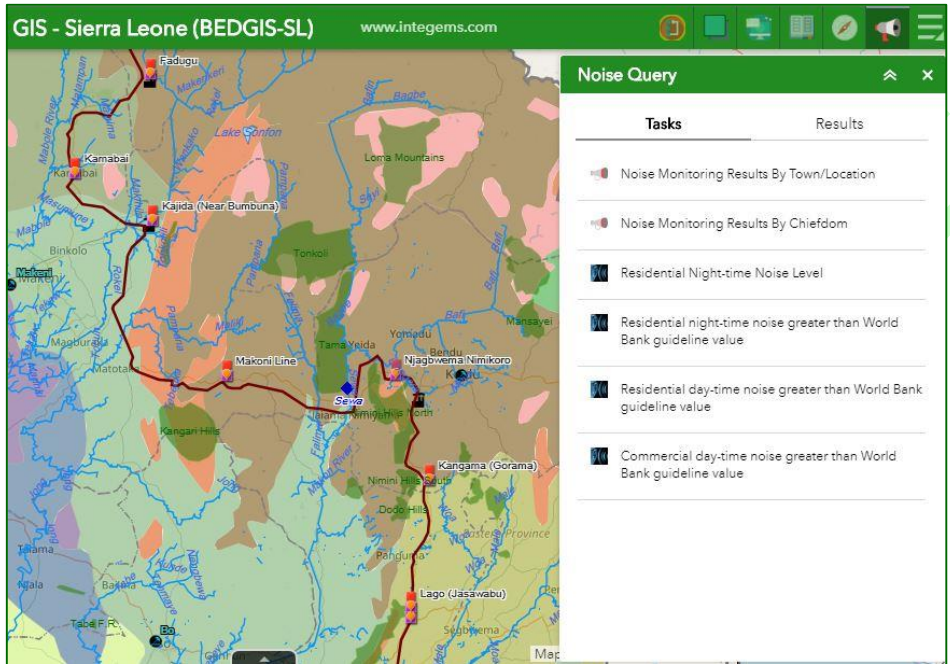
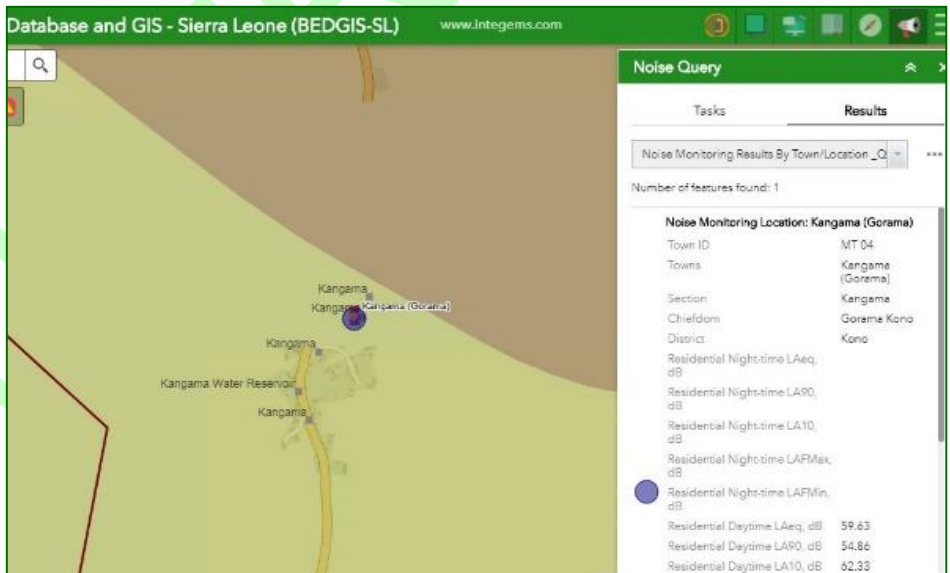


Figure 3-8: Noise Query Result





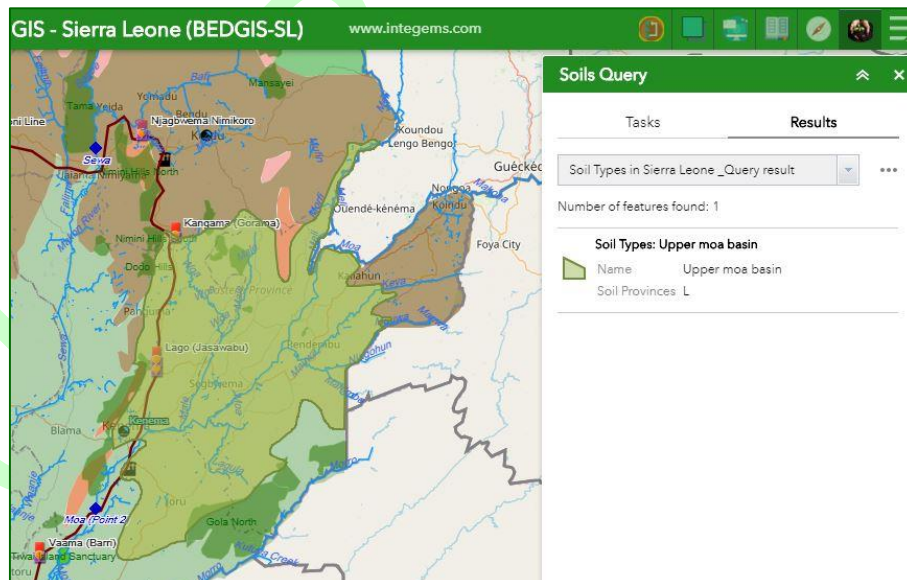
### 3.3.11 Soil Query

The soil query widget gives a general classification of the soil provinces and types in Sierra Leone, applying a query to any soil province will automatically zoom the map to the extent where that province is located in Sierra Leone.

Figure 3-9: Soils Query



Figure 3-10: Soils Query Result

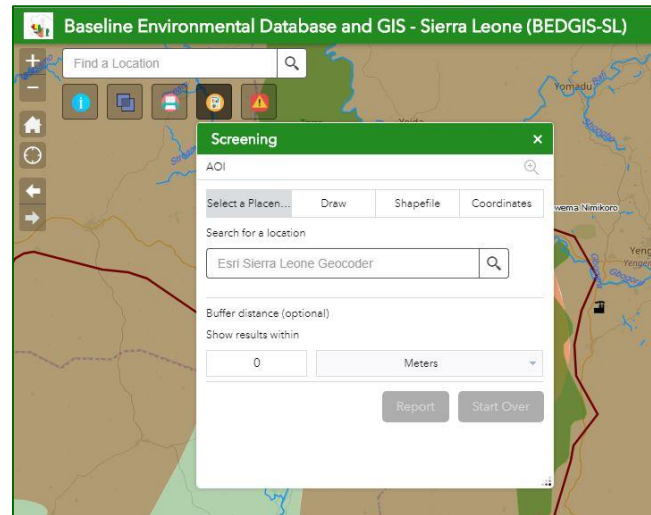




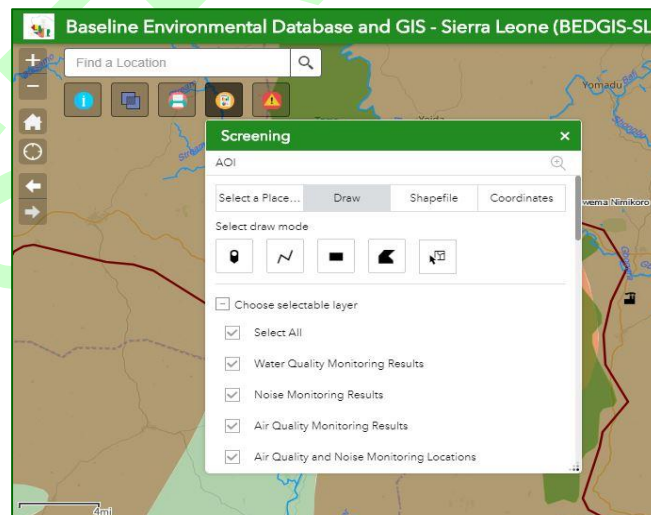
### 3.3.12 Screening

The Screening widget allows you to define an area of interest and analyze specified layers for potential impacts. The area of interest can be defined through a place name search, by drawing on the map, by uploading a shapefile, or by entering a traverse with coordinate and distance pairs. Analysis results can be inspected in the widget and, optionally, shared via a printed report, CSV file download, or feature download.

