AgileAssets - Roads and Highways LRS Interface

User's Guide

6/9/2017

Revisions

Date	Author	Description
May 2015	Phil Hardy	Initial release
May 2016	Phil Hardy	Updated links to Esri help pages to version 10.3.1. Updated snapshots of AgileAssets screens to version 7.1. Added configuration step to install native FGDB libraries. Added configuration step to make a table temporal. Added lists of reasons to the Invalid reports.
June 2017	Phil Hardy	Updated links to Esri help pages to version 10.5. Updated registering external events to match 10.4 and 10.5. Updated to explain extra fields on the LRS Interface Setup window. Updated Test Mode reports section to include possible error text messages. Added link to Troubleshooting web page.

Table of contents

1 Introduction

Location is an important aspect of an asset management system. In order to decide **how** to best spend limited transportation management funds, it is important to know **where** these funds are needed. That is why the maintenance of asset linear locations is so important.

Esri Roads and Highways is an example of the new breed of single-source linear referencing system (LRS) maintenance tools. That is, it is designed to update not only the road network but also the linear location of all assets and events associated with that network. The Roads and Highways system works by using the editor to make changes to the roadway network and the system automates the update of linear locations for assets and events. This is a powerful way to maintain locations because one single LRS edit can easily necessitate hundreds of asset location edits.

The interface described in this document uses the web services that Roads and Highways provides in order to maintain the linear locations within the AgileAssets system. That way, even though the AgileAssets system and Roads and Highways are separate, they work together to maintain these locations.

1.1 Prerequisites

The following items are required to run this interface:

- A working, licensed implementation of the AgileAssets system
- A working, licensed implementation of the AgileAssets - Roads and Highways interface
- A working, licensed implementation of ArcMap
- A working, licensed implementation of Esri Roads and Highways (desktop version)
- A working, licensed implementation of ArcGIS Server
- A working, licensed implementation of Esri Roads and Highways (server version)
- Open communication between the systems being interfaced. This includes the following:
    - The ability to make a connection between tables in the AgileAssets Oracle schema and ArcCatalog. This is used to register the events-to-be-updated as external events to Roads and Highways and to create and operate the Relocate Events web services.
    - The ability of the AgileAssets system to call web services on the ArcGIS Server. This is to make calls to the Roads and Highways Export Network and Relocate Events web services.
    - The ability of the AgileAssets system to copy files from the ArcGIS Server. This is to copy the results of the Roads and Highways Export Network and Relocate Events web services.

- At the time that the system goes live, the LRS in AgileAssets, the asset locations in the AgileAssets system, and the LRS in Roads and Highways must be synchronized.
  - This means both the LRS data and the Linear Referencing Method (LRM) definitions must be compatible between the systems. Without the data synchronization, the data can become corrupted. Without the LRM synchronization, the interface may not function.
  - At the time the system goes live, the asset locations in the AgileAssets system must be synchronized with the LRS in the AgileAssets system. This means that all asset locations are locatable on the LRS and their locations are correct. If the asset locations are not synchronized, it may mean that either the LRS, the asset locations, or both are corrupted.

2 Configuration of the Interface between the Systems

The basics steps are:

1. Configure the interface on the AgileAssets system.
2. Configure LRMs on the AgileAssets system.
3. Make a connection between ArcCatalog and the AgileAssets system.
4. Register External Events with Roads and Highways.
5. Register the Roads & Highways database with ArcGIS Server.
6. Create the Roads and Highways Export Network web service.
7. Create the Roads and Highways Relocate Events web services.
8. Complete the interface configuration on the AgileAssets system.
9. Install native FGDB libraries
10. Make at least one event table temporal

In rare cases there is another configuration step that may be needed beyond those above. That is expanding the list of excluded event tables. The list of pre-configured excluded event tables contains those tables whose location data is maintained in a different manner than normal event tables. But event tables can be added to this list if you never want them to be updated. In those cases contact AgileAssets support for assistance.

2.1 Configure the Interface on the AgileAssets System

On most systems, the configuration page for this interface is located at System > LRS Mgmt. > Roads & Highways Interface > LRS Interface Setup. It is divided into three panes, Export Network Setup, Relocate Events Setup - Event Categories, and Relocate Events Setup - Member Tables.
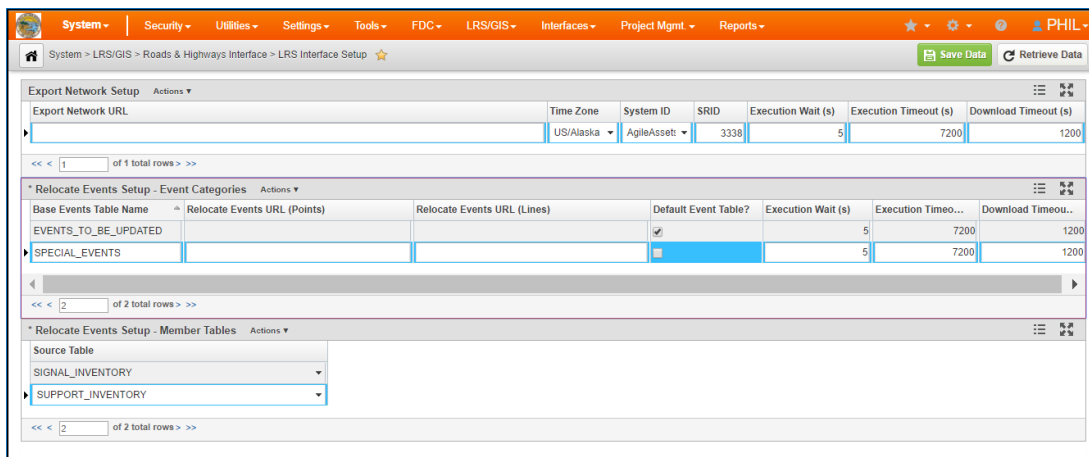

Figure 1   AgileAssets LRS Interface Setup window

The **Export Network Setup** pane (top pane) configures the part of the interface that imports the LRS. Note that there is one and only one record for this pane. You can modify the following fields:

- Export Network URL – This is the URL of the Roads and Highways Export Network web service. This can be left blank at this point in the configuration.
- Time Zone – Set this to match the time zone configured in the Roads and Highways instance.
- System ID – Pick the system associated with the base LRM being updated by the interface.
- SRID – This number indicates the map projection used for the Network in Roads & Highways. A full list of these map projections is stored in the mdsys.cs_srs table in Oracle.
- Execution Wait (s) – Then number of seconds the system waits before checking job status of the web service job again. The standard is 5 seconds.
- Execution Timeout (s) – The number of seconds the system will wait from when the web service job is submitted until the job is finished. The standard is 7200 seconds (2 hours).
- Download Timeout (s) – The number of seconds the system waits for the download of the web service job results to complete. The standard is 1200 seconds (20 minutes).

The **Relocate Events Setup - Event Categories** pane (middle pane) configures different event categories and allows you to select which event tables belong to each category in the following pane. Categories can be configured for each different set of event behaviors that you want to employ for different event tables.

> Note: To insert or delete a field in this pane, the database privileges assigned to the AgileAssets application must be set to allow the creation and deletion of tables.

The views created by this pane are the views that need to be registered with Roads and Highways and used in the creation of Relocate Events web services. You can insert records into this pane and modify the following fields:

- Base Events Table Name – This is the base name of the two views created when a record is inserted in this pane. This base name will have "_PTV" appended to it for point events and "_LNV" appended to it for linear events.
- Relocate Events URL (Points) – This is the URL of the Roads and Highways Relocate Events web service for the point events associated with this category. This can be left blank at this point in the configuration.
- Relocate Events URL (Lines) – This is the URL of the Roads and Highways Relocate Events web service for the linear events associated with this category. This can be left blank at this point in the configuration because it is addressed in the Complete Interface Configuration on the AgileAssets System step.
- Default Event Table? – By checking this option it means that all event tables that are not specifically assigned to other categories will automatically be assigned to

this category. There can be no more than one category with the default event table option checked. So check this field if this is the default event category.

- Execution Wait (s) – Then number of seconds the system waits before checking job status of the web service job again. The standard is 5 seconds.
- Execution Timeout (s) – The number of seconds the system will wait from when the web service job is submitted until the job is finished. The standard is 7200 seconds (2 hours).
- Download Timeout (s) – The number of seconds the system waits for the download of the web service job results to complete. The standard is 1200 seconds (20 minutes).

The **Relocate Events Setup - Member Tables** pane (bottom pane) configures which event tables are associated with each category in the Event Categories pane. The user first selects a category in the middle pane and then can enter the following field to be assigned to that category:

- Source Table – The user can insert from the pick list of event tables that they want associated with the selected event category. Each event table can be associated with at most one category. If the category chosen in the middle pane is the default category do not fill in any records in this field.

2.2 Configure LRMs on the AgileAssets System

This step correlates the LRMs in the AgileAssets system with the Networks implemented in Esri Roads and Highways. To configure this, navigate to the LRM Setup page which, on most systems, is located at **System > LRS Mgmt. > Setup > Location Referencing Methods (LRMs)**. For each LRM in the LRSs pane identify the number assigned to it on the Roads and Highways system in the dLRSNetworks domain and enter that number in the Net_LRM_ID field in the AgileAssets LRM Setup window. (Note: the Net_LRM_ID field may not be visible in the top pane. You must open design mode to add this field and then make it visible and editable.)

Figure 2   AgileAssets LRM Setup Window

Also, in cases where an LRM has more than one route identification field (marked as Location Attribute in the bottom screen) you may need to assign each of these fields a value in the Net_Order_ID field. This specifies the preferred order of the route identification fields. [Note: the Net_Order_ID field may not be editable in the bottom pane. You may have to go into design mode to make it editable.]

