Grid Event Signature Library Reader

1.0 Accessing the GESL Dataset

Grid Event Signature Library (GESL) is an extensive repository of publicly available anonymized power grid field measurements. Users can access, visualize and download data from the GESL website.

To access data, users must first create an account on the GESL website. To extract data, the user will need their account email and the API Key provided by GESL. To obtain the API Key:

1. Log in to your GESL account.
2. Navigate to the “Application” tab at the top of the page.
3. Select “API” from the drop-down menu.
4. The API Key can be copied from the top section of the page, as shown in Figure 1.

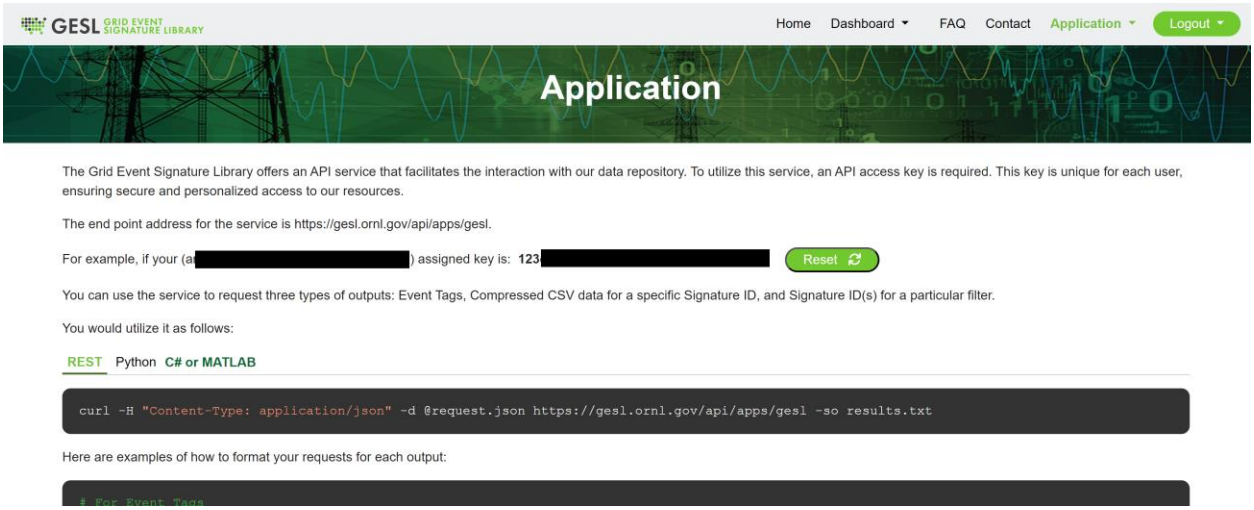

Figure 1: Getting API Key from GESL website

One option for downloading data is directly from the website using the "Dashboard" option, which is located at the top of the GESL homepage. If you are interested in accessing the source code for extracting GESL data, it can be found under the "API" option in the "Applications" tab. The source code is available in Python, REST, MATLAB, and C#.

An alternate option for filtering and downloading data is to use **the GESL Reader** graphical user interface (GUI). The GESL Reader can be downloaded by visiting GESL Connectors on GitHub. The website can also be accessed by going to the API option in the “Application” tab, and then selecting “MATLAB or C#”.

2.0 The GESL Reader

This chapter describes features of the GESL Reader and procedure to download the target dataset. The user interface of the GESL reader in displayed in Figure 2.

