

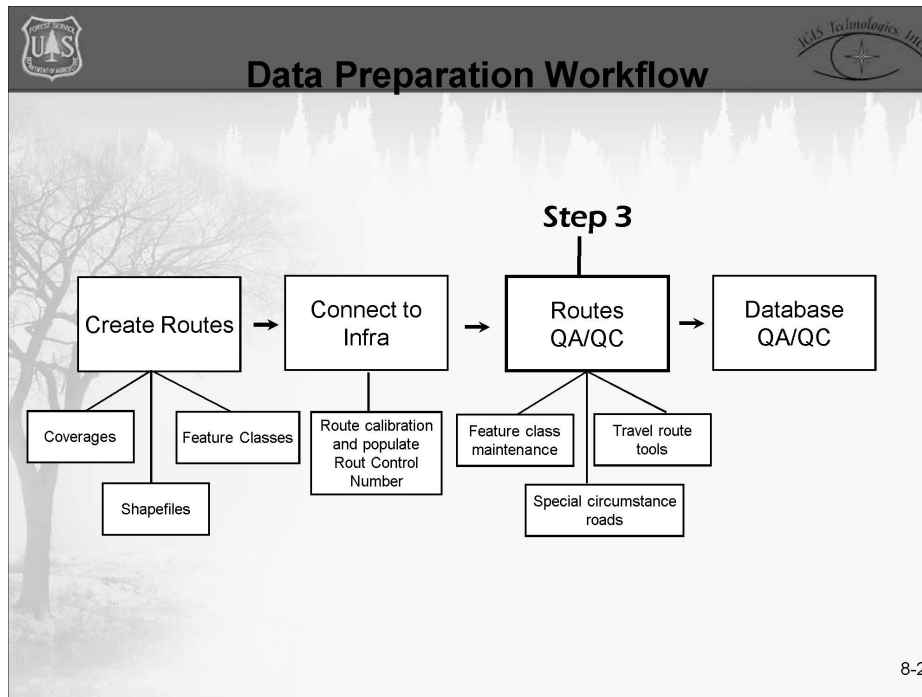


Maintaining Travel Route Feature Class



Objective: Explain what procedures need to be completed on an ongoing basis to maintain accurate data for the MVUM.

8-1

Maintaining Travel Route Feature Class




It is the responsibility of the GIS professional to periodically update travel route feature classes. These updates and quality assurance checks can be performed in the ArcGIS desktop environment utilizing a variety of resources such as: referencing GPS data, referencing digital orthophoto quadrangles (DOQs), and using the I-Web Spatial Editor Travel Routes tool bar.





What is Automatically Maintained

- Infra data: Route Basics table, Linear Event tables and Allow tables
BMP, EMP, Season, Status, etc..
- Dynamic segmentation
Assigning attributes only to a portion of a line feature



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Tables downloaded from Infra and used to make the road and trail event layers are constantly being maintained by transportation engineers; recreation program leads, or trails managers. When the needed table is downloaded from Infra it is current. Because these tables refresh nightly, current event tables should be downloaded and incorporated just prior to the maps being sent to print. These tables support dynamic segmentation which is the assigning of attributes only to a portion of a line feature rather than the entire arc and is dictated by the event tables downloaded from Infra.





What Needs Maintaining

- Download recent
 - Route Basics table (EMP/BMP/RTE_CN)
 - Roads Allow table ("Big 3" attributes)
- Route alignment
- Route direction
- Add routes
- Decommission routes

	A	B	C	D	E	F
1	GC RTE BASICS V					
2	RTE_CN	OBJ_NAME	ID	NAME	BMP	EMP
3	1296010397	ROAD	66009	UN-NAMED	0	0.55
4	516010397	ROAD	66393	UN-NAMED	0	0.636
5	539010397	ROAD	66464	UN-NAMED	0	1.5
6	1413010397	ROAD	61073	UN-NAMED	0	0.625
7	258791010602	TRAIL	6464	VEGA CREEK SPUR	0	0.669
8	253651010602	TRAIL	6914	UN-NAMED	0	0.15
9	5441010397	TRAIL	6902	KITCHEN	0	0.941
10	66010397	ROAD	60132	LOWER GREENS HOLLOW	0	2.58
11	70010397	ROAD	60138	OAK CREEK RIDGE	0	5.59

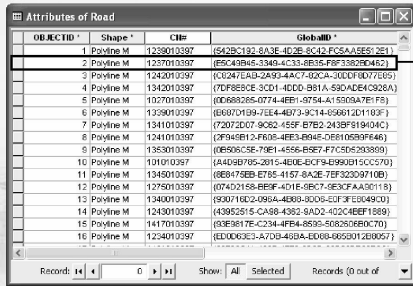
8-4

The GIS professional is responsible for keeping the geometry of the data up to date. This has always been a responsibility, but through the quality control process used by MVUM, it is very common to find various errors, large and small, in the feature geometry. Managing the geometry of the routes includes adding, deleting, and altering route alignments inside of a route feature class. Beside the route's geometry, the GIS professional downloads and uses the latest Rte_Basics table to calibrate the route feature class. The Rte_Basics table provides the (RTE_CN), beginning milepost (BMP) and ending milepost (EMP). The BMP and EMP are used to calibrate routes. Routinely downloading and calibrating the route feature classes will be required to ensure the most recent measurements are being used in the MVUM. The Allow table downloaded from Infra to create event theme data is also updated nightly and therefore special attention should be used to ensure the most up-to-date version is included. This table provides the "Big 3 attributes": status, jurisdiction, and system.