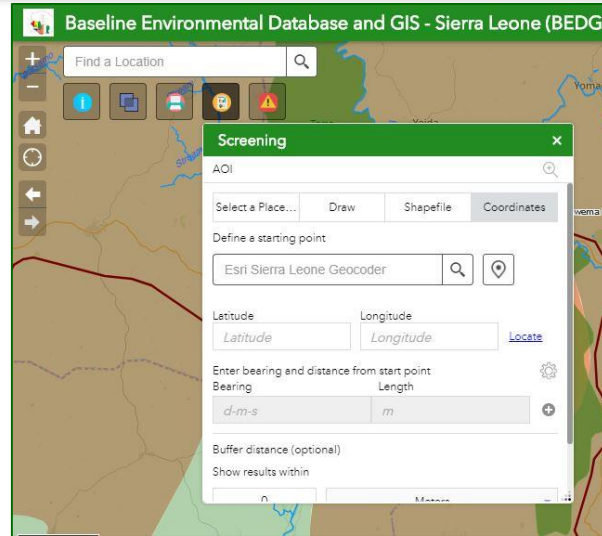
1. Click the Screening widget icon to open it.



2. Define an area of interest with one of the provided tools.
  - **Place name** — Search for a location in the map, and optionally apply a buffer.
  - **Draw** — Draw a point, line, or polygon on the map or select a feature from the map, and optionally apply a buffer. Use the Choose selectable layer list to define which layers are selectable in the map.



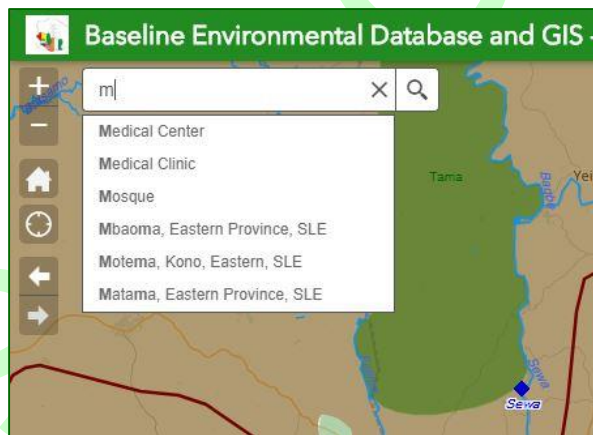
- **Shapefile** — Upload a zipped shapefile, and optionally apply a buffer.
- **Coordinates** — Identify a starting point for a traverse by searching the map, entering a coordinate pair, or drawing a point on the map. Enter bearing and distance pairs to define the traverse.



3. Define a buffer.
4. Click Start Over to remove the defined area of interest and create a new one.
5. Click Report to analyse the configured layers within the area of interest.

### 3.3.13 Search

1. When you enter a place name or a keyword in the search box, you see suggestions as you type. If you see an arrow in the search box, you can search on all sources, or click the arrow and choose a locator or layer from the drop-down list.



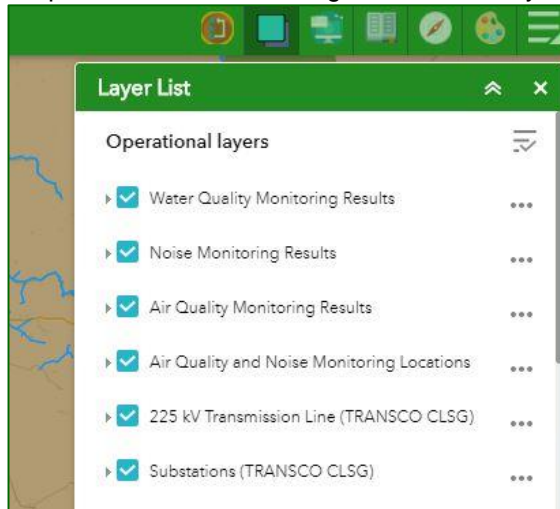
A pop-up appears at the location of the place name or the feature and displays any available attribute information.


### 3.3.14 Map Layer list

1. Clicking the layer list widget in your app displays the layer list or table of contents window.



- If the **Show Legend** option is checked, clicking an individual layer shows its symbols.



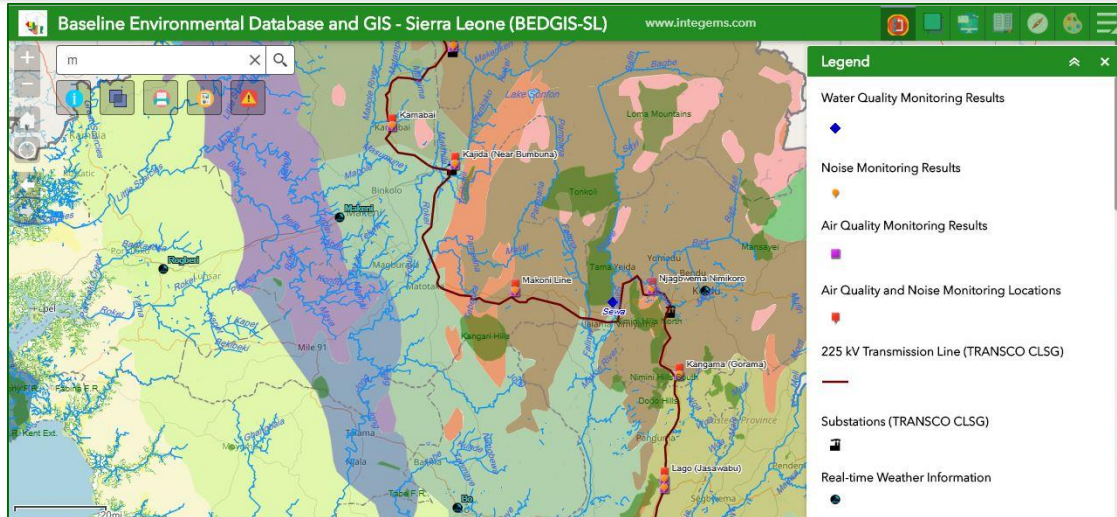
- Clicking the ellipsis on the right side of a layer displays the layer menu, which includes the following functions:
  - Zoom To**—Sets the map extent to the extent of the layer.
  - Transparency**—Sets the transparency for the layer.
  - Enable Pop-up / Remove Pop-up**—Enables or disables the pop-up for the feature layer. If a feature layer does not have a pop-up configured in the map, clicking **Enable Pop-up** shows all field values for the feature layer.
  - Move up**—Moves the layer one level up.
  - Move down**—Moves the layer one level down.
  - Open attribute table**—Opens the attribute table for the feature layer.
  - Description / Show Item Details**—Opens the service description or the item details page for the service or the item associated with the layer, if available.
- The  icon on the upper right, next to **Operational Layers**, controls the behaviour of all of the layers in the list. Click the icon to open the menu, which allows you to turn on or off all the layers, or expand or collapse all the layers. Alternatively, you can use keyboard shortcuts to do so. Press Ctrl and click the checkbox of the layer to turn on or off the layers in the same level. Press Ctrl and click the arrow to expand or collapse layers at the same level.
- Layers are greyed out in the list when zoomed out of their visible ranges.

Clicking the **X** button in the upper right corner of the **LayerList** window closes it.



### 3.3.15 Map Legend

When the application starts, the Legend widget is automatically enabled. Clicking the Legend widget displays the legend window and shows the symbols of the layers that are visible within the map extent. Clicking the “X” button in the upper right corner of the legend window closes it.