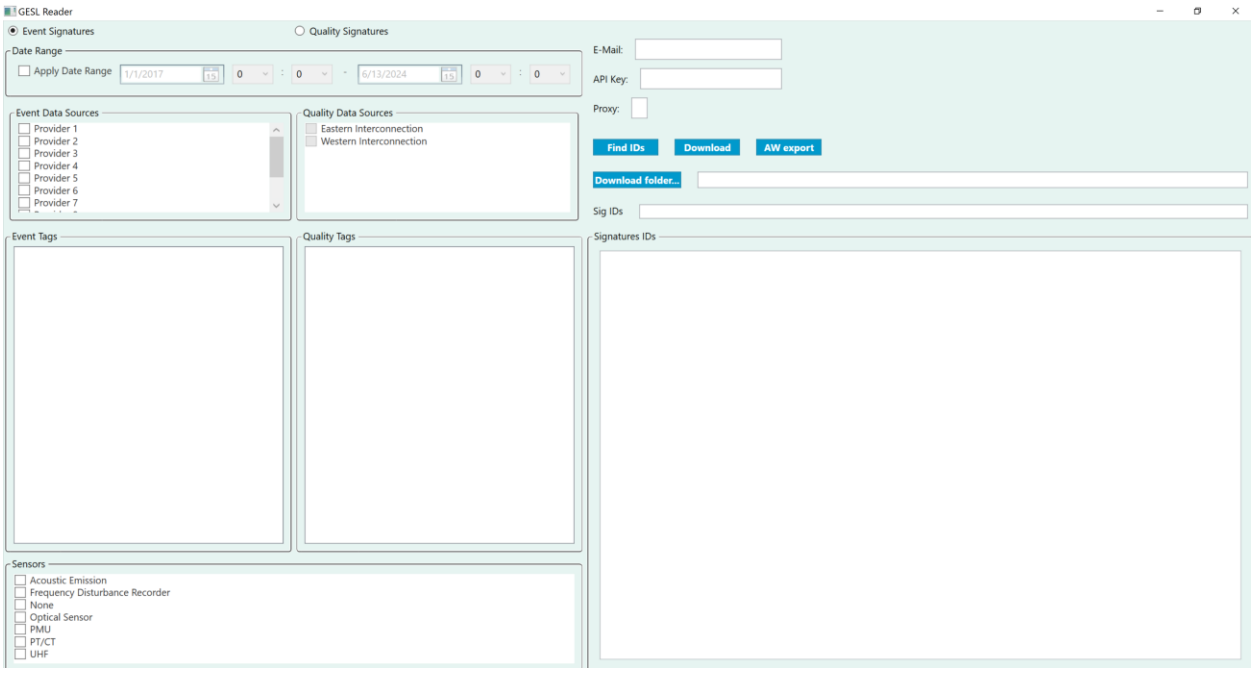

Figure 2: GESL Reader – User Interface

The GESL Reader authenticates the user, filters datasets based on user inputs, and exports the data. The following sections provide detailed explanations of these tasks.

2.1 Authenticating the User

The GESL Reader authenticates the user using their email and API Key. Ensure you have created an account on the GESL website and obtained your API Key (see Chapter 1). Enter your GESL account email and API Key into the GESL Reader, as shown in Figure 3.