Mismatched and Orphaned EMP

- Routes with no match in the RTE_BASICS table
- Records in Infra with no matching spatial feature
- Logs mismatched EMP values between the spatial table and Infra table





OBJECTID	Shape	CTR	GlobalID
1	Pointline M	1239013397	(5429C192-8A3E-4E2E-8C42-F05A45E52251)
2	Pointline M	1237013397	(8524B845-3348-4C33-8B05-F8F3392644C2)
3	Pointline M	1242013397	(C0247EAD-3A93-44C7-82CA-33C3C70D7055)
4	Pointline M	1342013397	(7DF8E8CE-3CD1-4CDD-B81A-53D4DE4C928A)
5	Pointline M	1027013397	(0D6A8285-0774-4EB1-8754-A15D09A781F8)
6	Pointline M	1228013397	(868701D9-7E44-4873-9C14-656612D1103F)
7	Pointline M	1341013397	(72072007-9C92-458F-B7E2-2438F819404C)
8	Pointline M	1241013397	(2F046B12-F605-4BE3-8642-05E10590F446)
9	Pointline M	1353013397	(0B505C5E-70E1-4556-B9E7-F7C5D6203809)
10	Pointline M	101070267	(A4D9B705-2015-4E0E-8CF9-4990D15CC570)
11	Pointline M	1345013397	(8B8178B9-E708-4157-8A3E-70F323259710B)
12	Pointline M	1275013397	(07420158-BE6F-4D1E-8B07-4E5F2FA430115)
13	Pointline M	1340013397	(930716D2-096A-4E08-8C06-E0F3FE049CD)
14	Pointline M	1243013397	(43952515-CAS8-4392-8AD2-42C4B8F1588)
15	Pointline M	1417013397	(83E8617E-C234-4FB4-8595-5082506B0C70)
16	Pointline M	1234013397	(ED063E33-A70B-408A-E068-865D012E06571)

Orphan because no match was found in RTE_BASICS Infra table

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The mismatched and orphaned end mile post (EMP) tool finds routes with no match in the RTE_BASICS Infra table. This might be due to a data entry error to the route control number for the feature class. The tool also finds Infra Table records with no matching spatial feature. This might be due to a road that may have been decommissioned and should be kept on a list of legal mismatches. This is not a true error but will be flagged as one. The tool also compares EMP values between the spatial feature class and the Infra table and logs any mismatch errors. After running this process, review the QA report. Zoom to and examine an orphaned or EMP mismatch listed in the report. Report errors to the roads engineer or recreation program specialist responsible for maintaining the data.



Find Route Anomalies



Searches for:

- Missing M values
- M values that are equal to 0
- EMP values that are equal to 0
- BMP values that are greater than the EMP
- Maximum M value not equal to EMP

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Part	X	Y	M	
0	28	437654.600	4374519.110	0.000
	29	437688.600	4374553.110	0.000
	30	437700.600	4374562.110	0.000
	31	437718.600	4374568.110	0.000
	32	437743.600	4374568.120	0.000
	33	437755.600	4374564.120	0.000
	34	437767.600	4374561.120	0.000
	35	437780.610	4374553.120	0.000

The find routes anomalies tool finds routes with: missing M values, M values that are equal to 0, EMP values that are equal to 0, BMP values that are greater than the EMP, or Maximum M not equal to EMP. If a route has missing M values or M values equal to 0 then it is not calibrated correctly. EMP values should always be greater than the BMP. EMPs should also be greater than all M values except for the maximum M value. The maximum M value comes from the last vertex in the arc and is the same location as the EMP, therefore these values should be equal. After running this process, review the QA report. Zoom to and examine a route anomaly if one is listed in the report. If you have double checked to find a correct calibration, you may need to report errors to the roads engineer or recreation specialist responsible for maintaining the data.



Find Measure to Length Ratios

- EMP (calibrated in miles) vs. Shape_Length (GIS measured in meters)
- Ratio value is the EMP divided by the Shape_Length
- Discrepancies larger than 10% may be cause for concern

Shape	EMP	Shape_Length
Polyline M	48	55401.262613
Polyline M	24.55	29667.854637
Polyline M	46.6	28090.398267
Polyline M	15.57	24846.971119
Polyline M	18.6	24251.127686



Do these two values agree?

Record: 0

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The Find Measure to Length Ratios tool determines the ratio difference between the calibrated measures and the Shape_Length field (aka the GIS length). Ratio value is the EMP value divided by the Shape_Length value converted to miles. If the ratio value = 100%, EMP and Shape_Length are equal and it means that your GIS data agrees very well with the Infra data. Values greater than 100%, the EMP is greater than the Shape_Length. Values less than 100%, the EMP is less than the Shape_Length. If the discrepancy is larger than 10% then it begs for some examination of the feature lengths. The 10% discrepancy threshold is guide but the route's distance should be taken into consideration. If a route exceeds the 10% discrepancy but is less than a mile long it is not a concern, but if another route exceeds the 10% and is 25 miles long it will be a concern. Confirmed errors deemed 'significant' can be reported to the roads engineer or recreation program specialist responsible for maintaining the data. Due to time restrictions and the volume of errors this tool generates, errors with the largest discrepancies should get higher priority and be fixed first.

Maintaining Travel Route Feature Class



Find Lengths Tool

- Identifies maximum M values higher than the value you specify
- Quick way to determine measure anomalies
- Finds routes calibrated in meters: 14.1 miles = 22,686 meters

Part	X	Y	M
0	540	43923...	43787... 13.902
	541	43920...	43787... 13.921
	542	43917...	43787... 13.948
	543	43914...	43786... 13.976
	544	43909...	43785... 14.016
	545	43908...	43784... 14.096
	546	43908...	43784... 14.100

Finish Sketch

Property	Value
BMP	0
BUS	open
BUS_OUR	01/01-12/31
CREATED_BY	FSD/BA
CREATED_DATE	4/10/2008 1:24:45 AM
EMP	12

Travel Routes Assistant

Set minimum measure length:

13

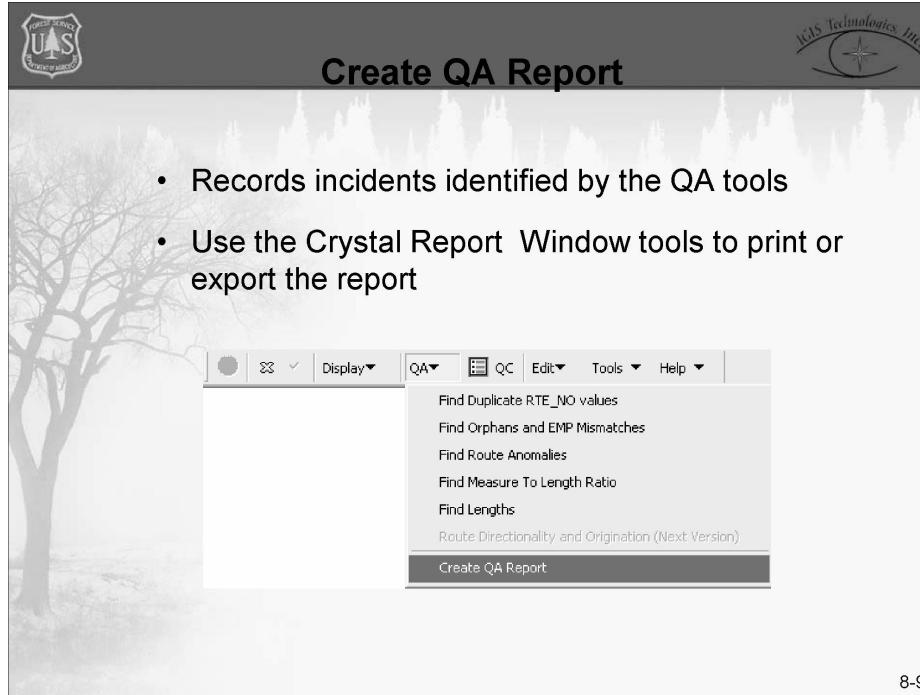
OK

Error when M value exceeds EMP

I-Web QA tool



8-8

The Find Length tool selects and highlights routes with Maximum M values higher than a value you specify. So if you know a general maximum length of roads based on the size of your forest, you can quickly evaluate the validity of long roads beyond that threshold. You can review the QA report for features identified from this process as well as zoom to individual errors. A minimum measure length must be set. This tool finds routes calibrated in meters instead of miles. Errors should be reported to the roads engineer or recreation specialist responsible for maintaining the data.



The Create QA Report tool records errors identified from running the QA tools previously mentioned. Not every incident in this report qualifies as a legitimate error. This report should be reviewed and the errors should be prioritized. Some values flagged as errors may not be real errors or these incidents may not be able to be corrected. A list of these features and their values should be recorded and kept for future reference. Checking for errors might be done at least once per year, especially after periods of much activity taking place in the database. All errors brought to the attention of Infra data manager should be reviewed individually. Many situations thought to be errors may be acceptable. The Crystal Report Window tools can be used to print out the report or export it to a file.

Maintaining Travel Route Feature Class



Error Report

I-Web Spatial Editor : Travel Routes QA Report

Feature Class: Road
Generated on: 12/11/2008 1:15:34PM

Geodatabase: \\Feature Dataset
C:\Nick\MMVUM_USFS\Data\Original materials\Data\IWeb GDB TransportationOnly.mdb\Transporta

Type	Errors	Exceptions	Fixed
Duplicate			
Orphans	27	27	0
Anomalies	12	3	4
Ratios	17	0	0
Exceeds Distance	6	3	0

2983 total records

Status	Route No	Error	Value	Feature ID
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	1
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	2
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	3
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	4
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	5
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	6
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	7
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	8
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	9
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	10
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	11
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	12
Pending		Orphan-Feature Class	RTE_NO AND Road RTE_BASICS.ID IS NULL	13



Type of tool and the results

Logged incidents

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The error report records what tools were run on the data and the resulting errors. At the top of the report there is a summary of the number of errors found by each tool. Additionally, exceptions and fixes are recorded. Down below, you will find a list of the individual incidents. This includes the recorded status, type of error, value and Feature ID. Because many incidents listed on the report may be acceptable, this data should be examined closely before further action is taken.

Maintaining Travel Route Feature Class



QC Tool and Organizing the QA Report

☐ ☒ QC ☐ Edit ☐ Tools ☐ Help

- Categorize QA Report
- Mark Errors, Exceptions and Fixes
- Edit feature, Connect to Infra and Calibrate
- Zoom to and display minimum and maximum measurements

Show: Orphan

Refresh

Status	Error	Value
Pending	Orphan Feature Class	Road RTE_BASIC

Note: Please click on 'Refresh' button to get the latest records.
Right click on the selected record to see more editing options.

Show: Orphan

Refresh

Status	Error	Value
Pending	Orphan Feature Class	Road RTE_BASIC

Note: Please click on 'Refresh' button to get the latest records.
Right click on the selected record to see more editing options.



Show: Orphan

Refresh

Status	Error	Value
Pending	Orphan Feature Class	Road RTE_BASIC


Note: Please click on 'Refresh' button to get the latest records.
Right click on the selected record to see more editing options.

The QC tool in the I-Web Spatial Editor Travel Routes toolbar is very useful after running the QA tools. This tool helps you categorize and organize features recorded in the QA report. Using the checkbox the QC tool allows you to view features logged in the QA report by the type of error. After selecting a feature logged in the QA report you can: zoom to it, edit and calibrate it all using the QC tool. After reviving and possibly editing a feature in the QC tool its status can remain as an error or if necessary changed to fixed or an exception.





Demo

- Find duplicate RTE_NO values
- View ArcCatalog error table
- Generate QA Report




7-12



Exercise:



**Utilize the QA tools on the I-Web Spatial Editor
Travel Routes tool bar**

- Goal: Review and understand the functionality of the QA tools in the I-Web Spatial Editor Travel Routes tool bar and create an error report



1. Connect to Infra to activate the I-Web toolbar
2. Run each tool under the QA drop-down menu on the toolbar

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Summary

- ☐ Infra tables are automatically updated and will require a fresh download before finalizing your MVUM.
- ☐ There are a series of systematic checks from the QA tools that you can run to evaluate your routes.
- ☐ A QA report must be scrutinized to determine priority errors, exceptions, and fixes.

