

TIS vs LRS

(A tale of 2 databases)

Background:

It was the best of data, it was the worst of data, it was the age of free access, it was the age of foolishness...
(Charles Dickens- paraphrased)

The new Linear Referencing System (LRS) is now in production and the old Transportation Information System (TIS) and GIS BaseMap are frozen and obsolete. When TIS was the department standard there were decisions made that do not support the modern age wherein we aim for data governance. Part of working within a Data Governance framework is to treat data as an asset. We want to make sure that the data is reliable, sustainable and is collected/maintained once and then shared as much as possible, to avoid duplication of efforts and conflicting information.

As part of this new environment we are instituting some changes that may seem counter to the above statement, but actually are being done to support it. The most obvious of these changes is that we are doing away with generic data access accounts. In the old 'TIS world' we had the GIS_User account which anyone could use for read access to the SDW data which included GIS BaseMap and spatial versions of TIS data. The new LRS environment will not have an account similar to this; rather everyone who accesses the data will use their own account. Applications will have an application account and their own application copy of the required data.

The primary reason for this change is that some data producers now want to better track who is accessing their data so that as changes are made to the data they can communicate directly with the users. As we worked our way through the LRS project, we learned that we did not have a good idea of who was using our data, why they were using it, what they needed/expected of the data, or how they manipulate it or further share it. By switching to using direct user accounts we can now find out who is using the data so that we can then follow up with them and keep them informed as we change the data. This will in the end make the data much more reliable and useful for the end users. Although there is an extra step of requesting access to the data, the benefits outweigh the detriments.

Another change is that to access the new data we are requesting users read this document and not share the new data without making sure that the recipient(s) understands the dangers of mixing TIS & LRS based data together. The following pages will attempt to further explain those dangers.

True Miles Vs Cartographic Length:

'Do you spell it with a 'V' or a 'W'?' inquired the judge. 'That depends upon the taste and fancy of the speller, my Lord'. (Charles Dickens)

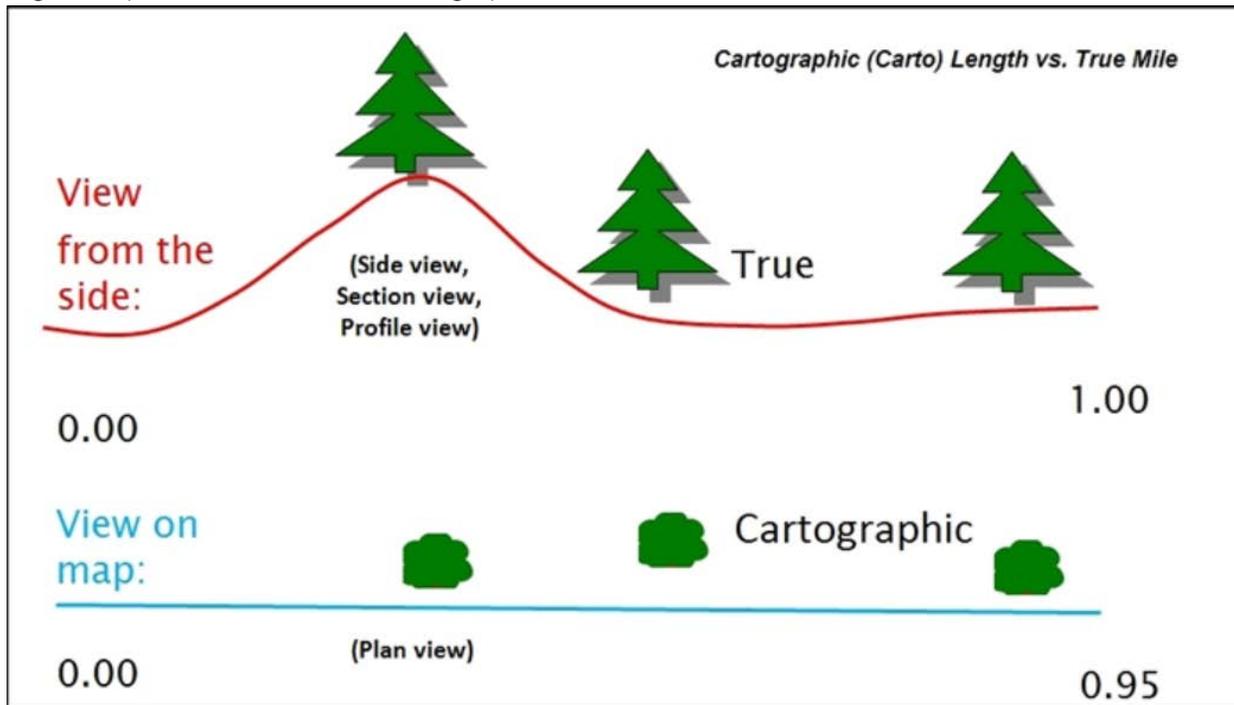
The old TIS environment had measures called 'True Miles' which were calibrated measures from the beginning (usually SW corner) of a route. These measures were originally created by staff driving at posted speed limits (often over 70 MPH at that time) with an odometer that read out to 3 decimal places. The person would notice when they passed a Reference Post (Mile Marker) or major intersection, then glance down to the odometer and jot the measure into a note pad. Any delay in the time to change from looking at the post to the odometer or any distance too early or late that they looked would skew the measures. Another factor that may have affected the measures would be if due to the distraction of driving the person may have transposed numbers, this could turn a measure from 0.95 to 9.05. That would create a grossly inaccurate length!