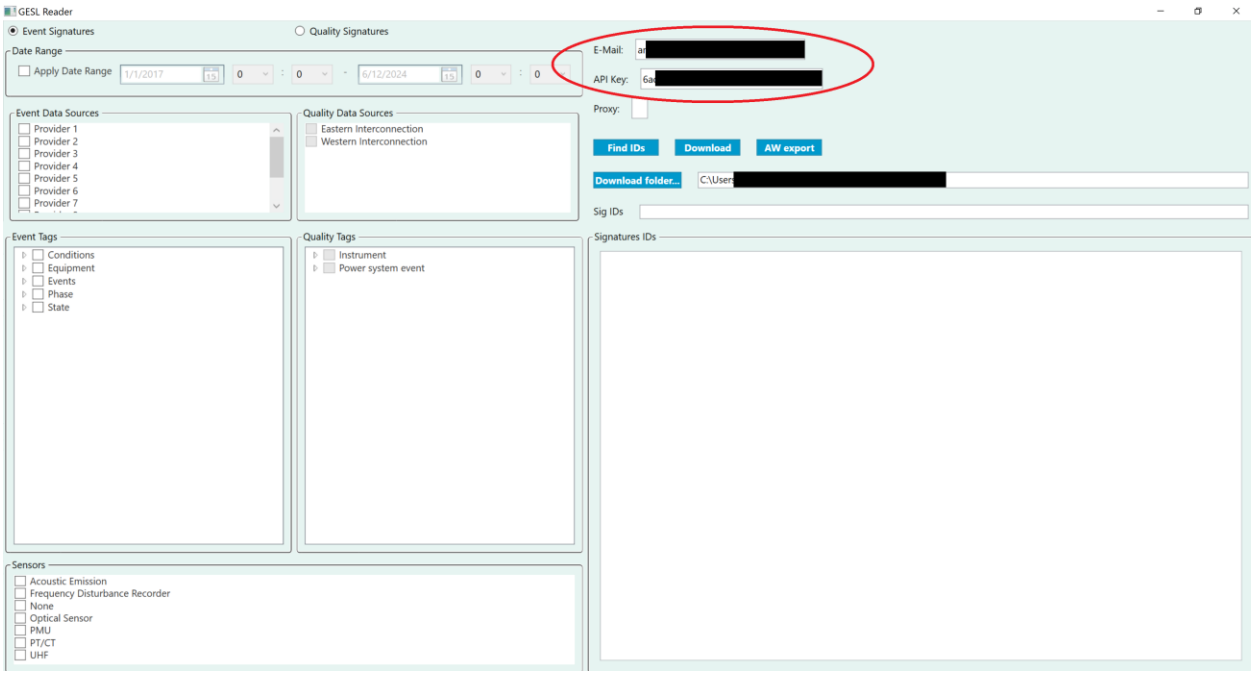

Figure 3: Input email and API Key

After this step, the user can proceed to select the data that they want to extract.

2.2 Data Selection by User Input

The GESL dataset is extensive, making a full download impractical due to storage requirements. The GESL Reader allows users to filter and select specific datasets. This section explains the process of refining the target dataset based on user inputs.

2.2.1 Event Signatures and Data Quality Signatures

The GESL dataset comprises two main types: Event Signatures and Data Quality Signatures. Select the desired type using the toggle at the top left of the GESL Reader.

When the Event Signature toggle is selected, related options such as event data sources, event tags, and sensors are highlighted in Figure 4.