2.3 Make a Connection between ArcCatalog and the AgileAssets System

In ArcCatalog, make a database connection to the Oracle instance underlying the AgileAssets implementation. The directions for creating an Oracle database connection can be found on the Esri website at http://desktop.arcgis.com/en/arcmap/latest/manage-data/gdbs-in-oracle/connect-oracle.htm.
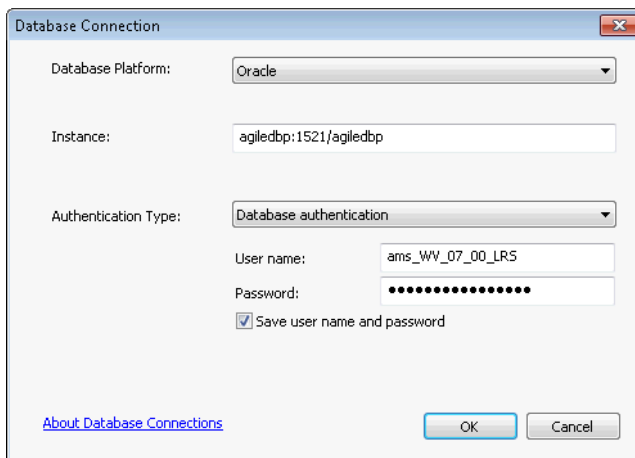
Figure 3   Esri Database Connection dialog box

2.4 Register External Events with Roads and Highways

For each record entered into the **Relocate Events Setup - Event Categories** pane of the LRS Interface Setup window on the AgileAssets system, you will have two External event views that must be registered to the Advanced Linear Referencing System (ALRS). The names of the External Event views are created from the Base Events Table Name field of each record plus "_PTV" appended to it for point events and "_LNV" appended to it for linear events.

The directions for registering External events to Roads and Highways can be found on the Esri website (http://desktop.arcgis.com/en/arcmap/latest/extensions/roads-and-highways/registering-an-external-event-source.htm). Make sure to complete the following:

- Register the "_PTV" events as point events and the "_LNV" events as linear events.
- These event views should be registered as External events.

• Point events only need the MEASURE field assigned to its single measure.
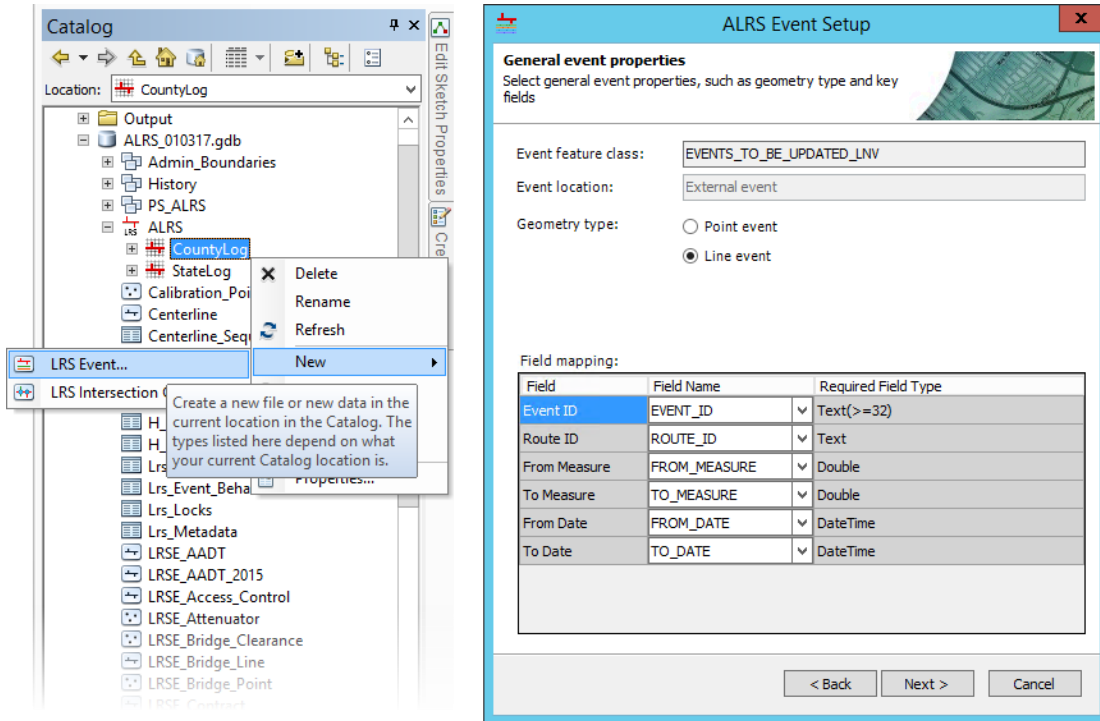
Figure 4   Esri ALRS Event Setup dialog box

2.5 Register the Roads & Highways database with ArcGIS Server

In almost all cases this step will have already been done, but it is listed here for completeness. However, the instructions for registration can be found on the Esri website (http://server.arcgis.com/en/server/latest/publish-services/windows/registering-your-data-with-arcgis-server-using-manager.htm).

2.6 Create Roads and Highways Export Network Web Service

There are two main steps to creating the Export Network web service. First you must run the geoprocess, and then share the results of that geoprocess as a web service.

The directions for running the geoprocess and creating the web service can be found on the Esri website (http://desktop.arcgis.com/en/arcmap/latest/extensions/roads-and-highways-server/deploying-network-export-tool-as-a-service.htm).

1. In the **Export Network** dialog, select the base LRM of the AgileAssets system.
2. When specifying the Output Export File make sure to include a full name with a directory path (e.g. C:\Temp\Export).
3. Select **FGDB** for output format.

4. Select the precision (number of digits to the right of the decimal point) that matches the precision of measures in the Setup_Network_Lines table in the AgileAssets system.
5. The LRM Translations value must be a comma-delimited list of the numbers that Roads and Highways assigns to the networks that correspond to any alternate LRMs in the AgileAssets system. These numbers are listed in the dLRSNetworks domain.
6. Leave the following fields blank: Last Invoked Time, LRS Time, Last LRS Time, and Output Spatial Reference WKID.
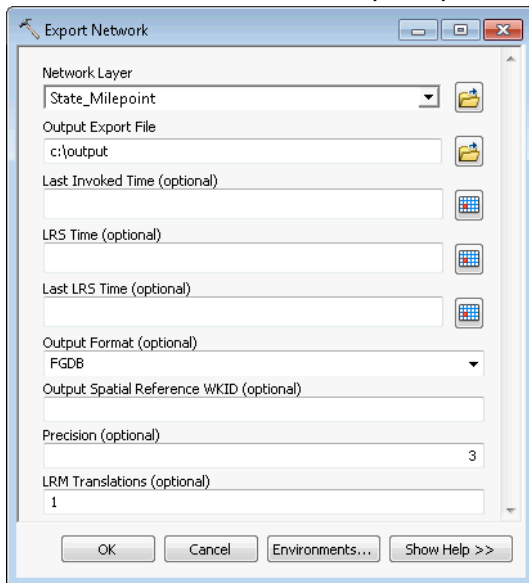
Figure 5   Esri Export Network dialog box

2.7 Create Roads and Highways Relocate Events Web Services

Create a Relocate Events web service for each External event registered in the Register External Events with Roads and Highways step. There are two main steps to creating a Relocate Events web service. First, you must run the geoprocess, and then share the results of that geoprocess as a web service. Both steps must be run for each registered External event.

The directions for running the geoprocess and creating the web service can be found on the Esri website at http://desktop.arcgis.com/en/arcmap/latest/extensions/roads-and-highways-server/deploying-relocate-event-tool-as-a-service.htm. Enter the network that corresponds to the base LRM in the AgileAssets system into the Network Layer. Select the Event Name for the external event associated with this iteration. Select CSV for the output format. And when specifying the Output Export File make sure to include a full name with a directory path (e.g. C:\Temp\Rel_Events_Pt).

Suggestion: when creating the web service and using the **Service Editor** dialog, under **Parameters** you may want to pick a Message Level of "Info" as this provides more meaningful error messages.
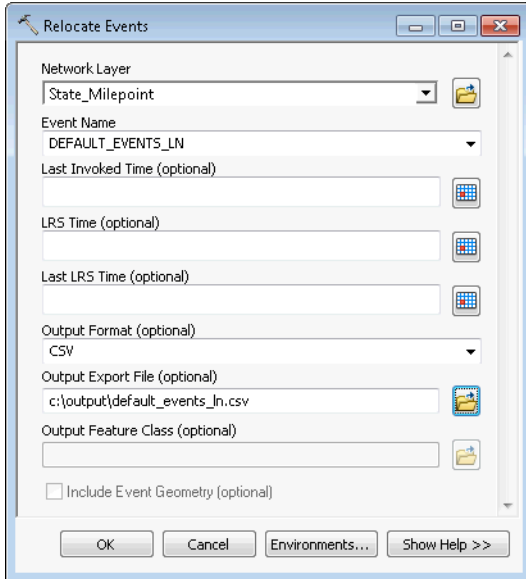
Figure 6   Esri Relocate Events dialog box