### 3.3.16 Add Your Own Data

1. On the Search tab, choose the scope you want to search and click Add on a specific item to add the layer to the map. The added layer will appear in the Layer List widget as well. Click Remove to remove the layer from the map and the Layer List widget. Click Details to get information about the layer.
2. Optionally, click the magnifying glass icon to search for layers.
3. Click the icon  to only search layers within the map area. Clicking it turns the icon red so you can search all layers in the scope.
4. Click the sort icon  to refine the type of search layer and sort the items.
  - Click the Type drop-down list to search layers based on map service, feature service, image service, vector tile service, KML, or WMS.
  - Click the Sort By drop-down list to sort items by relevance, title, owner, rating, view, or date.
5. To add layers by URL, click the URL tab next to the Search tab. Choose a type and enter the URL. Click Add to add the data to the map. The added layer will appear in the Layer List widget as well. The following types are supported through the URL:
  - ArcGIS Server web service
  - WMS OGC web service
  - KML
  - GeoRSS
  - CSV



**Add Your Own Data**

URL File

Type  
A CSV File ▼

URL

SAMPLE URL(S) **ADD**

`http://earthquake.usgs.gov/earthquakes/feed/v1.0/summary/2.5_week.csv`

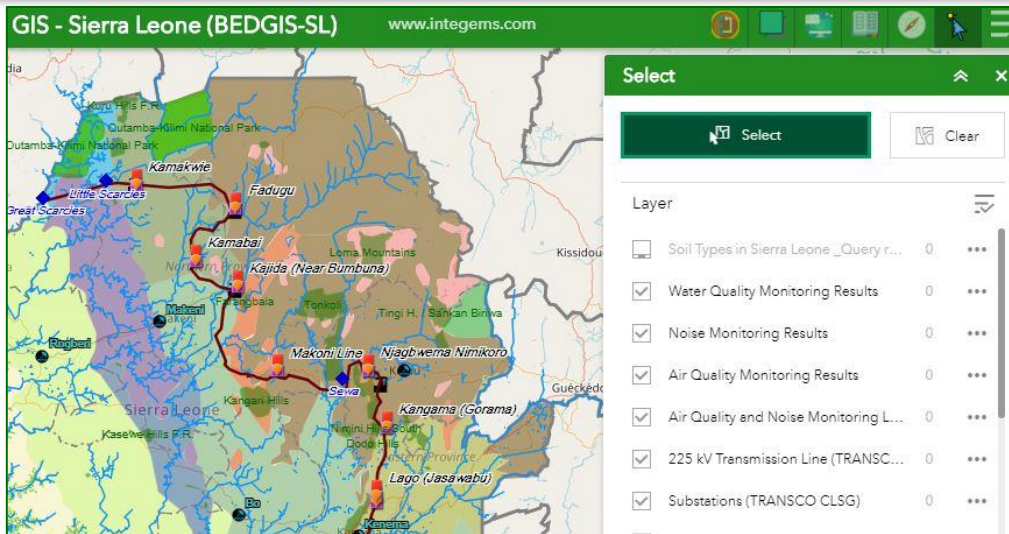
### 3.3.17 Select Widget

The Select widget enables users to interactively select features on the map and takes actions on the selected features. The selected features can be passed on to other widgets as input, such as the Geoprocessing widget, Attribute Table widget, Directions widget, and so on.

1. Click the Select widget icon to open it.
2. Choose the layer or layers you want by checking the box.
3. Hover over the **Select** button. You can **Select By Rectangle** with the following actions:
  - Drag the pointer on the map to create a new selection.
  - Press the Shift key while dragging the pointer on the map to add selected features to the selection.
  - Press the Ctrl key while dragging the pointer on the map to remove selected features from the selection.
4. Click **Select** and draw on the map to select features. If more than one selection tool is configured, click the arrow on **Select** to choose the tool in the menu.

The number of selected features display next to the layer.

5. Click the ellipsis (...) to open the **Selection Actions** drop-down menu.

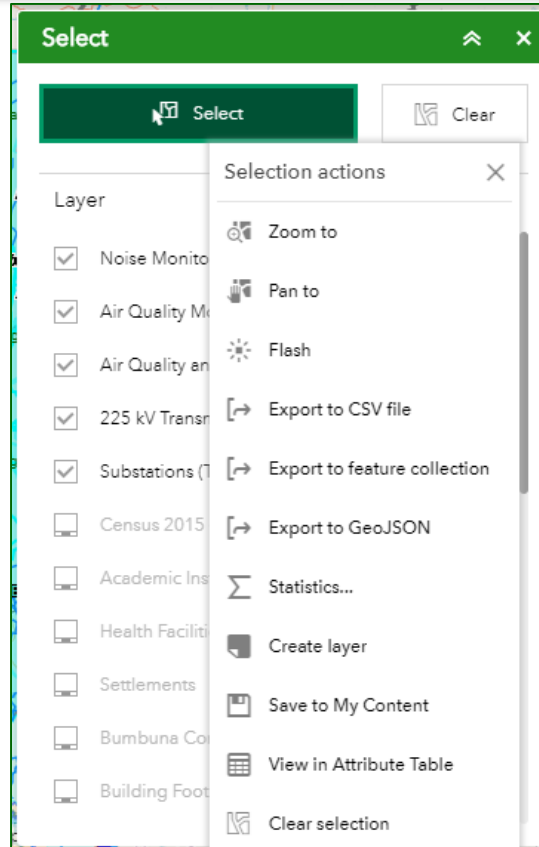



- Click one of the actions, for example, **Air Quality Monitoring Results**. Choose the field you want to see for the Air Quality Monitoring Results.
- Click **Create Layer** to create a new graphic layer on the map. You can turn it on and off in the Layer List widget.
- Click **Export to CSV file** if you check the **Allow to export selected features** option during the configuration. A CSV file is generated locally for the feature set.

**Caution:** If **Export to GeoJSON** is selected, you may notice that the GeoJSON file does not contain spatial reference information. This is by design. The geometries have been automatically projected to wkid 4326 during the exporting process.

- Optionally click the rest of the actions.
6. Click **X** on the main panel to close the drop-down menu.
  7. Alternatively, click the number to display the list of features. Click the ellipsis (...) next to the feature to open the selection actions drop-down menu.





- Click one of the actions, for example, **Directions from Here**. The feature location becomes one of the destinations in the Directions widget.
  - Click **Set as Incident**. The feature location becomes the incident with a 10-mile buffer around it.
  - Optionally click the rest of the actions.
8. Click the **Back** button  to return to the main panel.
  9. Click **Clear** to clear all the selections.

### 3.3.18 Draw Widget

The Draw widget allows users to create graphics that display on the map. It optionally adds line distance or polygon area to the feature as text. It enables users to draw basic graphics and text onto the map. It provides basic sketching and redlining functionality for the web application. It also displays some measurements for drawn features, such as lengths for lines, and areas and/or perimeters for polygons. When the widget initially activates, a dialog box shows containing 11 feature creation tools.

The Draw widget enables end users to draw basic graphics and text onto the map. It provides basic sketching and redlining functionality for the web application. It also displays some measurements (if configured) for drawn features, such as lengths for lines, and areas and/or perimeters for polygons. When the widget initially activates, a dialog box shows containing 11 feature creation tools. From left to right, they are as follows:

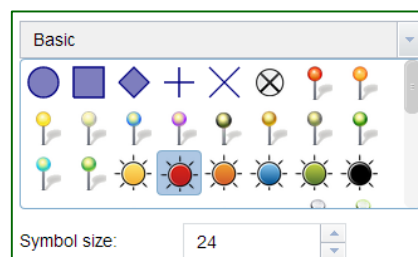
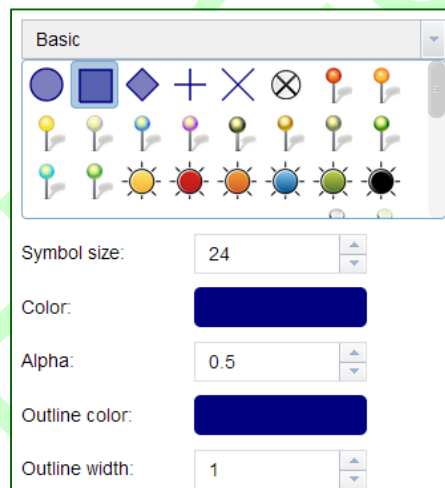
- Point

- Line
- Polyline
- Freehand Line
- Triangle
- Rectangle
- Circle
- Ellipse
- Polygon
- Freehand Polygon
- Text



### Using the Draw widget

1. Select the desired drawing mode by clicking the symbol type.
2. Optionally, change the symbol for the feature using the symbol picker in the Draw widget.
  1. For point symbols, select the marker category (different symbols are available in each category), size, color, transparency, outline colour, and outline width of the symbol. Only the size is available for the picture marker symbols.