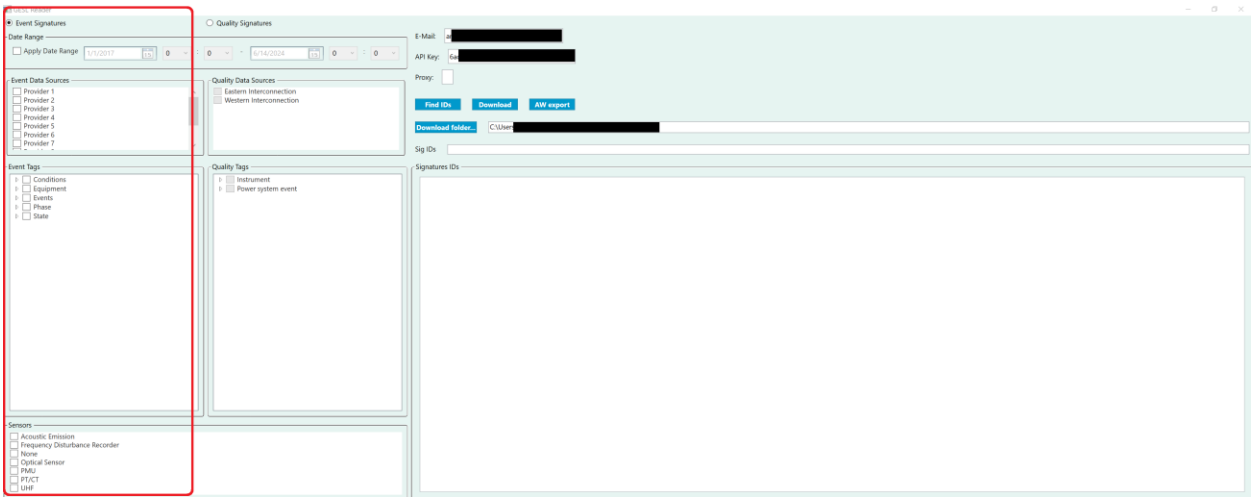

Figure 4: Event Signature Options

If the Quality Signature toggle is selected, the corresponding sources and tags are highlighted, as shown in Figure 5.

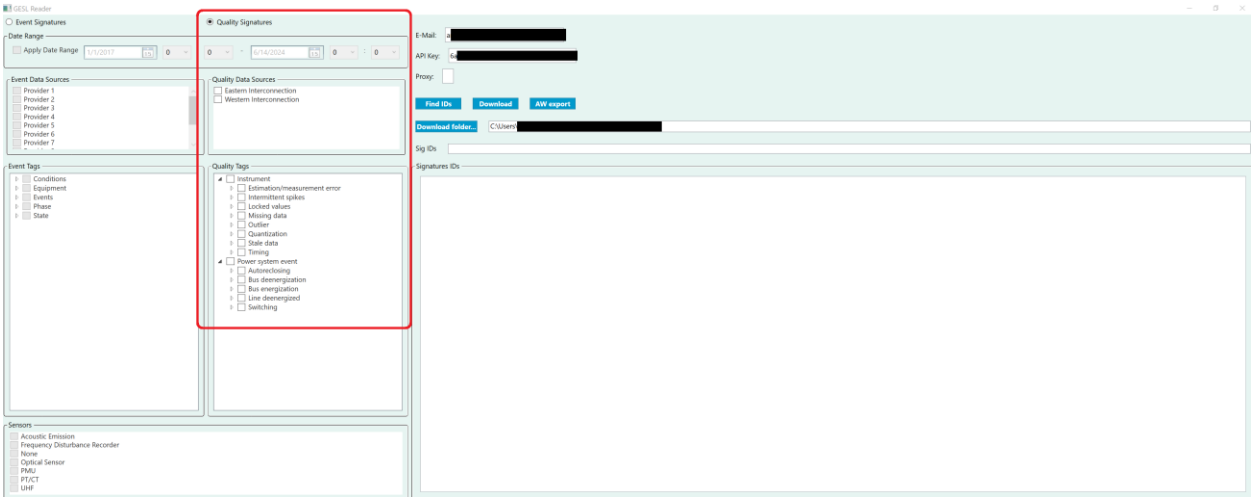

Figure 5: Quality Signature Options

2.2.2 Additional User-driven Data Filtering

After choosing between Event Signature data and Quality Signature data, users can apply additional filters to narrow down the target dataset. These filters include date range, data sources, tags, and sensors. Users are not required to select these filters; if left unselected, the data will not be filtered by that criterion. Detailed explanations of these filters are provided below.

The “Date Range” filter applies to both event and quality signature data. Selecting an invalid date range (start date later than the end date or date range in which data is not available) will result in no data being returned. The second filter available for the user is the “Data Sources”. Event data comes from 11 different sources, labeled as Provider 1 to Provider 11. For Quality Data Sources, there are two sources, eastern interconnection and western interconnection.

Records in the GESL use a hierarchical tagging scheme, and the tags can help users download only a subset of the library of interest to their use-cases. In the GESL Reader, users can explore Event Tags by clicking on a parent tag to reveal its child tags, doing this iteratively. Multiple events tags may be selected at the same time.

After selecting the required filter options, the user should click on the “Find IDs” button on the right as shown in Figure 6.