2.8 Complete Interface Configuration on the AgileAssets System

On the AgileAssets system, return to the LRS Interface Setup window which on most systems is at **System > LRS Mgmt. > Roads & Highways Interface > LRS Interface Setup**. Use the following instructions to fill in the URLs that were left empty in an earlier step.
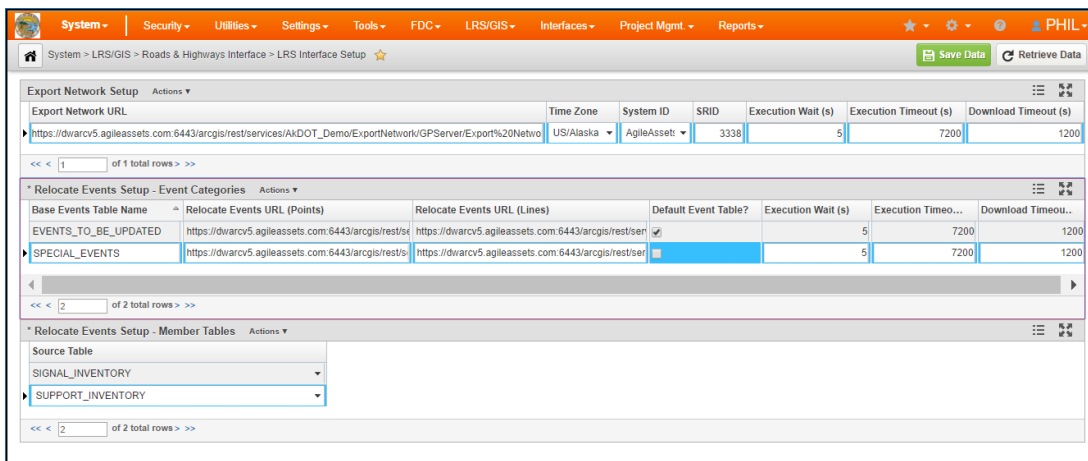
Figure 7   AgileAssets LRS Interface Setup window

In the Export Network URL field on the top pane, enter the URL associated with the Export Network web service that you created. To find the URL to enter here, do the following:

- In a separate browser page, visit the ArcGIS Server Manager website for this instance.
- Inside ArcGIS Server Manager, go to **Services > Manage Services**.
- On this page, choose the folder where you placed the web service, and then click the **Export Network** web service (or whatever you named your service in the Create Roads and Highways Export Network Web Service step).
- Click **Capabilities** on the left-hand panel.
- Click the URL next to the phrase "Rest URL".
- Click the phrase **Export Network** under the heading **Tasks:**.
- Copy the URL from the address bar of the browser, and paste it into the **Export Network URL** field of the LRS Interface Setup page.
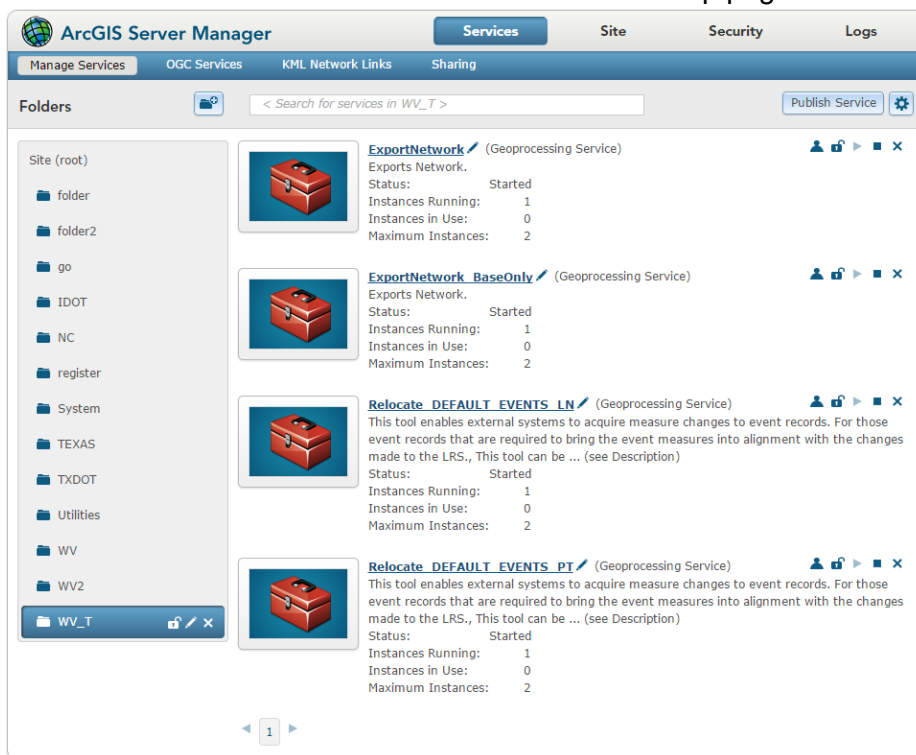
Figure 8   Esri Manage Services Web Page in ArcGIS Server

In the **Relocate Events URL (Points)** field and in the **Relocate Events URL (Lines)** field on the middle pane, enter the URL associated with the Relocated web services that you created for each of these event categories. To find the URL to enter here, do the following for each event category:

- In a separate browser page, open the ArcGIS Server Manager website for this instance.
- Inside ArcGIS Server Manager, go to **Services > Manage Services**.
- On the new page, choose the folder where you placed the web service, and then click the **Relocate Events** web service you are working on.
- Click **Capabilities** on the left panel.

- Click the URL next to the phrase **Rest URL**.
- Click the phrase **Relocate Events** under the heading **Tasks:**.
- Copy the URL from the address bar of the browser, and paste it into the appropriate **Relocate Events URL** field of the LRS Interface Setup page.

2.9 Install native FGDB libraries

One of the outputs of ESRI's Roads & Highways web services is an ESRI File GeoDatabase (FGDB). In order for our system to be able to read ESRI File GeoDatabases, native libraries must be installed.

For Linux-based servers, these libraries are named:

- libfgdbunixrtl.so – This library is written and provided by ESRI, as part of the File GeoDatabase API, v. 1.4.
- libFileGDBAPI.so – This library is written and provided by ESRI, as part of the File GeoDatabase API, v. 1.4.
- libcore.so – This library is written and provided by AgileAssets and depends on the other libraries provided by ESRI.

For Windows-based servers, these libraries are named:

- Esri.FileGDBAPI.dll – This library is written and provided by ESRI, as part of the File GeoDatabase API, v. 1.4.
- FileGDBAPID.dll – This library is written and provided by ESRI, as part of the File GeoDatabase API, v. 1.4.
- FileGDBAPI.dll – This library is written and provided by ESRI, as part of the File GeoDatabase API, v. 1.4.
- core.dll – This library is written and provided by AgileAssets and depends on the other libraries provided by ESRI.

The implementation steps are as follows:

1. Obtain the AgileAssets libraries. The choice of AgileAssets libraries are provided above. Contact AgileAssets support and provide them with operating system details of your server.
2. Obtain the ESRI libraries. The Esri libraries are provided on Esri's download page.

   - Go to http://www.esri.com/apps/products/download/index.cfm?fuseaction=#File_Geodatabase_API_1.4
   - Download the appropriate package for the required operating system.

- Unpack the package.
- Find the required libraries in the FileGDB_API/lib directory.

3. Install the libraries. Create a directory on the application server and put all required libraries (from both Esri and AgileAssets) in that directory. Make note of the directory name. For the examples below we used /usr/local/tomcat/geo_libs.

4. Create a script that lets the application server know the whereabouts of these libraries. Replace "/usr/local/tomcat/geo_libs" in the directions below with the location of your libraries as appropriate.

For Linux:
- If a file named setenv.sh does not exist in the Tomcat bin directory, then create it and make it executable.
- For Linux, add ONE of these lines to setenv.sh:
  - For versions of Java below 7 and if LD_LIBRARY_PATH is already set on the system:
    > LD_LIBRARY_PATH=$LD_LIBRARY_PATH:/usr/local/tomcat/geo_libs
  - For versions of Java below 7 and if LD_LIBRARY_PATH is not already set on the system:
    > LD_LIBRARY_PATH=/usr/local/tomcat/geo_libs
  - For Java 7 and above, the LD_LIBRARY_PATH needs to be exported and set this way:
    > export LD_LIBRARY_PATH="/usr/local/tomcat/geo_libs"
    > export LD_LIBRARY_PATH=/usr/local/lib:${LD_LIBRARY_PATH}
    > JAVA_OPTS="-Djava.library.path=/usr/local/tomcat/geo_libs"

For Windows:
  - If a file named setenv.bat does not exist in the Tomcat bin directory, then create it and make it executable.
  - Add this line to setenv.bat:
    > Set PATH = %PATH%;\usr\local\tomcat\geo_libs

5. Restart Tomcat.

2.10 Make at least one event table temporal

Because Roads and Highways keeps track of the dates associated with each edit the AgileAssets side of the interface needs to have fields to store this data. Those fields are created when at least one linearly-referenced table is set to "Keep Change History".
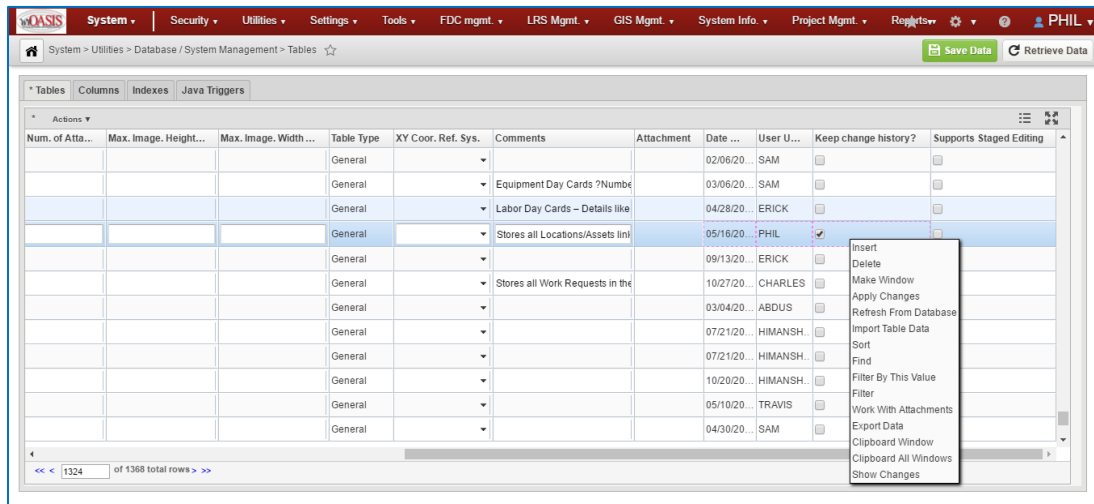
Figure 9   AgileAssets Tables window

The steps to make a table temporal are as follows:

1. Go to **System > Utilities > Database/System Management > Tables** (or wherever this window is on your implementation.
2. Find a linearly-referenced table (one that has route and measures) and select its row in the table.
3. Scroll to the far right of the window and place a check mark in the **Keep Change History** checkbox.
4. Right-click the row to bring up the context menu and select **Apply Changes**.
5. A dialog may appear asking you to give a beginning birth date for your existing records in this table. By default it is 1/1/1900. Give it a date of your choosing and click **OK**.
6. Next a dialog will appear asking if it is OK to process the script needed to make the table temporal. Click **OK**. This process will likely take several minutes depending on the number of records in the table.
7. After the script completes click the **Save Data** button and this task is complete.