After the initial calibration of the trunk highways, changes were made from engineering station conversions off of the design plans.

Local routes in the old system were usually given length by someone tracing the representation of the route on a paper map with a ruler. If the route turned then the person measuring it would have to hold the ruler down at a pivot point and continue to measure, often times having to repeat if the route had many curves. A further problem with this method is that the map may have been printed at one of many different scales, if the editor grabbed the wrong ruler then all the measurements would be off.

The new LRS has measures in it called Carto Length, which are similar to true miles. Like true miles, they are represented in miles from the beginning of a route, and displayed as a decimal number. Unlike true miles they only represent the two dimensional length of the road and do not add in changes in length due to changes in elevation (hills and valleys).

Figure 1 (True Miles vs. Carto Length):



Actual tabular examples:

True miles (old system)

TIS_CODE	FROM_TRUE_MILE	TO_TRUE_MILE	SPEED_LIMIT
0200000012	1.661	41.965	55
0200000002	28.008	56.368	65
0200000002	27.6	28.008	50
0200000002	26.606	27.6	30
0200000002	26.176	26.606	30
0300000062	104.7	105.75	55
0300000044	50.851	62.324	55
0200000002	25.604	26.176	30
0200000065	310.855	311.693	40

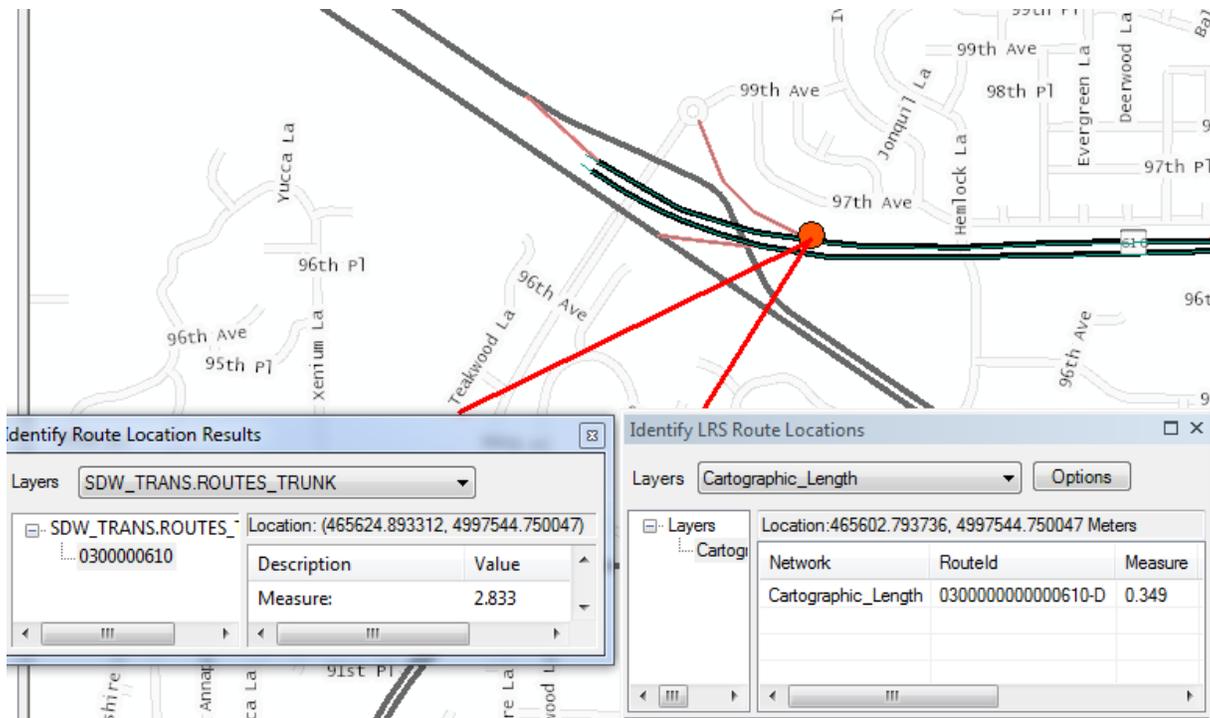
Carto Length (new system)