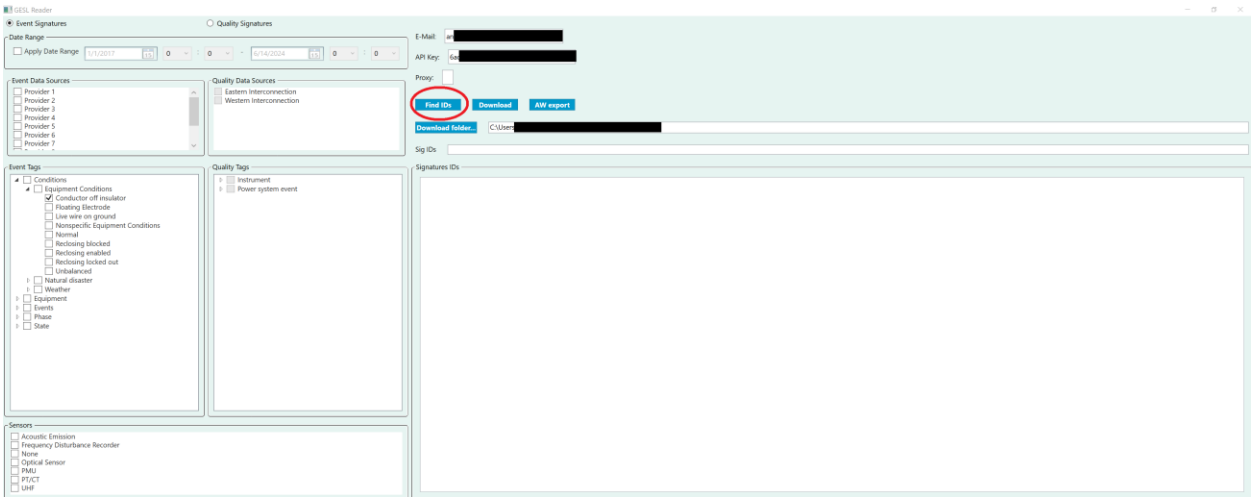

Figure 6: Applying filter options using "Find IDs" button

Upon clicking this “Find IDs” button, GESL Reader finds the event IDs based on tags, date, sensors (only for event data), and data sources. It then identifies all the signature IDs that are mapped to these event IDs. Finally, the GESL Reader displays the signature IDs on the Signature IDs section on the right as shown in Figure 7.