3 Workflow Overview

The suggested workflow is shown in the following diagram. The top row of the diagram is what takes place inside Roads and Highways. The bottom half is what takes place inside the AgileAssets system.
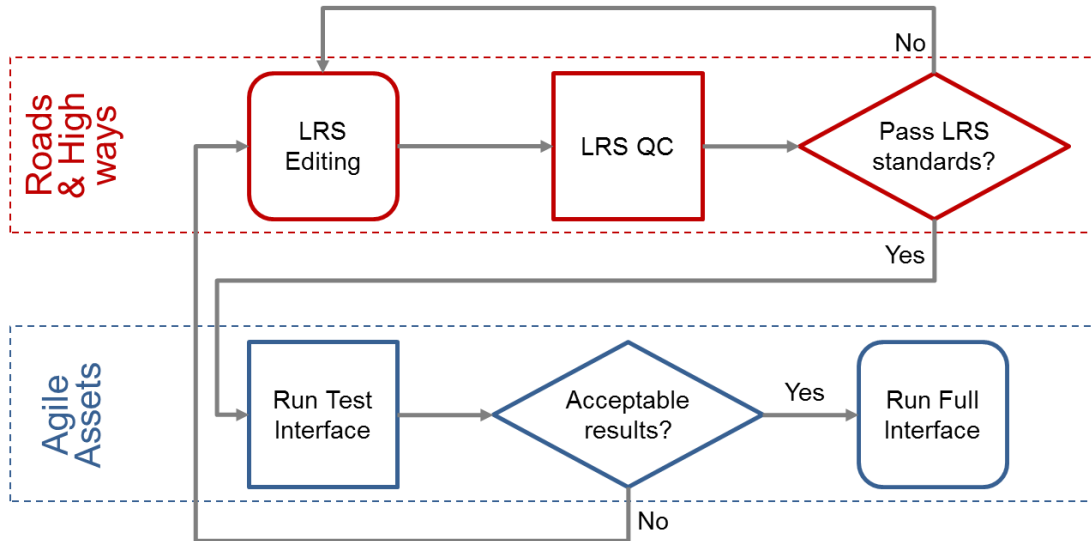
Figure 10   AgileAsset-Roads and Highways LRS Interface Workflow

Notice in the bottom half that there is both a Test Interface and a Full Interface. The Test Interface makes the calls to the Roads and Highways web services and loads the results into buffer tables that are separate from the rest of the AgileAssets system. This allows you to compare current locations with proposed locations prior to committing the change. If, during this review, you notice unintended changes then this comparison review will allow you to alert the LRS editors to a potential problem and allows them to make corrections. Once you are satisfied with the results of the review, the Full Interface can be run. This updates both the LRS and asset locations on the AgileAssets system.

4 Workflows Steps – Test Mode

4.1 Running the Test Mode Interface

To start the Test Interface, go to **System > Tools > System Job > Schedules**. Then scroll down and select **Roads & Highways Interface – Test Mode**. Right-click, and select **Run Job**.
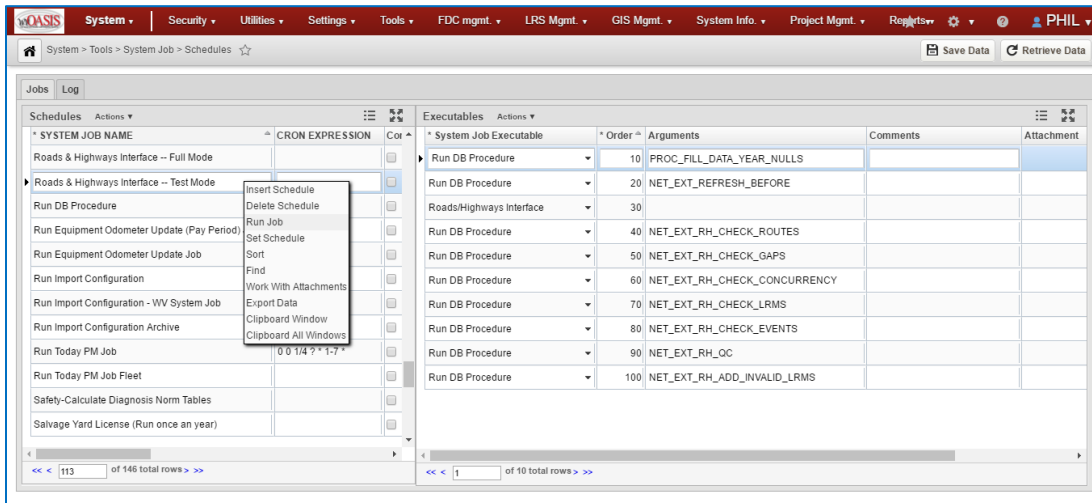
Figure 11   AgileAssets System Job Schedule Window

The time to run the job may vary significantly, but a range of 15 to 40 minutes is typical. You can either keep the window open to see status messages or hide the window and continue using the system for other purposes. If you choose to hide the window, you will see a message via the system when the job is complete. If you keep **Roads & Highways Interface – Test Mode** selected and click the **Log** tab, you will see the messages produced by the job.
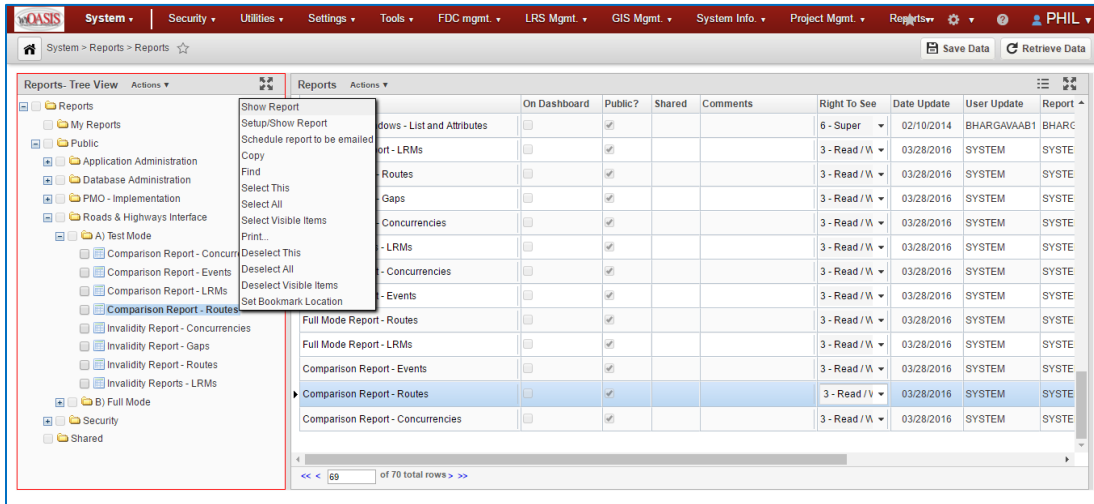
Figure 12   AgileAssets Reports Window

When the job is complete, you can review the comparison reports by going to **System > Reports > Reports**. Then, in the left pane find **Reports > Public > Roads & Highways Interface > A) Test Mode** to see list of comparison and invalidity reports. Right-click on a report and select **Show Report**. This will display a new browser page with the report. The report can then be downloaded in various formats.
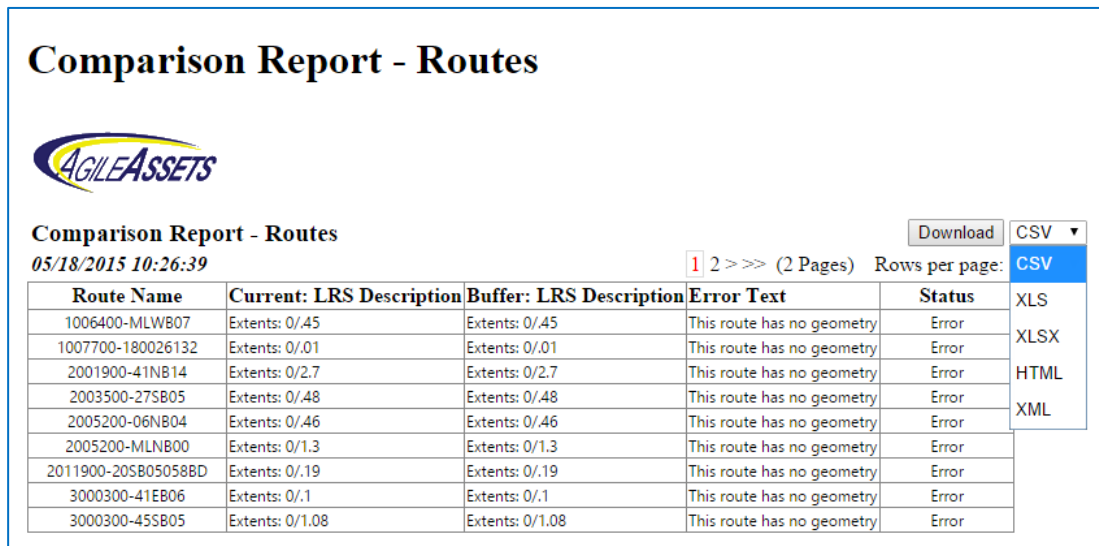
Figure 13   Comparison Report for Routes

There are eight test mode reports, and they are described below. The criteria to evaluate the results in these reports is up to the user. A general criteria of a successful test mode run is as follows:

- No event location edits are made that are not wanted.
- No LRS edits are made that are not wanted.
- No errors show up in the job log.