2. For line symbols, select a pre-defined symbol from the box. You may also customize the colour, style, transparency, and width of the symbol. Click **Show Measurements** and select the **Distance Units** to display the measurement with the line.



Color

Style

Alpha

Width

Show Measurements

Distance Units

- For polygon symbols, select a pre-defined symbol from the box. You may also customize the fill color, transparency, outline color, and outline width of the symbol. Click **Show Measurements** and select the **Area Units** and **Distance Units** to display the measurement with the polygon.

Color

Alpha

Outline color

Outline width

Show Measurements

Area Units

Distance Units

- For text symbols, enter the **Text** to be drawn, and select a font color and size for the symbol.

Text

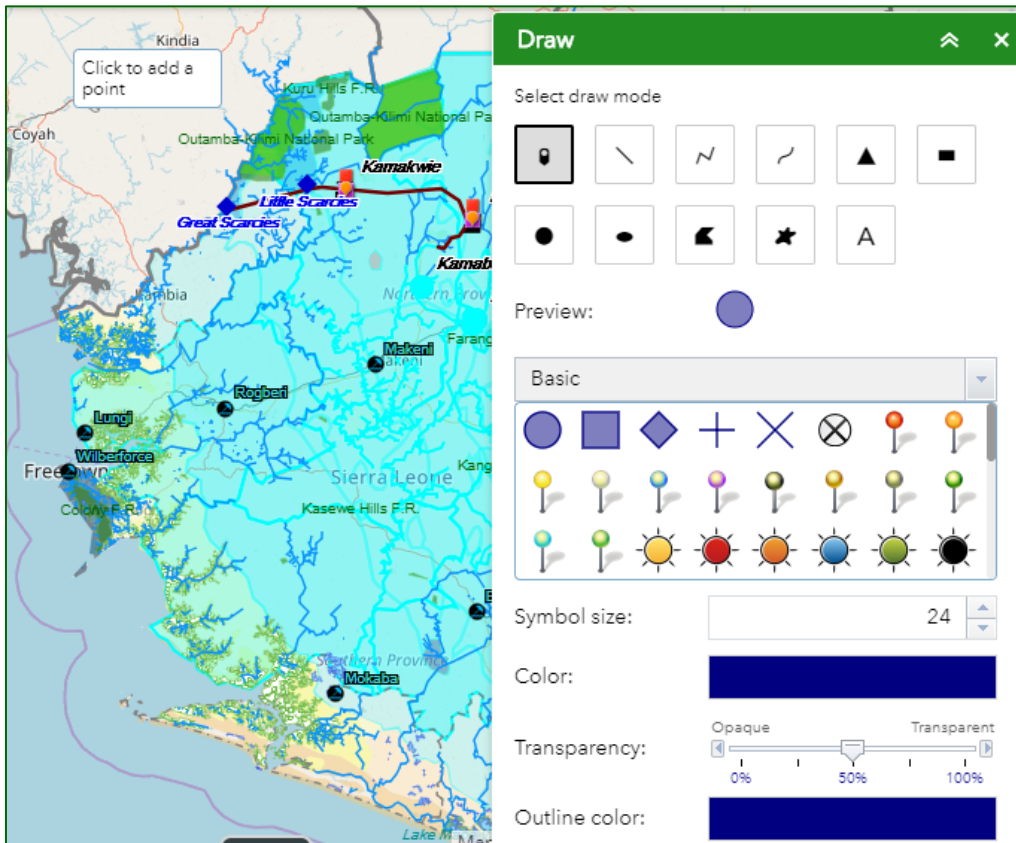
Font color

Font size

- Draw features and texts on the map.
- If the **Add the drawing as an operational layer of the map** option is checked, open Layer List widget, you will see **Draw Results** layer.



5. Click **Undo** or **Redo** to undo or redo the drawing features. Click **Clear** to remove all of them.




### 3.3.19 Measurement Widget

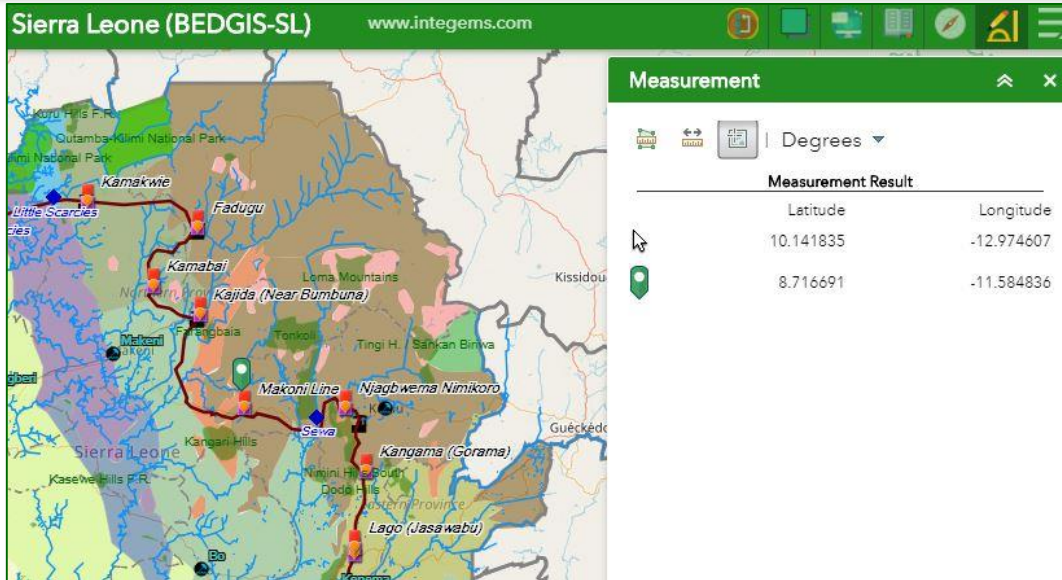
The Measurement widget allows the user to measure the area of a polygon, length of a line, or find the coordinates of a point.

Click the widget icon to open the Measurement widget.