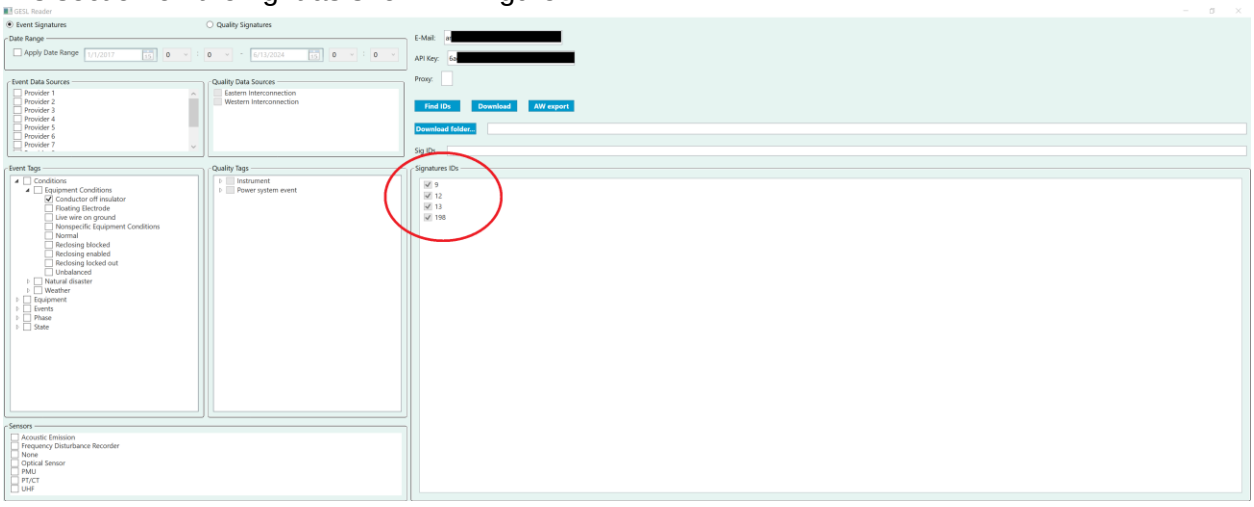

Figure 7: Signature IDs found using filters

The corresponding data for these signature IDs is then extracted and ready to download. The next section explains the data downloading process.

2.3 Exporting the Output Dataset

After data is successfully extracted, the final step is to export the dataset. The user needs to provide the Download Folder information as highlighted in Figure 8.

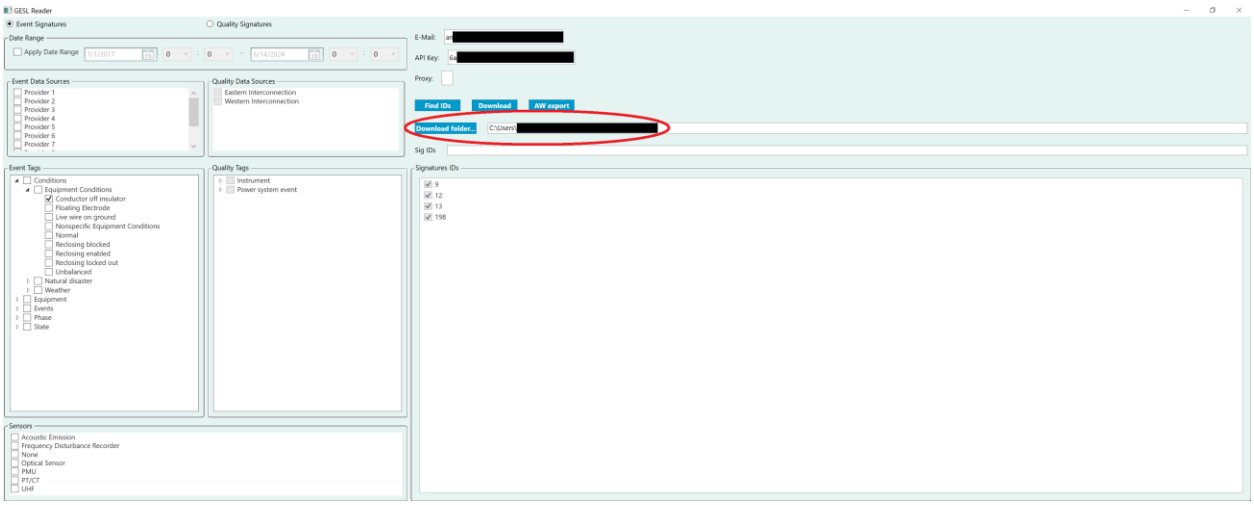

Figure 8: Download Folder

Finally, clicking the Download button will extract selected events as CSV files in the user-specified folder.