- No errors show up in the test mode reports.
- No rows show up in the invalidity reports.
-

It is recommended to not to run the Full Mode Interface if the test mode run is not successful.

4.2 Comparison Report - Routes

The **Comparison Report - Routes** report is used to display a comparison of the routes in the system as it was just prior to running the interface compared to the contents of the buffer tables loaded by the interface run. This is primarily used with Test Mode interface runs so that the changes that would be made by a Full Mode interface run can be evaluated.

Each changed route is displayed in a single row. Each row contains the following five fields:

1. **Route Name** – This is the name of the route described by this line.
2. **Current: LRS Description** – This is a concise description of the route as it was just prior to running the interface system job. It shows the extents of the route (the beginning and ending measures) plus any gaps in the route. This field will be empty if the route in question did not exist prior to running the interface job.
3. **Buffer: LRS Description** – This is a concise description of the route as it exists in the buffer table that was loaded by the interface system job. It shows the extents of the route (the beginning and ending measures) plus any gaps in the route. This field will be empty if the route in question does not exist after running the interface job.
4. **Error Text** – This field shows a description of any errors that were found in this route after the interface system job was run. The possible values for this field and their meanings are:

   - The System ID of this route is null – System ID is a key field that should never be null

   - The route name of this route is null – Route name is a key field that should never be null

   - The start measure of this route is null – Start measure is a key field that should never be null

   - The end measure of this route is null – End measure is a key field that should never be null

   - The start measure of this route is greater than the end measure – Measures should always go from lower values to higher values

   - This route has no geometry – Null geometry removes the ability to display this route and its related events on maps within the AgileAssets system, but other functions will work as designed

- Duplicate Route – This indicates more than one route with the same name and this is not allowed

5. **Status** – This field shows the word "Change" if the values on the Current LRS fields differ from the values of the LRS Buffer fields. This field shows the word "Error" if the route did not change but exhibits an error. Otherwise this field is blank. By default, a filter is applied based on this field to show only rows where this field is not null.

4.3 Comparison Report - Events

The **Comparison Report - Events** report is used to display a comparison of the events in the system as it was just prior to running the interface compared to the contents of the buffer tables loaded by the interface run. This is primarily used with Test Mode interface runs so that the changes that would be made by a Full Mode interface run can be evaluated. Only changed events are shown in this report.

Each changed event is displayed. Each row contains 12 fields:

1. **Source Table Name** – This is the type of event this row represents. You can sort or filter based on this field.
2. **Data Year** – This field displays year data if it is available.
3. **Location ID** – This is the identifier for the location of this event.
4. **Current: Route Name** – This is the name of the route associated with this event as it was just prior to running the interface.
5. **Current: From Measure** – This is the beginning measure of the event as it was just prior to running the interface.
6. **Current: To Measure** – This is the end measure of the event as it was just prior to running the interface. For point events, this is the same as the Current LRS: From Measure field.
7. **Split Count** – For events that get split into multiple rows, this numbers the individual pieces.
8. **Buffer: Route Name** – This is the name of the route associated with this event as it exists in the buffer table that was loaded by the interface.
9. **Buffer: From Measure** – This is the beginning measure of the event as it exists in the buffer table that was loaded by the interface. For point events, this is the same as the LRS Buffer: From Measure field.
10. **Buffer: To Measure** – This is the end measure of the event as it exists in the buffer table that was loaded by the interface.
11. **Delete Flag** – This field indicates if an event is deleted. Otherwise it is blank.
12. **Error Text** – This displays any errors that were detected when locating the changed version of the event compared to the changed version of the LRS. The possible values for this field and their meanings are:

- The start of this event (*<event start>*) occurs before the start of the route (*<route start>*) – Event measures that do not land on the route are not allowed

- The end of this event (*<event end>*) occurs after the end of the route (*<route end>*) – Event measures that do not land on the route are not allowed

- The event (*<event start>*/*<event end>*) overlaps a gap (*<gap start>*/*<gap end>*) – Event measures that do not land on the route are not allowed

- The event (*<event start>*/*<event end>*) overlaps a subordinate section (*<concurrency start>*/*<concurrency end>*) – Events are not allowed on subordinate routes

- The start measure of this event is null – Start measure is a key field that should never be null

- The end measure of this event is null – End measure is a key field that should never be null

- The route name of this event is null – Route name is a key field that should never be null

- The effective date of this event is null – Effective date is a key field that should never be null

- The begin measure is greater than the end measure – Measures should always go from lower values to higher values

- This event is not present in SETUP_LOC_IDENT – The event that is attempting to be updated does not exist in the currect AgileAssets system

- The event (*<event start>*/*<event end>*) overlaps another event with the same loc_ident (*<event start>*/*<event end>*) – Two or more event records may have the same loc_ident value in the case of split events, but the pieces of that split should never overlap

4.4 Comparison Report - Concurrencies

The **Comparison Report - Concurrencies** report is used to display a comparison of the concurrencies in the system as it was just prior to running the interface compared to the contents of the buffer tables loaded by the interface run. This is primarily used with Test Mode interface runs so that the changes that would be made by a Full Mode interface run can be evaluated.

Each changed Dominant/Subordinate route combination that contains concurrencies is displayed in a single row. Each row contains six fields:

1. **Dominant Route Name** – This is the name of the dominant route referred to by this row.
2. **Subordinate Route Name** – This is the name of the subordinate route referred to by this row.

3. **Current: Concurrencies** – This field shows the ranges of measures on the dominant route that corresponds to a range of measures of the subordinate route as it was just prior to running the interface. If the measures in the dominant range go from a greater measure to a lower measure, this means that the subordinate route increases measures in the opposite direction compared to the dominant route.

4. **Buffer: Concurrencies** – This field shows the ranges of measures on the dominant route that corresponds to a range of measures of the subordinate route as it exists in the buffer table that was loaded by the interface. If the measures in the dominant range go from a greater measure to a lower measure, this means the subordinate route increases measures in the opposite direction compared to the dominant route.

5. **Error Text** – This displays any errors that were detected when locating the changed version of the concurrency against the changed version of the LRS. The possible values for this field and their meanings are:
   - This concurrency (Dom side) does not occur on a route – Concurrencies must occur on a route
   - The start of this concurrency (Dom side) (<concurrency start>) occurs before the start of the route (<route start>) – Concurrencies must occur on a route
   - The end of this concurrency (Dom side) (<concurrency end>) occurs after the end of the route (<route end>) – Concurrencies must occur on a route
   - The concurrency (Dom side) (<concurrency start>/<concurrency end>) overlaps a gap (<gap start>/<gap end>) – Concurrencies must occur on a route
   - The start and end measures of this concurrency (Dom side) are the same – this indicates a point concurrency which is meaningless
   - The Dom start measure of this concurrency is null – Start measure is a key field that should never be null
   - The Dom end measure of this concurrency is null – End measure is a key field that should never be null
   - The Dom route name of this concurrency is null – Route name is a key field that should never be null
   - This concurrency (Sub side) does not occur on a route – Concurrencies must occur on a route
   - The start of this concurrency (Sub side) (<concurrency start>) occurs before the start of the route (<route start>) – Concurrencies must occur on a route
   - The end of this concurrency (Sub side) (<concurrency end>) occurs after the end of the route (<route end>) – Concurrencies must occur on a route
   - The concurrency (Sub side) (<concurrency start>/<concurrency end>) overlaps a gap (<gap start>/<gap end>) – Concurrencies must occur on a route

- The start and end measures of this concurrency (Sub side) are the same – this indicates a point concurrency which is meaningless
- The Sub start measure of this concurrency is null – Start measure is a key field that should never be null
- The Sub end measure of this concurrency is null – End measure is a key field that should never be null
- The Sub route name of this concurrency is null – Route name is a key field that should never be null
- The start measure of this concurrency (Sub side) is greater than the end measure – Measures for the subordinate side should always go from lower values to higher values; on the Dom side when measures go from higher to lower it indicates that the 2 sides of the concurrency have opposite directions of increasing measures
- This concurrency (Sub side) overlaps another concurrency (<route name>|<concurrency start>/<concurrency end>) – Subordinate concurrency sections should never overlap as this would indicate that more than one route is dominant for a given section
- The measure ranges differ by <measure difference> – As both sides of a concurrency record represent the same section of road, it is expected that both sides will have the same length; this indicates an issue with caibration

6. **Status** – This field shows the word "Change" if the values on the Current LRS fields differ from the values of the LRS Buffer fields. This field shows the word "Error" if the route did not change but exhibits an error. Otherwise this field is blank. By default, a filter is applied based on this field to show only rows where this field is not null.

4.5 Comparison Report - LRMs

The **Comparison Report - LRMs** report is used to display a comparison of the LRMs in the system as it was just prior to running the interface compared to the contents of the buffer tables loaded by the interface run. This is primarily used with Test Mode interface runs so that the changes that would be made by a Full Mode interface run can be evaluated.