#### 1. Point measurements

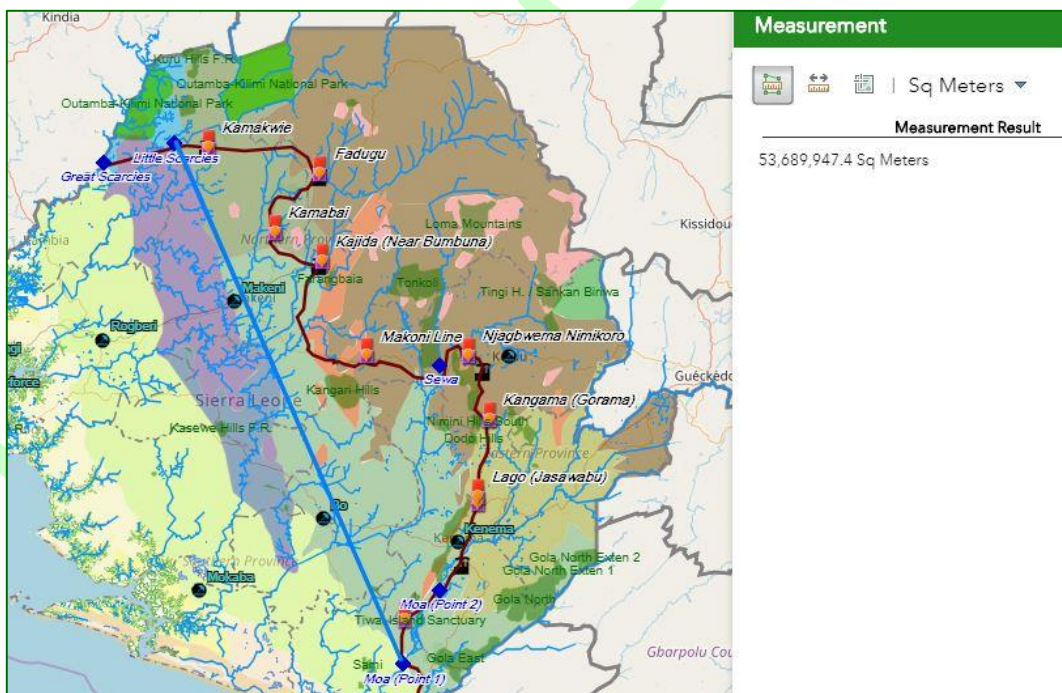
Click the point measurement icon  and click a point on the map. The Measurement widget displays the coordinates for the point in **Degrees** (decimal). You may change the coordinate display format to degrees/minutes/seconds by changing the **Degrees** drop-down to **DMS**.





## 2. Polyline measurements

Click the polyline measurement icon  and draw a polyline on the map by clicking two or more points. Double-click to finish drawing the polyline. The Measurement widget displays the total length of the polyline, using the defined **Default Length Unit**. To change the length unit, select the applicable unit of measure from the **Miles** drop-down menu.

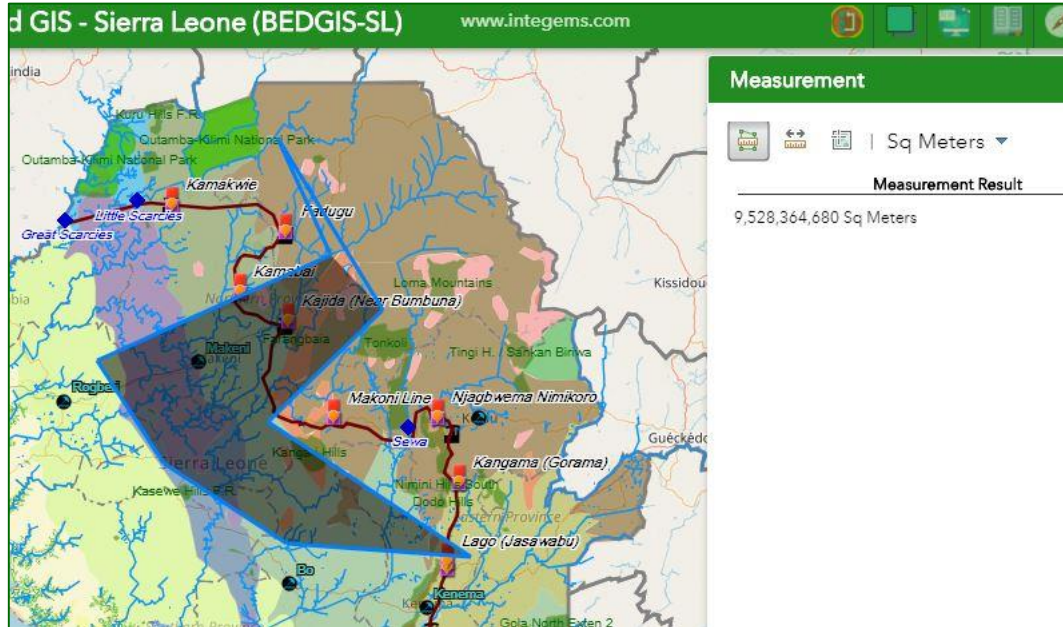


## 3. Polygon measurements





Click the polygon measurement icon and draw a polygon on the map by clicking three or more points. Double-click to finish drawing the polygon. The Measurement widget displays the total area of the polygon, using the defined **Default Area Unit**. To change the area unit, select the applicable unit of measure from the **Acres** drop-down menu.





### 3.3.20 Swipe Widget

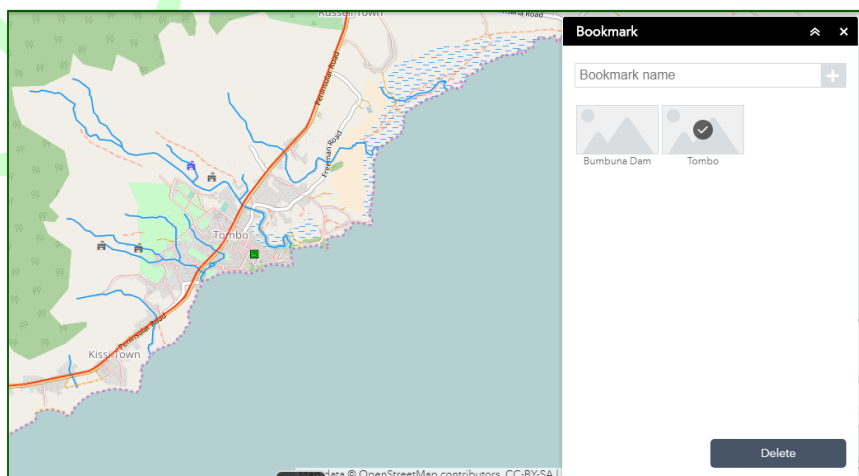
The Swipe widget enables you to easily compare the content of different layers in a map. It provides horizontal, vertical and spyglass view modes. You can slide the swipe tool or move the mouse around to reveal the content of another layer. For example, you may want to use it to display two related thematic layers in a map. Click the Swipe widget icon on the upper-left corner of the map to toggle the widget on and off.



Only the layer visible on the map can take effect with the swipe tool.

### 3.3.21 Bookmark Widget

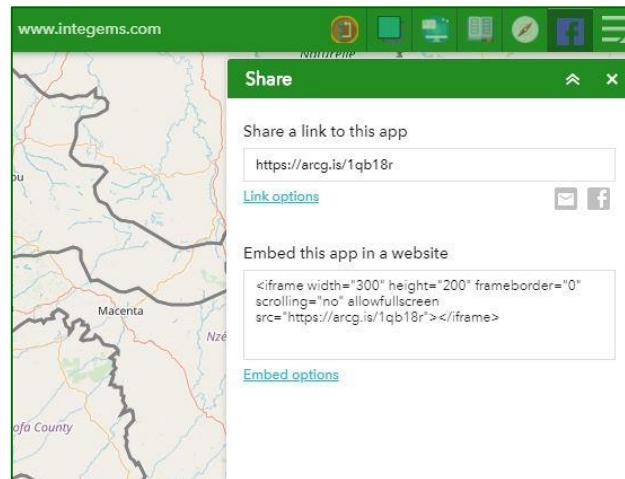
Clicking the Bookmark widget displays all pre-defined bookmarks, including bookmarks specified using the widget configuration window, as well as bookmarks defined in the web map used in the app. Clicking one of the bookmark thumbnails in the list sets the map extent to the bookmark area. You can also add additional bookmarks by zooming to your desired location and clicking the + icon next to the text box. To delete a bookmark defined at runtime or configured using the widget configuration window, click the bookmark icon to highlight it first, and click the **Delete** button to delete it. If the bookmark is inherited from the web map, the **Delete** button is unavailable.



Clicking the X button in the upper right corner of the Bookmark window closes the bookmark window

### 3.3.22 Share Widget

The Share widget allows users to share an app by posting it to a social media account, sending an email with a link, or embedding it in a website or blog. It also provides an easy way to define URL parameters for the app.