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Exercise 8: Utilizing the QA tools on the I-Web Spatial Editor Travel Routes Toolbar



Exercise goal: In this exercise you will use the quality assurance tools on the I-Web Spatial Editor toolbar on an MVUM roads route feature class.

Why is this important? It is necessary to run the I-Web Spatial Editor toolbar QA tools to identify errors in the route datasets.

Upon completion of the exercise, you will be able to QA route data for ...

- ✓ Use QA tools to find duplicate RTE_NO values
- ✓ Use QA tools to find orphaned and mismatched EMP values
- ✓ Use QA tools to identify route anomalies
- ✓ Use QA tools to find measure-to-length ratios that are greater than the allowed tolerance
- ✓ Use the I-Web Spatial Editor toolbar to create a QA error report

STEP	DESCRIPTION	PAGE
1	Find Duplicate RTE_NO Values	8 – 16
2	Find Orphaned EMP Mismatches	8 – 21
3	Find Route Anomalies	8 – 23
4	Find Measure-to-Length Ratio	8 – 25
5	Find Lengths	8 – 29
	Appendix A – How to Approach Logged Errors	8 – 32

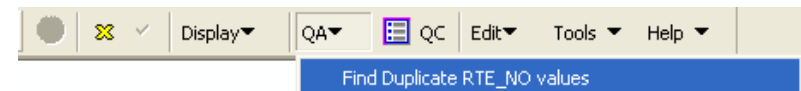
Step 1: Find Duplicate RTE_NO Values

This tool identifies routes with the same RTE_NO value. Each route's RTE_NO value should be unique. No two routes will have the same value for this field. If more than one route has the same RTE_NO value, it should be addressed as an error.

Navigate to C:\Training\Ex8\IWeb GDB TransportationOnly.mdb\Transportation add the **Road** feature class to an ArcMap session. Add the I-Web Spatial Editor Travel Routes toolbar. As described in the previous chapter connect to Infra and create meta data.

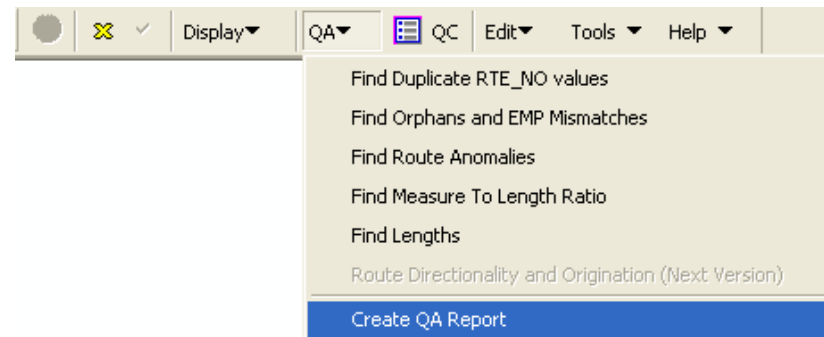


- a. Click on the QA dropdown menu on the I-Web Spatial Editor Travel Routes toolbar and select **Find Duplicate RTE_NO values**.



In the Travel Routes Assistant window click **Yes** to the stop editing prompt and click **OK** in the next I-Web Spatial Editor window confirming that duplicates were found and logged.

- b. In the I-Web Spatial Editor Travel Routes toolbar click on the QA dropdown menu and select **Create QA Report**.

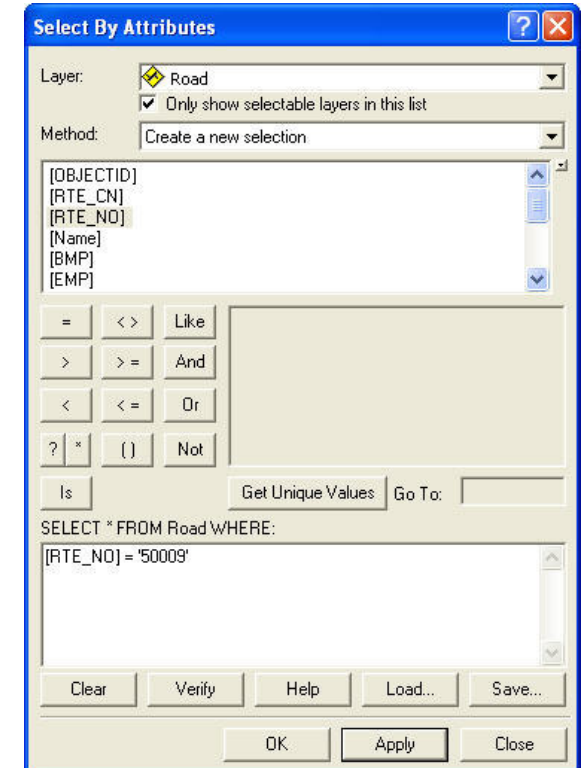


The QA Report window lists all of the errors identified thus far.

- c. On the Report toolbar, select the Find Text icon and enter **50009** to find this route in the report.

Maintaining Travel Route Feature Class

Status	Route No	Error	Value	Feature ID
Pending	54788	Duplicate RTE_NO	54788	1,744
Pending	50213	Duplicate RTE_NO	50213	1,745
Pending	54753	Duplicate RTE_NO	54753	1,746
Pending	52174	Duplicate RTE_NO	52174	1,756
Pending	54659	Duplicate RTE_NO	54659	1,759
Pending	54665	Duplicate RTE_NO	54665	1,765
Pending	50214	Duplicate RTE_NO	50214	1,770
Pending	54656	Duplicate RTE_NO	54656	1,773
Pending	54656	Duplicate RTE_NO	54656	1,774
Pending	54646	Duplicate RTE_NO	54646	1,777
Pending	50123	Duplicate RTE_NO	50123	1,782
Pending	55551	Duplicate RTE_NO	55551	1,788
Pending	54728	Duplicate RTE_NO	54728	1,793
Pending	54657	Duplicate RTE_NO	54657	1,796
Pending	54683	Duplicate RTE_NO	54683	1,799
Pending	54779	Duplicate RTE_NO	54779	1,804
Pending	54779	Duplicate RTE_NO	54779	1,805
Pending	51067	Duplicate RTE_NO	51067	1,819
Pending	50009	Duplicate RTE_NO	50009	1,834
Pending	50047	Duplicate RTE_NO	50047	1,836

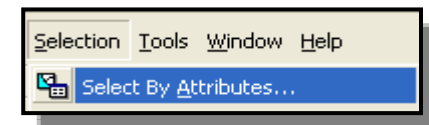


d. Close the QA Report window. 