Each changed Base LRM route/Alternate LRM route combination that contains alternate LRMs is displayed in a single row. Each row contains seven fields:

1. **Alternate LRM Name** – This is the name of the alternate LRM referred to by this row. There may be multiple Linear Referencing Methods configured in a system. This field indicates which one is covered in each line.
2. **Base Route Name** – This is the name of the base LRM route referred to by this line.
3. **Alt Route Name** – This is the name of the alternate LRM route referred to by this line.

4. **Current: LRM Measures** – This field shows the ranges of measures on the base LRM route that corresponds to a range of measures of the alternate LRM route as it was just prior to running the interface.

5. **Buffer: LRM Measures** – This field shows the ranges of measures on the base LRM route that corresponds to a range of measures of the alternate LRM route as it exists in the buffer table that was loaded by the interface.

6. **Error Text** – This displays any errors that were detected in trying to locate the changed version of the LRM against the changed version of the LRS. The possible values for this field and their meanings are:

   - This LRM does not occur on one of the new routes – LRM sections must occur on a route

   - The start of this LRM (*<LRM start>*) occurs before the start of the route (*<route start>*) – LRM sections must occur on a route

   - The end of this LRM (*<LRM end>*) occurs after the end of the route (*<route end>*) – LRM sections must occur on a route

   - The LRM (*<LRM start>*/*<LRM end>*) overlaps a gap (*<gap start>*/*<gap end>*) – LRM sections must occur on a route

   - The LRM (*<LRM start>*/*<LRM end>*) overlaps a subordinate section (*<concurrency start>*/*<concurrency end>*) – LRM sections must occur on a route

   - The start measure of this LRM is greater than the end measure – Measures should always go from lower values to higher values

   - The start measure of this LRM is null – Start measure is a key field that should never be null

   - The end measure of this LRM is null – End Measure is a key field that should never be null

   - The route name of this LRM is null – Route name is a key field that should never be null

   - This LRM (*<LRM route name>*|*<LRM start>*/*<LRM end>*) overlaps this LRM (*<LRM route name>*|*<LRM start>*/*<LRM end>*) – LRM sections should never overlap as this would indicate that the same alternate LRM section is assigned to more than one base route location

   - The measure ranges differ by *<measure difference>* – As both sides of an LRM record represent the same section of road, it is expected that both sides will have the same length; this indicates an issue with calibration

6. **Status** – This field shows the word "Change" if the values on the Current LRS fields differ from the values of the LRS Buffer fields. This field shows the word "Error" if the route did not change but exhibits an error. Otherwise this field is blank. By default, a filter is applied based on this field to show only rows where this field is not null.

4.6 Invalidity Report - Routes

The **Invalidity Report - Routes** report is used to display routes that came through the interface to the buffer tables that do not meet the minimum quality requirements to be added to the AgileAssets system. If the full mode Interface is run, these routes will not be included in the new LRS. It is recommended that if any rows appear in this table when the interface is run in Test mode, that you do not run Full mode until this problem is corrected in Roads and Highways.

Each invalid route is displayed in a single row. Each row contains nine fields:

1. **Object ID** – This is the unique record identifier supplied by the Roads and Highways Export Network web service.
2. **Network ID** – This is the identifier that Roads and Highways uses to identify the Network (LRM) associated with this route. All of these rows should be associated with the base LRM.
3. **Route ID** – This is the route name.
4. **Start Measure** – This is the beginning measure of the route.
5. **End Measure** – This is the end measure of the route.
6. **Start Date** – This is the date that this version of the route was created.
7. **End Date** – This is the retirement date of this version of the route. If this value is null, this version is still active.
8. **Shape Length** – This is the length of the route.
9. **Reason(s) for being marked Invalid** – This is the reason or reasons that this route is marked as invalid. The possible values for this field and their meanings are:

   - REQUIRED_FIELD_NULL – This means a key field has a null value

   - START_MEASURE_GREATER_THAN_END_MEASURE – This means the start measure of the route is greater than or equal to the end measure

   - END_DATE_NOT_AFTER_START_DATE – This means the start date of this record is greater than or equal to the end date

4.7 Invalidity Report - Gaps

The **Invalidity Report - Gaps** report is used to display gaps that came through the interface to the buffer tables that do not meet the minimum quality requirements to be added to the AgileAssets system. If the full mode Interface is run, these routes will not be included in the new LRS. It is recommended that if any rows appear in this table when the interface is run in Test mode, that you do not run Full mode until this problem is corrected in Roads and Highways.

Each invalid gap is displayed in a single row. Each row contains eight fields:

1. **Object ID** – This is the unique record identifier supplied by the Roads and Highways Export Network web service.

2. **Route ID** – This is the name of the route on which the gap resides.
3. **Gap Start Measure** – This is the beginning measure of the gap.
4. **Gap End Measure**– This is the end measure of the gap.
5. **Gap Type** – The gap type is shown as a number where: 0 = a measure gap, 1 = a physical gap, or 2 = both.
6. **Start Date** – This is the date that this version of the gap was created.
7. **End Date** – This is the retirement date of this version of the gap. If this value is null, this version is still active.
8. **Reason(s) for being marked Invalid** – This reports the reason or reasons that this gap is marked as invalid. The possible values for this field and their meanings are:

   - REQUIRED_FIELD_NULL – This means a key field has a null value

   - START_MEASURE_GREATER_THAN_END_MEASURE – This means the start measure of the gap record is greater than or equal to the end measure

   - STARTS_BEFORE_ROUTE – This means the start measure of this gap was before the start measure of the entire route

   - ENDS_AFTER_ROUTE – This means the end measure of this gap was after the end measure of the entire route

   - UNKNOWN_ROUTE – This means this gap is associated with a route that is not in the system

   - OVERLAPS_A_GAP – This means this gap overlaps another gap.

4.8 Invalidity Report - Concurrencies

The **Invalidity Report - Concurrencies** report is used to display concurrencies that came through the interface to the buffer tables that do not meet the minimum quality requirements to be added to the AgileAssets system. If the full mode Interface is run, these routes will not be included in the new LRS. It is recommended that if any rows appear in this table when the interface is run in Test mode, that you do not run Full mode until this problem is corrected in Roads and Highways.

Each invalid concurrency is displayed in a single row. Each row contains 10 fields:

1. **Object ID** – This is the unique record identifier supplied by the Roads and Highways Export Network web service.
2. **Dominant Route ID** – This is the name of the dominant route associated with the concurrency.
3. **Dominant Start Measure** – This is the beginning measure of the concurrency on the dominant route.
4. **Dominant End Measure** – This is the end measure of the concurrency on the dominant route.

5. **Subordinate Route ID** – This is the name of the subordinate route associated with the concurrency.
6. **Subordinate Start Measure** – This is the beginning measure of the concurrency on the subordinate route.
7. **Subordinate End Measure** – This is the end measure of the concurrency on the subordinate route.
8. **Start Date** – This is the date that this version of the concurrency was created.
9. **End Date** – This is the retirement date of this version of the concurrency. If this value is null, this version is still active.
10. **Reason(s) for being marked Invalid** – This is the reason or reasons that this concurrency is marked as invalid. The possible values for this field and their meanings are:

- REQUIRED_FIELD_NULL – This means a key field has a null value

- DUPLICATE_INVERTED – This means the same record exists twice but in one record the dominate route/measures are switched with the subordinate route/measures as opposed to the other record

- INVALID_OVERLAPS – This means ones of two things: 1) a record for a dominant route has measures that overlap another record for the same dominant route and both records share the same subordinate route or 2) it means two records with the the same subordinate route have overlapping subordinate measures regardless of dominant route

- DOM_MEASURES_EQUAL – This means a record has the same start and end measures for the dominant side of the concurrency

- SUB_MEASURES_EQUAL – This means a record has the same start and end measures for the subordinate side of the concurrency

- DOM_STARTS_BEFORE_ROUTE – This means the start measure of the dominant side of the concurrency is before the start measure of the entire route

- DOM_ENDS_AFTER_ROUTE – This means the end measure of the dominant side of the concurrency is after the end measure of the entire route

- DOM_UNKNOWN_ROUTE – This means the dominant route of this concurrency is associated with a route that is not in the system

- DOM_OVERLAPS_A_GAP – This means the dominant side of this concurrency overlaps a gap

- SUB_STARTS_BEFORE_ROUTE – This means the start measure of the subordinate side of the concurrency is before the start measure of the entire route

- SUB_ENDS_AFTER_ROUTE – This means the end measure of the subordinate side of the concurrency is after the end measure of the entire route

- SUB_UNKNOWN_ROUTE – This means the subordinate route of this concurrency is associated with a route that is not in the system

- SUB_OVERLAPS_A_GAP – This means the subordinate side of this concurrency overlaps a gap

- MEASURE_RANGES_DIFFER_>_0.1 – This means the difference is greater than 0.1 between the measure range (end measure minus start measure) on the dominant side of this concurrency and the measure range on the subordinate side

4.9 Invalidity Report - LRMs

The **Invalidity Report - LRMs** report is used to display LRMs that came through the interface to the buffer tables that do not meet the minimum quality requirements to be added to the AgileAssets system. If the full mode Interface is run, these routes will not be included in the new LRS. It is recommended that if any rows appear in this table when the interface is run in Test mode, that you do not run Full mode until this problem is corrected in Roads and Highways.

Each invalid LRM is displayed in a single row. Each row contains 12 fields:

1. **Object ID** – This is the unique record identifier supplied by the Roads and Highways Export Network web service.
2. **Base Network ID** – This is the identifier that Roads and Highways uses to identify the Network (LRM) associated with the base LRM.
3. **Base Route ID** – This is the name of the base LRM route associated with this row.
4. **Base Start Measure** – This is the base LRM beginning measure associated with this row.
5. **Base End Measure** – This is the base LRM end measure associated with this row.
6. **Translated Network ID** – This is the identifier that Roads and Highways uses to identify the Network (LRM) associated with the alternate LRM referred to in this row.
7. **Translated Route ID** – This is the name of the alternate LRM route associated with this row.
8. **Translated Start Measure** – This is the alternate LRM beginning measure associated with this row.
9. **Translated End Measure** – This is the alternate LRM end measure associated with this row.
10. **Start Date** – This is the date that this version of this LRM row was created.
11. **End Date** – This is the retirement date of this version of this LRM row. If this value is null, this version is still active.