- **Add a marker on the map**—Click the point icon and click where you want to add a marker to the map. Fill in the **WKID**, **Pop-up title**, **Symbol**, and **Label** properties in each text box.
  - **Overwrite the default screen size of mobile layout**—Input the screen size in pixels. By default, when either the height or width of a screen display is less than 600 pixels, the mobile layout automatically applies.
  - **Set display language of the app**—Choose a language from the drop-down menu.
  - **Authenticate a user automatically**—Input a token. By default, your login credentials display in the text box when the option is checked.
2. Click -> to return to the main panel. The short link should be updated to reflect the URL change made in the step above.
  4. Under **Embed this app in a website**, copy the HTML code and paste it into your website. If you want, click **Embed Options** to choose the size of your app to be embedded.

### 3.3.23 Attribute Table Widget

The Attribute Table widget displays a tabular view of operational layers' attributes. It displays at the bottom of your web application and can be opened, resized, or closed. When more than one layer's attributes display, multiple tabs automatically generate in the attribute panel allowing you to switch among the attribute tables. You can use the widget's configuration window to specify which layer or layers are included in the tabular view, which fields show, and if the tabular view can be exported.

The screenshot shows the 'Baseline Environmental Database and GIS - Sierra Leone (BEDGIS-SL)' interface. At the top, it says 'Developed by INTEGEMS, 2018'. Below the map, there are several tabs for different data layers: 'Water Quality Monitoring Results', 'Noise Monitoring Results', 'Air Quality Monitoring Results', 'Air Quality and Noise Monitoring Locations', and '225 kV Transmission Lines'. The 'Air Quality Monitoring Results' tab is active, showing a table with the following data:

Towns	Section	Chiefdom	District	Residential PM2.5, ug/m3	Residential PM10, ug/m3	Residential O3, ug/m3	Residential CO2, mg/m3	Residential CO, ug/m3
Mano (Junction)	Kona Kpindibu	Nongowa	Kenema	0	0.00	3.10	373.70	0.00
Lago (Jasawebu)	Kona Kpindibu	Nongowa	Kenema	2	0.00	0.50	400.20	352.00
Kangama (Gorama)	Kangama	Gorama Kono	Kono	0	0.00	2.40	370.10	129.00
Njagbwema Nimikoro	Gbogboafeh	Nimikoro	Kono	0	0.00	2.44	428.00	215.80

At the bottom of the table, it says 'features 0 selected'.

### 3.3.24 Coordinate Widget

The Coordinate widget displays x and y coordinate values on the map. With the default coordinate system of the web map, the coordinate values change dynamically when the mouse pointer moves to

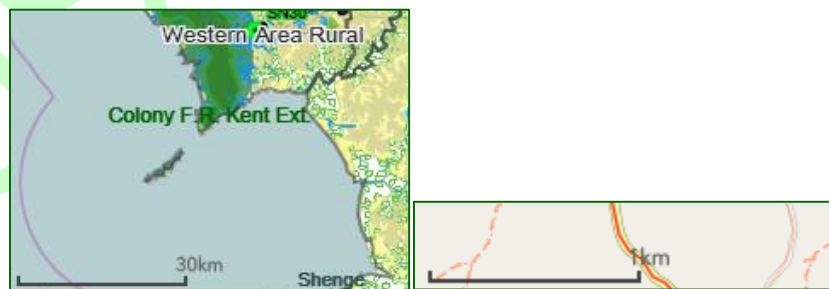


different locations on the map. Multiple spatial references can be configured and the coordinate values display based on the spatial reference you select when the application starts.



### 3.3.25 Scale Bar Widget

When the application starts, the Scale Bar widget is automatically enabled and displayed at the lower left corner of the application. It is updated dynamically when the map's scale changes.







## 4 THE BEDGIS-SL ACCESS DATABASE

INTEGEMS has designed and developed the TRANSCO\_BEDGIS Database in Microsoft Access. The **TRANSCO\_BEDGIS** database is a baseline database of water quality of the watercourse crossed by the corridor of the line and the air quality and noise level of the cities/communities of the project area.

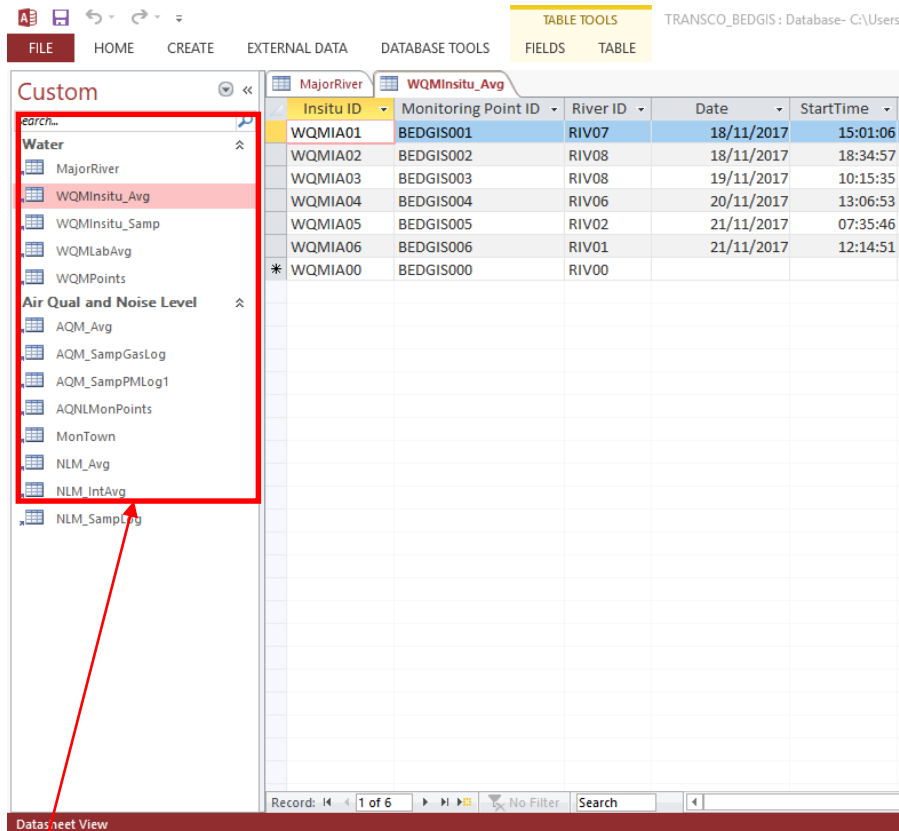
MajorRiver	Insitu ID	Monitoring Point ID	River ID	Date	StartTime	EndTime	SampDurati	Temperatur	pH	mV(pH)	ORP(mV)
Water	WQMIA01	BEDGIS001	RIV07	18/11/2017	15:01:06	15:56:06	00:55:00	26.86	6.42	25.32	245.96
MajorRiver	WQMIA02	BEDGIS002	RIV08	18/11/2017	18:34:57	19:29:57	00:55:00	28.12	6.47	22.32	301.53
WQMinsitu_Avg	WQMIA03	BEDGIS003	RIV08	19/11/2017	10:15:35	11:22:00	01:06:25	28.01	6.95	17.47	258.88
WQMinsitu_Samp	WQMIA04	BEDGIS004	RIV06	20/11/2017	13:06:53	14:06:53	01:00:00	26.12	6.96	13.98	183.1
WQMLabAvg	WQMIA05	BEDGIS005	RIV02	21/11/2017	07:35:46	08:35:46	01:00:00	27.37	6.83	28.9	115.57
WQMPoints	WQMIA06	BEDGIS006	RIV01	21/11/2017	12:14:51	13:14:51	01:00:00	27.82	6.7	36.29	214.3
Air Qual and Noise Level	WQMIA00	BEDGIS000	RIV00					0	0	0	0

Navigation Panel

Table View



The database contains 13 Tables which have been further separated into two categories, Water (5 tables) and Air Quality and Noise Level (8 tables).