Next you will query features in ArcMap that you found in the QA error report.

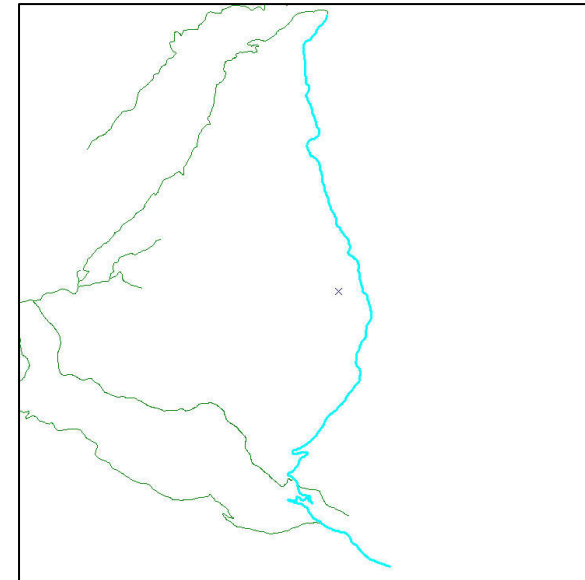
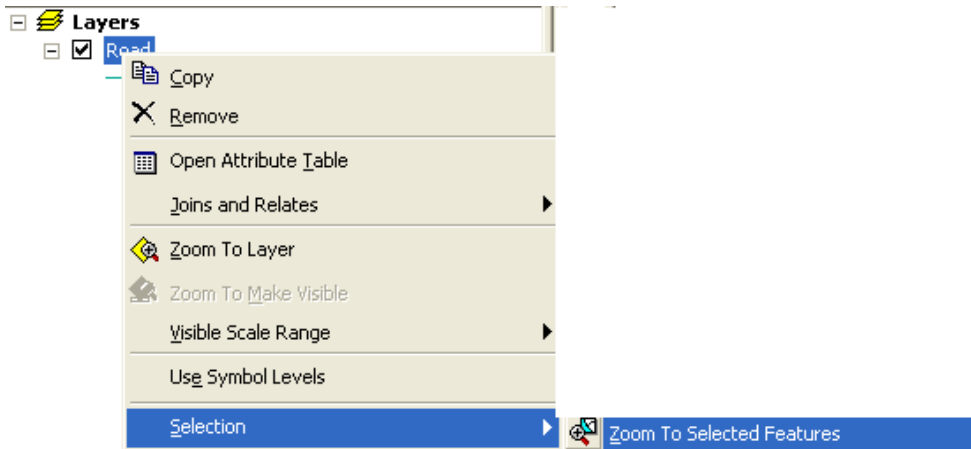
e. In the main menu bar click **Selection** → **Select By Attributes**.

f. In the Select By Attributes window, select features that have a RTE_NO value of 50009. The query statement is **[RTE_NO] = 50009**. Click **OK**.



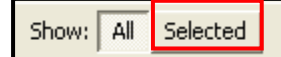
Maintaining Travel Route Feature Class

- g. Next, right-click on the Road feature class in the table of contents and click **Selection → Zoom to Selected Features**.



Your data view should zoom to the selected features and look like the graphic to the right.

- h. In the table of contents, right-click on the Road feature class and select **Open Attribute Table**. At the bottom of the attribute table, click **Selected**.



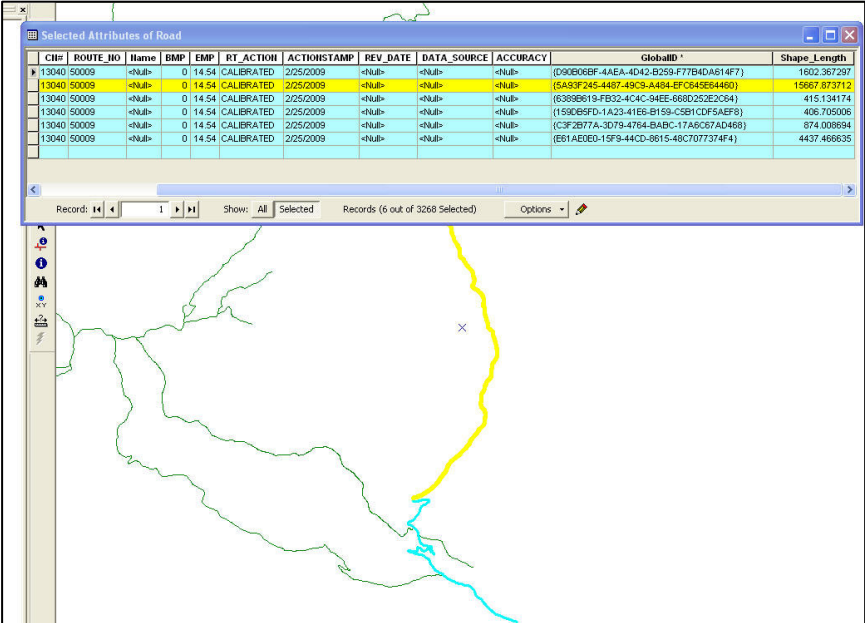
Compare the EMP value of each record the value in the Shape_Length field. Because the Shape_Length field is in meters you will multiply the EMP by 1609.34. It appears our EMP is representative of the sum of three shape lengths selected.