12. **Reason(s) for being marked Invalid** – This is the reason or reasons that this LRM row is marked as invalid. The possible values for this field and their meanings are:

- REQUIRED_FIELD_NULL – This means a key field has a null value

- BASE_MEASURES_EQUAL – This means that the start and end measures for the base LRM are equal

- TRANSLATED_MEASURES_EQUAL – This means that the start and end measures for an alternate LRM are equal

- STARTS_BEFORE_ROUTE – This means the start measure of the base LRM side of this record was before the start measure of the entire route

- ENDS_AFTER_ROUTE – This means the end measure of the base LRM side of this record was after the end measure of the entire route

- UNKNOWN_ROUTE – This means the base LRM side of this record is associated with a route that is not in the system

- OVERLAPS_A_GAP – This means the base LRM side of this record overlaps a gap.

- MEASURE_RANGES_DIFFER_>_0.1 – This means the difference is greater than 0.1 between the measure range on the base side of this LRM record and the measure range on the alternate LRM side

- OVERLAPS_A_LRM – This means that the alternate LRM route and measures for this record overlap the measures of another record for the same alternate route

- NEW_LRM_AND_OLD_LRM_OVERLAP – Checks to see if any of the LRM records provided by Roads and Highways overlap LRM records for existing AgileAssets LRM records for routes not impacted by this interface run

5 Workflow Steps – Full Mode

5.1 Running the Full Mode Interface

To start the Full Interface go to **System > Tools > System Job > Schedules**. Then scroll down and select **Roads & Highways Interface – Full Mode**. Right-click and select **Run Job**.
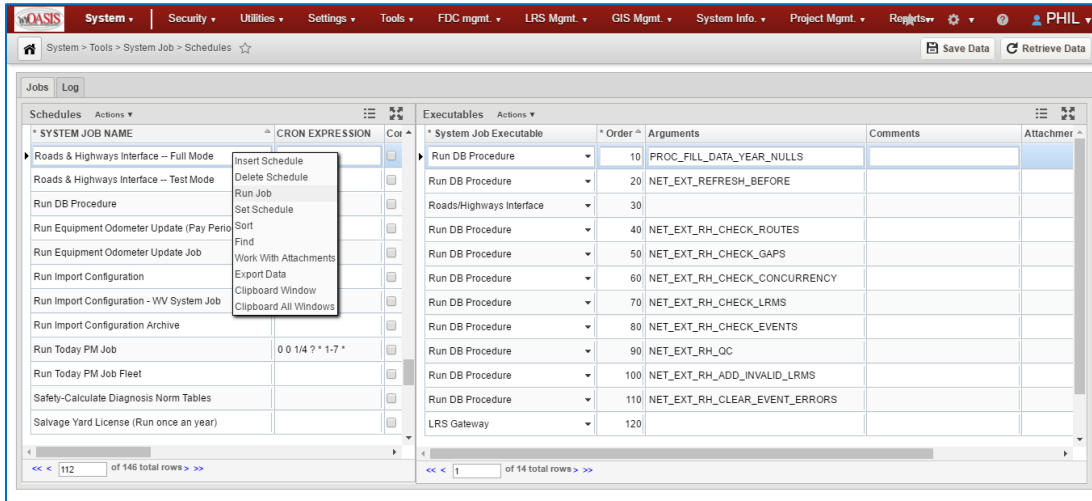
Figure 14   AgileAssets System Job Schedule Window

The time to run the job may vary significantly, but a range of 10 to 30 minutes is typical. You can either keep the window open to see status messages or hide the window and continue using the system for other purposes. If you choose to hide the window, you will get a message via the system when the job is complete. If you keep **Roads & Highways Interface – Full Mode** selected and click the **Log** tab you will see the messages produced by the job.
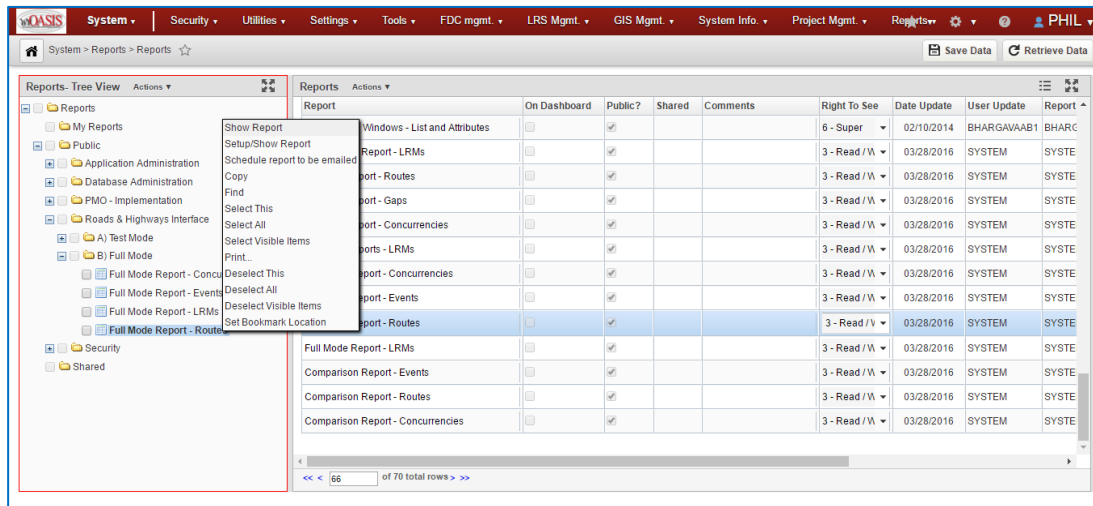
Figure 15   AgileAssets Reports Window

When the job is complete you can review the comparison reports by going to **System > Reports > Reports**. Then, in the left pane navigate to **Reports > Public > Roads & Highways Interface > Full Mode** to see list of full-mode reports. Right-click on a report and select **Show Report**. This will display a new browser page with the report. The report can then be downloaded in various formats.

Figure 16   Full Mode Report for Events

There are four full mode reports and they are described below.

5.1.1 Full Mode Report - Routes

The **Full Mode Report - Routes** report is used to display a comparison of the routes in the system as it was just prior to and after running the interface. This is primarily used with Full Mode interface to create a record of the results of the interface run.

Each changed route is displayed in a single row. Each row contains four fields:

1. **Route Name** – This is the name of the route as it was just prior to running the interface.
2. **Previous: Route Description** – This is a concise description of the route as it was just prior to running the interface. It shows the extents of the route (the beginning and ending measures) plus any gaps in the route. This field will be empty if the route in question did not exist prior to running the interface job.
3. **New: Route Description** – This is a concise description of the route as it exists in the AgileAssets system at the time of report generation. It shows the extents of the route (the beginning and ending measures) plus any gaps in the route. This field will be empty if the route in question does not exist after running the interface job.
4. **Status** - This field shows the word "Change" if the values on the "Previous" fields differ from the values of the "New" fields. Otherwise this field is blank. By default, a filter is applied based on this field to show only rows where this field is not null.

5.1.2 Full Mode Report - Events

The **Full Mode Report - Events** report is used to display a comparison of the events in the system as it was just prior to and after running the interface. This is primarily used with Full Mode interface to create a record of the results of the interface run. Only changed events are shown in this report.

Each changed event is displayed. The report is divided into sections for each event table and data year. Each row contains nine fields:

1. **Source Table** – This is the type of event this row represents. You can sort or filter based on this field.
2. **Data Year** – This field displays year data if it is available.
3. **Location ID** – This is the identifier for the location of this event.
4. **Previous: Route Name** – This is the name of the route associated with this event as it was just prior to running the interface.
5. **Previous: From Measure** – This is the beginning measure of the event as it was just prior to running the interface.
6. **Previous: To Measure** – This is the end measure of the event as it was just prior to running the interface. For point events this is the same as the Previous: From field.

7. **New: Route Name** – This is the name of the route associated with this event as it exists in the buffer table that was loaded by the interface.
8. **New: From Measure** – This is the beginning measure of the event as it exists in the AgileAssets system at the time of report generation. For point events this is the same as the LRS Buffer: From Measure field.
9. **New: To Measure** – This is the end measure of the event as it exists in the AgileAssets system at the time of report generation.

5.1.3 Full Mode Report - Concurrencies

The **Full Mode Report - Concurrencies** report is used to display a comparison of the concurrencies in the system as it was just prior to and after running the interface. This is primarily used with Full Mode interface to create a record of the results of the interface run. Only changed concurrencies are shown in this report.

Each changed Dominant/Subordinate route combination that contains concurrencies is displayed in a single row. Each row contains five fields:

1. **Previous: Dom Route** – This is the name of the dominant route as it was just prior to running the interface.
2. **Previous: Sub Route Name** – This is the name of the subordinate route as it was just prior to running the interface.
3. **Previous: Concurrencies** – This field shows the ranges of measures on the dominant route that corresponds to a range of measures of the subordinate route as it was just prior to running the interface. If the measures in the dominant range go from a greater measure to a lower measure this means the subordinate route increases measures in the opposite direction compared to the dominant route.
4. **New: Dom Route** – This is the name of the dominant route as it exists in the AgileAssets system at the time of report generation.
5. **New: Sub Route Name** – This is the name of the subordinate route as it exists in the AgileAssets system at the time of report generation.
6. **New: Concurrencies** – This field shows the ranges of measures on the dominant route that correspond to a range of measures of the subordinate route as it exists in the AgileAssets system at the time of report generation. If the measures in the dominant range go from a greater measure to a lower measure this means the subordinate route increases measures in the opposite direction compared to the dominant route.