ROUTE_ID	FROM_MEASU	TO_MEASURE	SPEED_LIMI
0200000000000012-I	150.469	150.939	40
0200000000000012-I	150.939	151.466	35
0200000000000012-I	151.466	153.005	45
0200000000000014-D	8.264	9.008	35
0200000000000014-D	9.008	15.955	55
0200000000000014-D	15.955	16.610	35
0200000000000014-D	16.610	29.690	55
0200000000000014-D	29.690	30.352	40
0200000000000014-D	30.352	41.817	55
0200000000000014-D	88.402	89.848	30

The segmentation is different between the two systems so these do not represent the same records. You will notice that other than the field names in the one table containing 'true mile' there is no way to tell whether the data itself is true mile or carto length. It would be easy for someone to copy a measure from the new system and put it into a measure field in the old system or vice-versa. Once that is done there is no way to tell which system was used to populate any given record.

Since there is no way to identify which measure came from which system there will be no way to fix the data after it is corrupted. Someone who is not aware of the difference will have no warning that they should not copy the data or that there is even a difference. They would think they are looking at data for whichever system they expect. This is why it is imperative that the data not be shared with someone who has not signed the document stating that they know the difference. If you need to share data between systems do not include Route IDs or measures (in the old system Route IDs may have been called many things, TISCode, Route_Ident, Rdwy_Id, etc.). The only valid way to share the data from one system to the other is through spatial tools.

The measures may be very close between the two systems or may be very different. For example see this map with the same intersection selected and the two different measures for both systems:



Notice that there is a 2.484 miles difference for the measure of that ramp intersection between the old system (SDW_TRANS.ROUTES_TRUNK) and the new Cartographic_Length. If you copied the new measure into a table of old system data that intersection will not map as the 0.349 measure in the old system is in the middle of a gap in the route.

Reference Points:

Progress is impossible without change, and those who cannot change their minds cannot change anything. (George Bernard Shaw)

The Reference Post system (often called Mile Posts) is a way to locate data along a route by its distance from a known location, the Reference Post. These posts are generally located about a mile apart along the trunk highway system. Sometimes they are actually physical posts along the side of the road and sometimes they exist solely within the database as ‘theoretical posts’. Either way there are various reasons why they may be more or less than a mile apart, that is a story for another document.

The reason they are brought up here is that there are differences in some of the posts locations within the two systems so that a direct translation may not be possible. The reasoning for this is that posts were populated in the old TIS and then the Transportation Data & Analysis program (TDA) staff would tell the districts where to place them. Sometimes they were misplaced; this could be due to a variety of reasons:

- When the crew went to place the post they may have found another sign nearby and attached the Reference Post Marker to that already existing sign rather than place it as TDA said.
- The sign may have been knocked down and then replaced in the wrong location.
- The Sign Crew may have not known to check with TDA as to where to place the post.
- Other...

The old system has the posts located where TDA directed but in the new system we have asked district staff to GPS the posts so that we can update their locations to match reality. Either way this means that reference posts, and related reference points, between the two systems will not necessarily match. This means that reference points from one system to the other will have the same issues as describes above between True Miles and Cartographic Lengths.

What this means to the end user is that in locations where the posts have not moved, the reference points could be used as a translation between the old and new systems. The only way to know where these locations are is to do a spatial comparison of the posts themselves. In cases where the posts have moved, they cannot be used to translate between the two systems.

If you have external (not in the LRS) data that was located by Reference Point and you populated it from field measurements then you can directly use the reference points in the new system (your data will map wrong in the old system). However, if you used a LogPoint report to populate your data, then there will need to be a conversion of your reference points in addition to true miles/cartographic length.

When you are ready to translate your data to match the new LRS and related systems, there will be a process of data conversion required on your existing data. The processes used to create and maintain your current data will affect how involved the conversion process will be. All conversion processes will involve some amount of manual data cleansing. Even if your data is in Reference Points there will be some conversion to the locations in the new system as some posts have moved as mentioned above.

Once data has been converted there are options for 'Registering' the data to the LRS which will set the stage for programmatic updates of your data's locations. This will help keep it in sync with the LRS and other registered systems, reducing (though not eliminating) the need for manually maintaining/adjusting your data location attributes.