	CIN#	ROUTE_ID	Name	BMP	EMP	RT_ACTION	ACTIONSTAMP	REV_DATE	DATA_SOURCE	ACCURACY	GlobalID *	Shape_Length
▶	13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	{D90B06BF-4AEA-4D42-B259-F77B4DA614F7}	1602.367297
	13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	{5A93F245-4487-49C9-A484-EFC645E64460}	15667.873712
	13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	{6389B619-FB32-4C4C-94EE-668D252E2C64}	415.134174
	13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	{159DB5FD-1A23-41E6-B159-C5B1CDF5AEF8}	406.705006
	13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	{C3F2B77A-3D79-4764-BABC-17A6C67AD468}	874.008694
	13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	{E61AE0E0-15F9-44CD-8615-48C7077374F4}	4437.466635

Maintaining Travel Route Feature Class

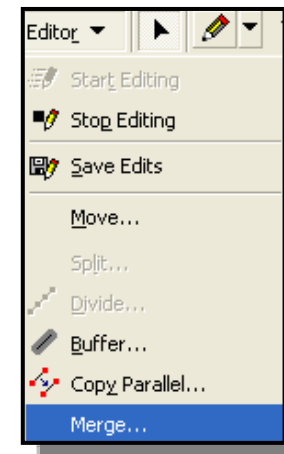
- i. Click on the gray box to the left of any record. The selected record and its feature will appear a different color.

The three features have the same ROUTE_NO, CN# and BMP/EMP. Because the EMP almost matches the sum of the three Shape_Length values, it is certain the three features should be one route and should be merged together.



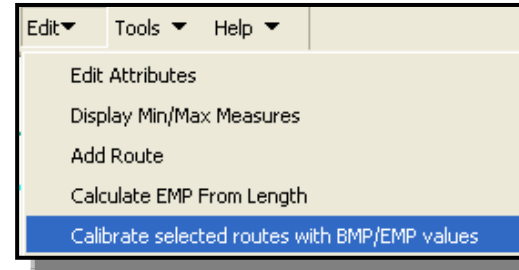
CN#	ROUTE_NO	Name	BMP	EMP	RT_ACTION	ACTIONSTAMP	REV_DATE	DATA_SOURCE	ACCURACY	GlobalID	Shape_Length
13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	(D90E06EF-44EA-4D42-B259-F77B4DA514F7)	15602.367297
13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	(5A33F245-4467-49C3-A484-EFC645E64460)	15667.873712
13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	(B38B618-FB32-4C4C-94EE-868D25E2C64)	415.134174
13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	(159D69FD-1A23-41E6-B159-C5B1CDF6AEF8)	406.705006
13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	(C3F2B77A-3D79-4764-BABC-17A6C57AD468)	874.008694
13040	50009	<Null>	0	14.54	CALIBRATED	2/25/2009	<Null>	<Null>	<Null>	(E61AE0D-19F3-44CD-8615-49C707374F4)	4437.468635

- j. In the Editor Toolbar click **Editor** → **Merge** and in the Merge window click **OK**.



Maintaining Travel Route Feature Class

- k. With the feature still selected, go to the I-Web Spatial Editor Travel Routes toolbar and click **Edit → Calibrate selected routes with BMP/EMP values**. Click **OK** in the I-Web Spatial Editor window.




- l. With the route still selected, go to the attribute table to see that a single record now exists for Route No 50009. Double check your length again using the miles to meters conversion factor (1609.34).

It should be close enough.

- m. From the Editor toolbar, ensure that the feature is still selected and change the task to **Modify Feature** and click the **Sketch Properties** tool. Make sure the M values are populated correctly (all values are populated and are in ascending order).



- n. From the Tools toolbar click **Clear Selected Features**. 



NOTE: It is recommended to merge all multi-part routes as done in the previous steps before continuing on with the rest of the QA tools. Merging segmented routes will cut down on the number of errors identified when running QA tools such as: Find Measure to Length Ratio and Find Lengths.

Question:

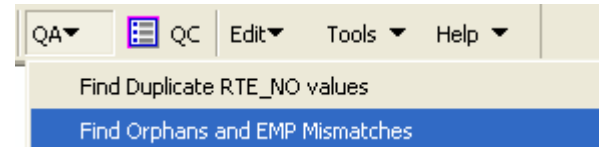
1. After merging the six features into one, why must it be calibrated?

Step 2: Check Mismatched and Orphaned EMP

Maintaining Travel Route Feature Class

This tool will find routes without a match in the RTE_BASICS Infra table or records in that Infra table with no matching spatial feature.

- a. From the I-Web Spatial Editor Travel Routes toolbar, click **QA → Find Orphans and EMP Mismatches**.



- b. In the next three I-Web Spatial Editor Travel Routes toolbar windows select **Yes** to momentarily stop editing, **Yes** to use existing Road_RTE_BASICS table, and **OK** acknowledging the errors found have been logged in the QA table.
- c. From the I-Web Spatial Editor Travel Routes toolbar click **QA → Create QA Report**. Notice in the QA Report window that in addition to Duplicate errors, you also see that Orphan errors have been recorded.

I-Web Spatial Editor : Travel Routes QA Report			
Feature Class		Generated on :	2/25/2009
Road			6:05:01PM
Geodatabase \ Feature Dataset			
C:\Training\Ex7\IWeb GDB TransportationOnly.mdb\Transportation			
Type	Errors	Exceptions	Fixed
Duplicate	664	0	0
Orphans	1221	0	0

Maintaining Travel Route Feature Class

d. In the QA report, use the **Find** tool again and enter **50022** to find this error.