Insitu ID	Monitoring Point ID	River ID	Date	StartTime
WQMIA01	BEDGIS001	RIV07	18/11/2017	15:01:06
WQMIA02	BEDGIS002	RIV08	18/11/2017	18:34:57
WQMIA03	BEDGIS003	RIV08	19/11/2017	10:15:35
WQMIA04	BEDGIS004	RIV06	20/11/2017	13:06:53
WQMIA05	BEDGIS005	RIV02	21/11/2017	07:35:46
WQMIA06	BEDGIS006	RIV01	21/11/2017	12:14:51
* WQMIA00	BEDGIS000	RIV00		

Tables

## 4.1 Tables

### 4.1.1 Water Quality Tables

1. MajorRiver
2. WQMPoints
3. WQMInNumbertu\_Avg
4. WQMInNumbertu\_Samp
5. WQMLabAvg

Below are schemas of the tables of the tables

**Field type:** Short Text, Long Text, Number, Date/Time, etc...

**Alias:** Alternate field name (may contain spaces)

**Nulls:** Are null values allowed?



#### 4.1.1.1 MajorRiver

The Major River Table contains details of the rivers monitored **Riv\_ID** is the Primary Key and is linked to all the other water quality tables acting as a Foreign Key.

Table name	Field name	Data type	Caption	Null (Y/N)
MajorRivers	Riv_ID	Short Text	River ID	No
	River_Name	Short Text	Name of the Rivers	No
	Length	Number	Length Of The Rivers	Yes
	Width	Number	Width Of The Rivers	Yes
	Basin	Number	River Basin	Yes

#### 4.1.1.2 WQMPoints

WQMPoints Table contains records of the water quality monitoring points. WQM is the Primary Key and is linked to all the other water quality tables as a Foreign Key.

Table name	Field name	Data type	Caption	Null (Y/N)
WQMPoints	<b>WQM_PID</b>	Short Text	Water Monitoring Point ID	No
	Date	Date/Time	Date of Monitoring	
	Latitude	Double	Latitude	No
	Longitude	Double	Longitude	No

#### 4.1.1.3 WQMinsitu\_Avg

WQMinsitu\_Avg contains the overall averages of each river that was monitored during baseline data collection. WQM\_InSampAvgID is the Primary Key.

Table name	Field name	Data type	Caption	Null (Y/N)
WQMinsitu_Avg	WQM_InSampAvgID	Number	Sample Average ID	No
	WQM_PID	Short Text	Water Monitoring Point ID	
	Riv_ID	Short Text	River ID	No
	Date	Date/Time	Date of Sampling	No
	StartTime	Date/Time	Sampling start time	No
	EndTime	Date/Time	Sampling end time	No
	SampDuration	Date/Time	Sampling Duration	No
	Temp	Number	Temperature (°C)	Yes
	PH	Number	pH	Yes
	mV	Number	mV(pH)	Yes
	ORP	Number	Oxidation-Reduction Potential (mV)	Yes



Table name	Field name	Data type	Caption	Null (Y/N)
	EC	Number	Electrical Conductivity ( $\mu\text{S}/\text{cm}$ )	Yes
	ECAbs	Number	EC Abs( $\mu\text{S}/\text{cm}$ )	Yes
	RES	Number	Resistivity (Ohm-cm)	Yes
	TDS	Number	Total Dissolved Solid (ppm)	Yes
	Sal	Number	Salinity (psu)	Yes
	Press	Number	Pressure (psi)	Yes
	DO%	Number	Dissolved Oxygen (%)	Yes
	Doppm	Number	Disolved Oxygen (ppm)	Yes
	Turb	Number	Turbidity (FNU)	Yes

#### 4.1.1.4 WQMInsitu\_Samp

WQMInsitu\_Samp contains the log interval averages of each river that was monitored during baseline data collection. WQM\_InsitSampID is the Primary Key.

Table name	Field name	Data type	Caption	Null (Y/N)
WQMInNumtu_Samp	<b>WQM_InsitSampID</b>	Number	SampleID	No
	WQM_MPID	Short Text	Water Monitoring Point ID	No
	Riv_ID	Short Text	River ID	No
	Date	Date/Time	Date of Sampling	No
	LogTime	Date/Time	Log time	No
	EndTime	Date/Time	Sampling end time	No
	SampDuration	Date/Time	Sampling Duration	No
	Temp_C	Number	Temp ( $^{\circ}\text{C}$ )	Yes
	PH	Number	pH	Yes
	mV	Number	mV(pH)	Yes
	ORP	Number	Oxidation-Reduction Potential (mV)	Yes
	EC	Number	Electrical Conductivity ( $\mu\text{S}/\text{cm}$ )	Yes
	ECAbs	Number	EC Abs( $\mu\text{S}/\text{cm}$ )	Yes
	RES	Number	Resistivity (Ohm-cm)	Yes
	TDS	Number	Total Dissolved Solid (ppm)	Yes
	Sal	Number	Salinity (psu)	Yes
	Press	Number	Pressure (psi)	Yes
	DO%	Number	Dissolved Oxygen (%)	Yes
	Doppm	Number	Disolved Oxygen (ppm)	Yes
	Turb	Number	Turbidity (FNU)	Yes



**4.1.1.5 WQMLabAvg**

WQMLab\_Avg contains the Lab results of physio-chemical and metals concentrations found in water sampled from the rivers monitored during the baseline data collection. WQM\_MetLabSampID is the Primary Key.

Table name	Field name	Data type	Caption	Null (Y/N)
WQMLabAvg	WQM_MetLabSampID	Number	Metals Lab Sample ID	No
	WQM_MPID	Short Text	Water Monitoring Point ID	No
	Riv_ID	Short Text	River ID	No
	ArsenicDis	Short Text	Arsenic dissolved (mg/L)	Yes
	HardnessByCal	Number	Hardness by Calculation (mg/L)	Yes
	TotAlkalCaCO3	Number	Total Alkalinity as CaCO3 (mg/L)	Yes
	ApparentColor	Number	Apparent Color by spec (Pt/Co colour)	Yes
	TrueColor	Number	True Color by spec (Pt/Co colour)	Yes
	BOD5	Short Text	Biochemical Oxygen Demand (BOD5) (mg/L)	Yes
	ChemOxyDemand	Short Text	Chemical Oxygen Demand (mg/L)	Yes
	NitrateNO3asNO3	Number	Nitrate, NO3 as NO3 (mg/L)	Yes
	NitriteNO2asNO2	Short Text	Nitrite, NO2 as NO2 (mg/L)	Yes
	PhosphateasPO4	Short Text	Phosphate as PO4 (mg/L)	Yes
	OilandGrease	Short Text	Oil and Grease (mg/L)	Yes
	TotalColiforms	Number	Total Coliforms (MPN/100 mL)	Yes
	FaecalColiforms	Number	Faecal Coliforms (MPN/100 mL)	Yes
	AntimonyDis	Short Text	Antimony dissolved (mg/L)	Yes
	MercuryDis	Short Text	Mercury dissolved (mg/L)	Yes
	CalciumDis	Number	Calcium dissolved (mg/L)	Yes
	MagnesiumDis	Number	Magnesium dissolved (mg/L)	Yes
	ArsenicTot	Short Text	Arsenic total (mg/L)	Yes
	AntimonyTot	Short Text	Antimony total (mg/L)	Yes
	SeleniumTot	Short Text	Selenium total (mg/L)	Yes
	MercuryTot	Short Text	Mercury total (mg/L)	Yes
	ManganeseTot	Number	Manganese total (mg/L)	Yes
	CopperTot	Short Text	Copper total (mg/L)	Yes
	ZincTot	Number	Zinc total (mg/L)	Yes
	LeadTot	Number	Lead total (mg/L)	Yes
	ChromiumTot	Short Text	Chromium total (mg/L)	Yes
	NickelTot	Short Text	Nickel total (mg/L)	Yes
	CadmiumTot	Short Text	Cadmium total (mg/L)	Yes
MolybdenumTot	Short Text	Molybdenum total (mg/L)	Yes	
CobaltTot	Short Text	Cobalt total (mg/L)	Yes	



Table name	Field name	Data type	Caption	Null (Y/N)
	IronTot	Number	Iron total (mg/L)	Yes
	AluminiumTot	Number	Aluminium total (mg/L)	Yes
	TSS	Number	Total Suspended Solids at 103-105°C (mg/L)	Yes

#### 4.1.2 Air Qual and Noise Level Tables

1. MonTown
2. AQNLMonPoints
3. AQM\_Avg
4. AQM\_SampGasLog
5. AQM\_SampPMLog1
6. NLM\_Avg
7. NLM\_IntAvg
8. NLM\_SampLog

Below are schemas of the tables of the tables

**Field type:** Long Integer, Short Integer, Text, Floating Point, etc...

**Alias:** Alternate field name (may contain spaces)

**Nulls:** Are null values allowed?

##### 4.1.2.1 MonTown

MonTown contains data relating to the towns where air and noise quality monitoring were undertaken. Town\_ID is the Primary Key and is linked to other air and noise quality tables as a Foreign Key.