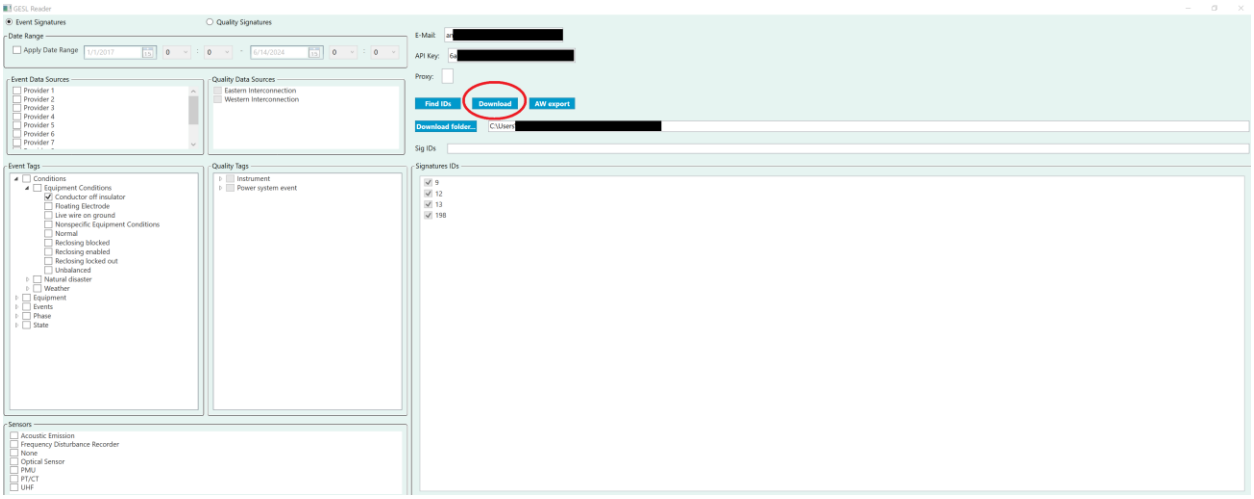

Figure 9: Download button in GESL Reader

The GESL reader also includes the capability to download a XML file for seamless integration with data-handling pipelines in Archive Walker, an open-source synchrophasor data processing software developed at PNNL. This can be done by clicking the ‘AW Export’ button as shown in Figure 10.

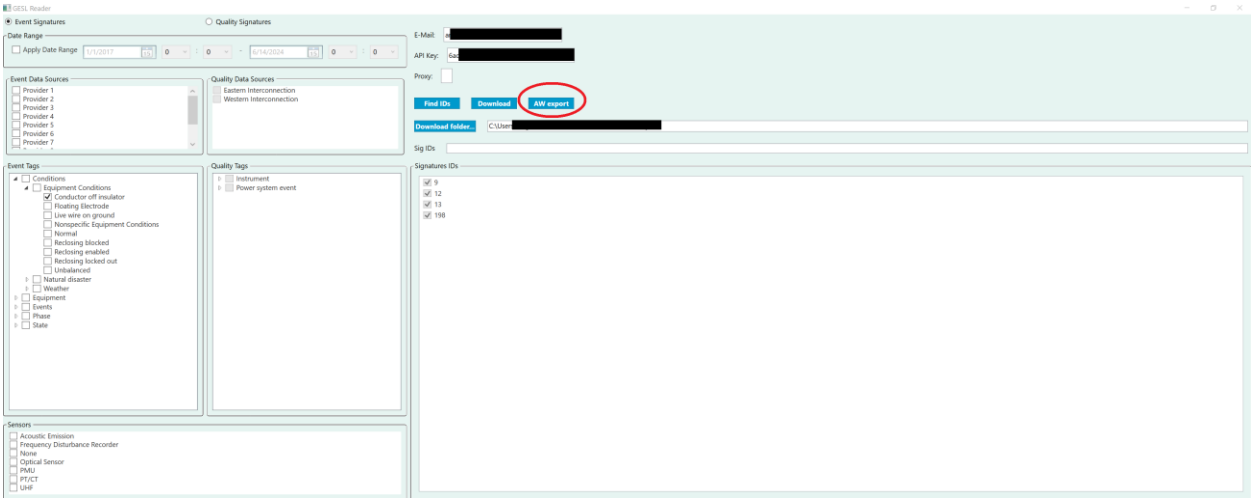

Figure 10: AW Export

Users can then utilize the downloaded data with their preferred software, such as Python or MATLAB, for further analysis and research.