<u>Status</u>	<u>Route No</u>	<u>Error</u>	<u>Value</u>	<u>Feature ID</u>
Pending	51094	EMP Mismatch	FC=0,Infra=0.35	1,516
Pending	52137	EMP Mismatch	FC=0,Infra=2.456	1,616
Pending	U52260	EMP Mismatch	FC=0,Infra=0.15	1,872
Pending	50175	EMP Mismatch	FC=0,Infra=9.926	2,540
Pending	50022	EMP Mismatch	FC=0,Infra=48.612	3,084
Pending	54664	Orphan -Infra	54664	
Pending	54670	Orphan -Infra	54670	
Pending	52012	Orphan -Infra	52012	

←

Missing Feature IDs

e. Using the select by attributes method in the previous step: select and zoom to route **50022** in ArcMap.



NOTE: The order of errors in your report may differ slightly from the graphic.

The above graphic shows the QA report. Route 50022 shows an EMP mismatch error. The error column shows the feature class having a value of 0.0 (miles) and the Infra value of 48.612(miles). The report does the meters to miles conversion for you with a bit of rounding. You can double check the length of this feature in your GIS data by comparing to other ancillary data. If the error does not appear to be a geometry error, then it should be reported to the Transportation engineer. The errors flagged as Orphan-Infra have no feature ID numbers because they only exist in the Infra database and not as GIS data. They have no spatial feature. The Orphaned-infra routes should be reviewed by the transportation engineer to verify their status.

It is important to remember decommissioned roads should continue to have Infra. It may show up as a mismatches if someone has mistakenly deleted it from Infra.

Maintaining Travel Route Feature Class

Question:

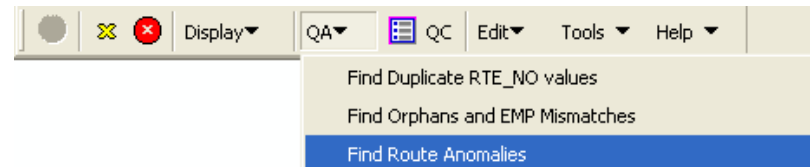
2. What are some reasons why a route may be an orphan in Infra?

 NOTE: Roads that have been decommissioned should be kept on a list of legal mismatches.

Step 3: Find Route Anomalies

This tool finds routes with missing M values, M values that are equal to 0, EMP values that are equal to 0, BMP values that are greater than the EMP, or Maximum M not equal to EMP. After running this process, review the QA report.

- a. From the I-Web Spatial Editor Travel Routes toolbar, click **QA → Find Route Anomalies**.



You will be prompted when the tool has finished running, click **OK**.

- b. From the I-Web Spatial Editor Travel Routes toolbar click **QA → Create QA Report**. Scroll down through the error report and view the route anomalies. Review route 52889.

Pending	54626	MMax <> EMP	MMax=NaN EMP=0.08	1,263
Pending	52889	MMax <> EMP	MMax=0.000 EMP=0.8	1,264
Pending	55292	MMax <> EMP	MMax=NaN EMP=5.5	1,265
Pending	55403	MMax <> EMP	MMax=NaN EMP=4.91	1,267

- c. In the main menu bar use the Select by Attributes tool and **Select Route_NO 53158**.

Maintaining Travel Route Feature Class

- d. From the Editor toolbar, change the task to **Modify Feature** and click the **Sketch Properties** tool. View the M values for the selected feature.
- e. Next click on the **Attributes** button on the Editor toolbar and review the feature's attributes.

Because this feature has BMP and EMP values but no M values it can be fixed by being calibrated. This will set the maximum M value equal to the EMP.

- f. Ensure that the feature is still selected. From the I-Web Spatial Editor Travel Routes toolbar click **Edit → Calibrate selected routes with BMP/EMP values**. Click **OK** in the I-Web Spatial Editor toolbar.

Question:

3. Why was route 53158 considered an anomaly?

- g. Route 50234 is also cited as an anomaly. **Select** and **Zoom to** this route.
- h. With route 50234 selected, click the **Attributes** button on the Editor toolbar.

Because this route lacks BMP and EMP Infra data, there is no GIS Fix for it. The transportation engineer should be consulted to understand why this feature lacks Infra data.

Question:

4. What is a possible reason why it lacks the BMP and EMP values?

Maintaining Travel Route Feature Class

We addressed two types of anomalies, but here are some possible causes for other route anomalies:

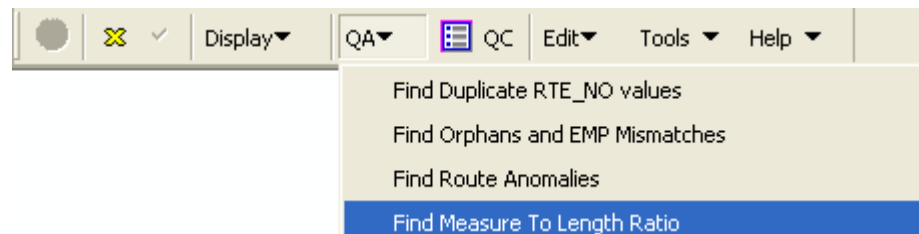
- A route that does not get calibrated
- A GIS feature that does not have Infra data
- An Infra error causing the BMP value to be larger than the EMP
- Maximum M values does not equal EMP
- EMP = 0

Look at Appendix A in this exercise for more advice on route anomalies.

Step 4: Find Measure to Length Ratio

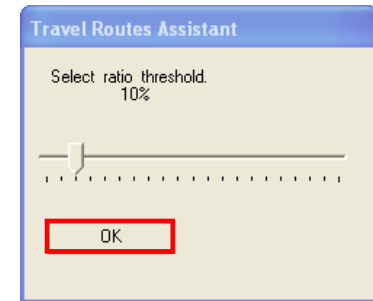
The Find Measure to Length Ratio tool identifies features that have significant differences between the EMP and the Shape_Length values. In this exercise you will identify features with a difference of 10% or greater. Depending on how accurate your data may be, you might adjust this value. If you believe your data has a lot of length errors, increase this value so you can focus on the larger errors.

- a. From the I-Web Spatial Editor Travel Routes toolbar click **QA → Find Measure to Length Ratio**.



Maintaining Travel Route Feature Class

- b. In the Travel Routes Assistant window adjust the slide window to the left to set the ratio threshold at **10%** and then click **OK**.
- c. In the next I-Web Spatial Editor Travel Routes window click **OK** to acknowledge that identified routes have been logged in to the QA table.