Table name	Field name	Data type	Caption	Null (Y/N)
MonTown	Town_ID	Short text	Town Identification Number	No
	Town_Name	Short text	Name Of Town	No
	Section	Short text	Section Name	No
	Chiefdom	Short text	Chiefdom Name	No
	District	Short text	District Name	No
	Province	Short text	Province Name	No
	Dist_From_TransLine	Number	Approximate Distance From Transmission Line (KM)	No
	Longitude	Number	Longitude	No

##### 4.1.2.2 AQNLMonPoints

AQNLMonPoints contains information on the air and noise quality monitoring points, the area of monitoring (commercial/residential) and location. AQNLMon\_PID is the Primary Key and links to other tables as a Foreign Key.

Table name	Field name	Data type	Caption	Null (Y/N)
------------	------------	-----------	---------	------------



<b>AQNLMonPoints</b>	AQNLM_PID	Short text	Monitoring Point ID	No
	Point_Type	Number	Point Of Monitoring	No
	Latitude	Number	Latitude	No
	Longitude	Number	Longitude	No

#### 4.1.2.3 AQM\_Avg

AQM\_Avg contains the overall air quality averages of each monitoring point that was monitored during baseline data collection. AQM\_AvgID is the Primary Key.

Table name	Field name	Data type	Caption	Null (Y/N)
<b>AQM_Avg</b>	<b>AQM_AvgID</b>	Number	Air Quality Monitoring Sample Avg ID	Yes
	Town_ID	Short text	Town ID	Yes
	AQNLM_PID	Short text	Monitoring Point Identification Number	Yes
	PM2_5	Number	PM 2.5 (ug/m3)	Yes
	PM10	Number	PM10 (ug/m3)	Yes
	O3	Number	O3 (ug/m3)	Yes
	CO2	Number	CO2 (mg/m3)	Yes
	CO	Number	CO (ug/m3)	Yes
	VOC	Number	VOC (mg/m3)	Yes
	SO2	Number	SO2 (ug/m3)	Yes
	NO2	Number	NO2 (ug/m3)	Yes
	RelHumidity	Number	Relative Humidity (%)	Yes
	Temperature	Number	Temperature (°C)	Yes

#### 4.1.2.4 AQM\_SampGasLog

AQM\_SampGasLog contains the log interval averages of gaseous parameters for each monitoring point monitored during baseline data collection. AQM\_SampGasLogID is the Primary Key.

Table name	Field name	Data type	Caption	Null (Y/N)
<b>AQM_SampGasLog</b>	<b>AQM_SampGasLogID</b>	Number	Gases Air Quality Monitoring Sample Log ID	Yes
	Town_ID	Short text	Town ID	Yes
	AQNLM_PID	Short text	Monitoring Point Identification Number	
	Date	Date/Time	Sampling date	Yes
	AQMSampGasTime	Date/Time	Time of sampling	Yes
	O3	Number	O3 (ug/m3)	Yes
	CO2	Number	CO2 (mg/m3)	Yes



	CO	Number	CO (ug/m3)	Yes
	VOC	Number	VOC (mg/m3)	Yes
	SO2	Number	SO2 (ug/m3)	Yes
	NO2	Number	NO2 (ug/m3)	Yes
	RelHumidity	Number	Relative Humidity (%)	Yes
	Temperature	Number	Temperature (°C)	Yes

#### 4.1.2.5 AQM\_SampPMLog1

AQM\_SampPMLog1 contains the log interval averages of particulate matter parameters for each monitoring point monitored during baseline data collection. AQM\_SampPMLogID is the Primary Key.

Table name	Field name	Data type	Caption	Null (Y/N)
AQM_SampPMLog	AQM_SampPMLogID	Number	PM Air Quality Monitoring Sample Log ID	Yes
	Town_ID	Short text	Town ID	Yes
	AQNLMPID	Short text	Monitoring Point Identification Number	Yes
	Date	Date/Time	Sampling date	Yes
	AQMSampStart	Date/Time	Start time of sampling	Yes
	AQMSampEnd	Date/Time	End time of sampling	Yes
	PM_Type	Number	Particulate Matter Type	Yes
	SampAvg	Number	Sampling Average (mg/m3)	Yes
	MaxAvg	Number	Max (mg/m3)	Yes

#### 4.1.2.6 NLM\_Avg

NLM\_Avg contains the overall noise level averages of each monitoring point monitored during baseline data collection. NLM\_SampAvgID is the Primary Key.

Table name	Field name	Data type	Caption	Null (Y/N)
NLM_Avg	NLM_SampAvgID	Short text	Noise Quality Monitoring Sample Average ID	No
	AQNLMPID	Short text	Air Quality and Noise Level Monitoring Point ID	
	Town_ID	Short text	Town ID	No
	AQNLMPID	Short text	Monitoring Point Identification Number	
	NQMAvgPoint_Type	Number	Monitoring Point Type	No
	PeriodOfDay_Type	Number	Sampling period of day	Yes
	Laeq	Number	LAeq (dB)	Yes
	La90	Number	LA90 (dB)	Yes





	LA10	Number	LA10 (dB)	Yes
	LAFMax	Number	LAFMax (dB)	Yes
	LAFMin	Number	LAFMin (dB)	Yes

#### 4.1.2.7 NLM\_IntAvg

NLM\_IntLog contains the interval averages of noise levels for each monitoring point monitored during baseline data collection. NLM\_SampIntID is the Primary Key.

Table name	Field name	Data type	Caption	Null (Y/N)
NLM_IntAvg	NLM_SampIntAvgID	Number	Noise Quality Monitoring Sample Interval ID	No
	Town_ID	Short text	Town ID	No
	AQNLMPID	Short text	Monitoring Point Identification Number	No
	NLM_StartDate	Date/Time	Start Date of sampling	Yes
	NLM_EndDate	Date/Time	End Date of sampling	Yes
	NLM_Start	Date/Time	Start time of sampling	Yes
	NLM_End	Date/Time	End time of sampling	Yes
	NLM_Duration	Date/Time	Duration of sampling	Yes
	Laeq	Number	LAEq (dB)	Yes
	La90	Number	LA90 (dB)	Yes
	LA10	Number	LA10 (dB)	Yes
	LAFMax	Number	LAFMax (dB)	Yes
	LAFMin	Number	LAFMin (dB)	Yes

#### 4.1.2.8 NLM\_SampLog

NLM\_SampLog contains the log averages of noise levels for each monitoring point monitored during baseline data collection. NLM\_SampLogID is the Primary Key.

Table name	Field name	Data type	Caption	Null (Y/N)
NLM_SampLog	NLM_SampLogID	Number	Noise Quality Monitoring Sample Log ID	Yes
	Town_ID	Short text	Town ID	Yes
	AQNLMPID	Short text	Monitoring Point Identification Number	Yes
	NLM_Date	Date/Time	Date of sampling	Yes
	NLM_LogStart	Date/Time	Start time of Measurement	Yes
	NLM_LogEnd	Date/Time	End time of Measurement	Yes
	Laeq	Number	LAEq (dB)	Yes
	La90	Number	LA90 (dB)	Yes
	LA10	Number	LA10 (dB)	Yes
	LAFMax	Number	LAFMax (dB)	Yes



	LAFMin	Number	LAFMin (dB)	Yes
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USER GUIDE





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