5.1.4 Full Mode Report - LRMs

The **Full Mode Report - LRMs** report is used to display a comparison of the LRMs in the system as it was just prior to and after running the interface. This is primarily used with Full Mode interface to create a record of the results of the interface run.

Each changed Base LRM route/Alternate LRM route combination that contains alternate LRMs is displayed in a single row. The report is divided into sections for each alternate LRM represented. Each row contains six fields:

1. **Alternate LRM Name** – This is the name of the alternate LRM referred to by this row. There may be multiple Linear Referencing Methods configured in a system. This field indicates which one is covered in each line.
2. **Base Route Name** – This is the name of the base LRM route.
3. **Alt Route Name** – This is the name of the alternate LRM route.
4. **Previous: LRM Measures** – This field shows the ranges of measures on the base LRM route that correspond to a range of measures of the alternate LRM route as it was just prior to running the interface.
5. **New: LRM Measures** – This field shows the ranges of measures on the base LRM route that correspond to a range of measures of the alternate LRM route as it exists in the AgileAssets system at the time of report generation.
6. **Status** – This field shows the word "Change" if the values on the "Previous" fields differ from the values of the "New" fields. Otherwise this field is blank. By default, a filter is applied based on this field to show only rows where this field is not null.

6 Troubleshooting

When an interface run does not complete successfully, there can be a number of reasons such as a server being down or the network being interrupted. Following are some recommendations for finding the source of the problem.

6.1 Job Log

When you run the interface, job entries are made in the job log about that run. You can find the job log by going to **System > Tools > System Job > Schedules**. Then scroll down and select the row for the type of interface you ran, such as Roads & Highways Interface – Full Mode or Roads & Highways Interface – Test Mode. Then click the **Log** tab at the top of the left pane. This takes you to a page with a list of all your interface runs in the left pane. The right pane shows the details of the interface run selected in the left pane.
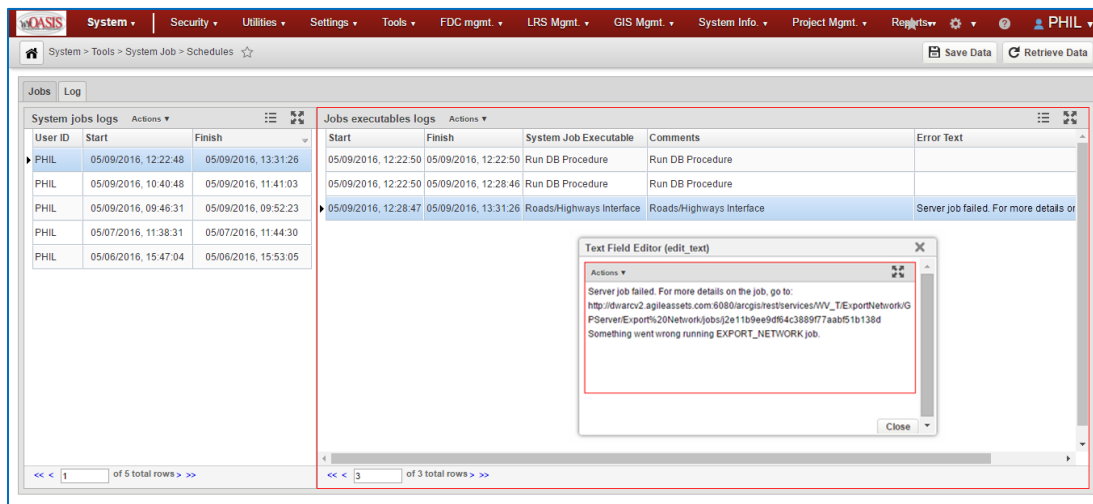

Figure 17   AgileAssets System Job Schedule Window

Select the interface run of interest in the left pane and look for any entries in the **Error Text** field in the right pane. If there is an Error Text entry, the first thing you can tell is which sub-step of the interface run had the error. In the example above it was the Roads/Highways Interface step. By double-clicking on the Error Text field you can see the full text of the error message. In this case, the error message was created by the ArcGIS Server. The message has a URL that you can open in a browser to view the full error message.

6.2 ArcGIS Server Manager

ArcGIS Server Manager tracks information about each web service call. The amount of detail stored in this tracked information is user-definable. Go to **Services > Manage Services** and select the folder with the web service of interest. Select the web service and then pick **Parameters** in the left pane. At this point you can set the Message Level. **Info** is the recommended choice.
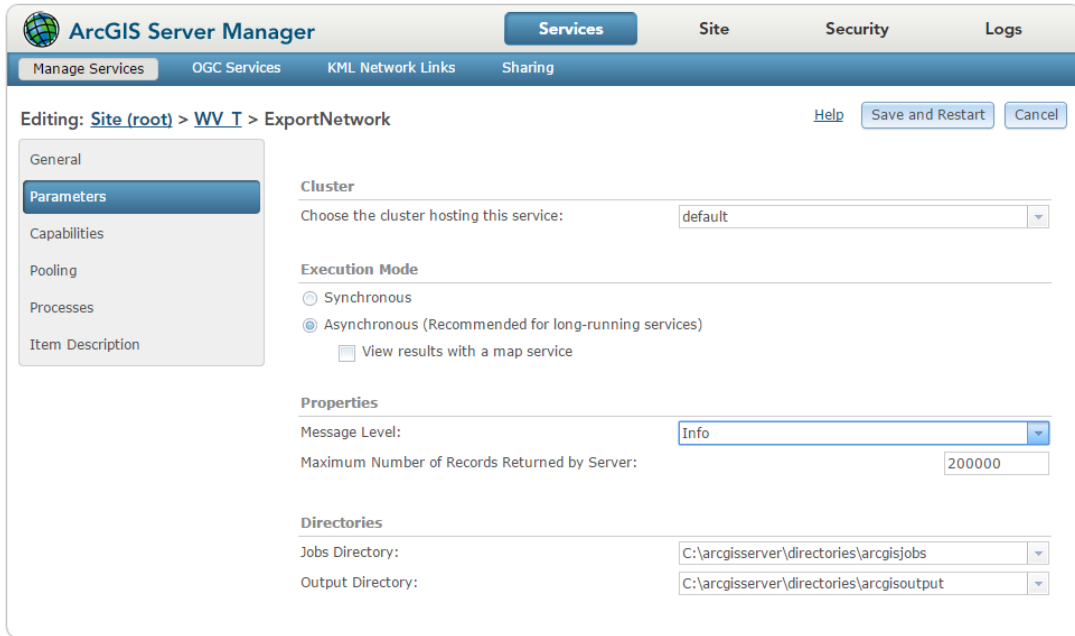
Figure 18   Esri Manage Services Web Page in ArcGIS Server

To view the log, go to **Logs**. Set the **Log Filter** to your preferred level of detail and enter the web service you want information about.
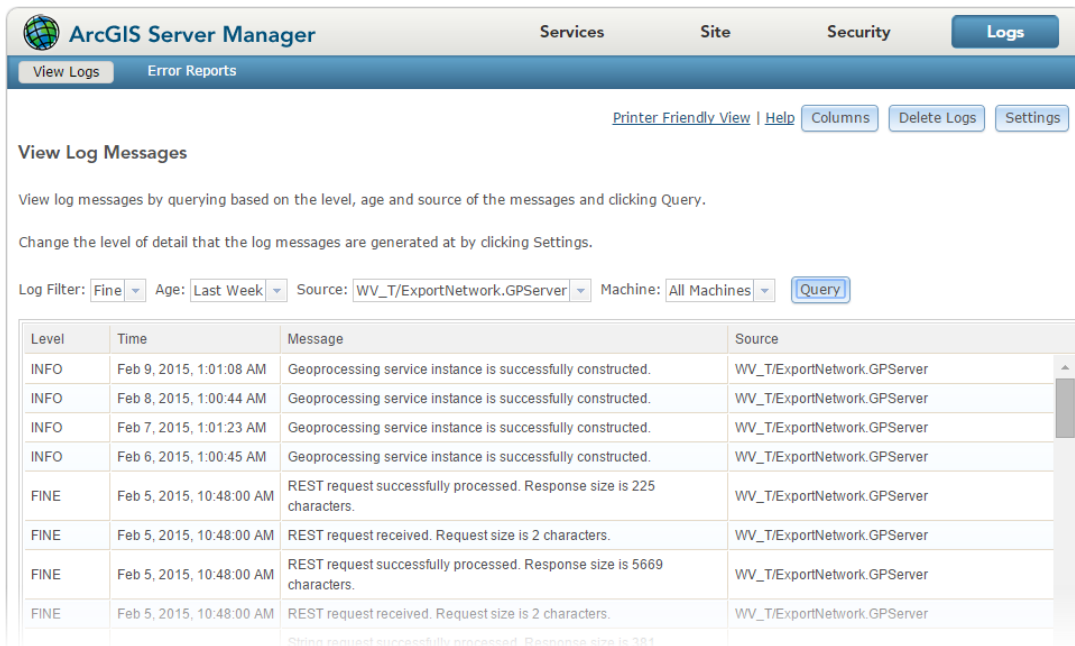

Figure 19   Esri View Logs Web Page in ArcGIS Server

6.3 Troubleshooting Web Page

The web page below contains a list of problems and solutions that have been gathered over time.

https://docs.agileassets.com/display/_PK/PD10/faq-rh

AgileAssets - Roads and Highways LRS Interface

User's Guide

6/9/2017

The Leading Global Provider of

Integrated Infrastructure Asset Management Software Solutions.