- d. From the I-Web Spatial Editor Travel Routes toolbar click **QA → Create QA Report**. Toggle to the last page of the report to see the ratio errors identified. By reviewing the QA report you will notice the percentage errors range from -70% to over 10000%.

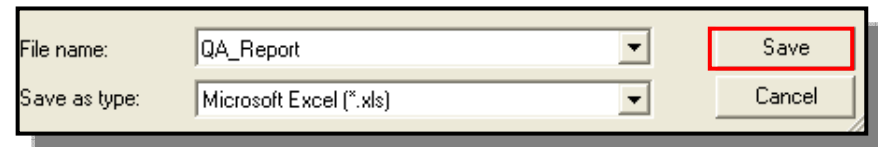
- e. In the upper left corner of the QA report click the Export Report button. Save the document to C:\Training\Ex8 as **QA_Report** and save it as a Microsoft Excel document in the Ex8 folder. Click **Save** in the Export report window.



Due to time restraints and the volume of features logged, the features with the largest errors should be addressed first. By sorting, you can prioritize the most severe errors. The more minor discrepancies can be addressed next and may be delegated to a future round of MVUM updates. You will now see how to do this sorting in Excel.



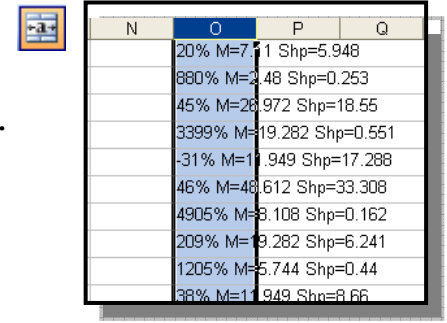
- f. Open the QA_Report spreadsheet in Microsoft Excel. Select the records with a value of **Ratio > 10** and **Copy** them. From the main menu bar in Excel click **Insert → Worksheet** creating a second worksheet and **Paste** the records into it.



The ratio error for each record shares a cell with the M value and Shape_Length value. The percentage must be separated from the other values in the cell in order to sort by the percentage.

Maintaining Travel Route Feature Class

- g. For each column with data in it click on the letter at the top. With the column highlighted click the **Merge and Center** button. This must be done for every column with data since the export does not come across in a regular set of parallel fields. Columns B,F,J,O and C have data in them.



N	O	P	Q
	20% M=7.1 Shp=5.948		
	880% M=2.48 Shp=0.253		
	45% M=26.972 Shp=18.55		
	3399% M=19.282 Shp=0.551		
	-31% M=11.949 Shp=17.288		
	46% M=48.612 Shp=33.308		
	4905% M=8.108 Shp=0.162		
	209% M=19.282 Shp=6.241		
	1205% M=5.744 Shp=0.44		
	38% M=11.949 Shp=8.66		

This step uses a wizard to separate merged cells and is required for sorting the data.

- h. Select the column with the percent, M and Shp values and in Excel's main menu click **Data → Text to Columns**. In the first window of the wizard select **Delimited** and **Next**. In the second window check **Space** and **Next**, and in the third window click **Finish**. Click **OK** in the alert box.

- i. Select all the records by clicking on the number of a row and pressing **Ctrl+A**.

- j. From the main menu bar click **Data → Sort**. Sort by the column with the percent data in it by **decending** order and click **OK**.



- k. Scroll down to the Ratio error with the feature **Route_NO = 51206** with the percent error of 113%. Although this feature has an error percentage of 113%, the length of the feature is approximately a mile. You can find more gross errors to prioritize and start fixing. **Minimize** the QA Report window.

Question:

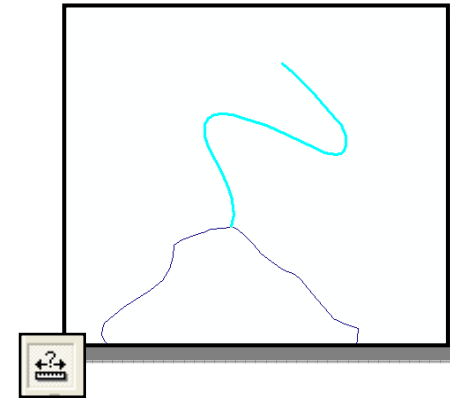
5. If you had to prioritize a subset of these ratio errors, how many segments would be greater than 15%?

Maintaining Travel Route Feature Class

1. Right-click on the Road feature class in the table of contents and open up the attribute table. Scroll down and select the row with the **ROUTE_NO = 53006**.

OBJECTID	Shape *	CID#	ROUTE_NO	Name	BMP	EMP	RT_ACTION
494	Polyline M	1500010397	53003	<Null>	0	2.578	CALIBRATED
326	Polyline M	1500010397	53003	<Null>	0	2.578	CALIBRATED
695	Polyline M	1500010397	53003	<Null>	0	2.578	CALIBRATED
1763	Polyline M	1713010397	53006	<Null>	0	0.9	CALIBRATED
328	Polyline M	1989010397	53008	<Null>	0	0.201	CALIBRATED
1086	Polyline M	2409010397	53010	<Null>	0	0.54	CALIBRATED
1869	Polyline M	357010397	53019	<Null>	0	1.82	CALIBRATED

- m. In the data frame zoom into the vicinity of this feature selected.
- n. From the Tools toolbar, select the Measure tool.



Set the measure units to **mile** and measure the selected feature.

With the measured distance being approximately 0.38 of a mile and the EMP value being 0.9, it is apparent the EMP value is incorrect.

This error appears to warrant attention while other errors might receive less priority. Remember that errors flagged must be prioritized with the largest ratio errors being addressed first. Secondly, you might look at the overall lengths of the roads to see how significant the length error might be. A 200meter route that has an error of 50meters might not receive as much priority as a 4 mile route with a ½ mile error even though the ratio errors would suggest otherwise.

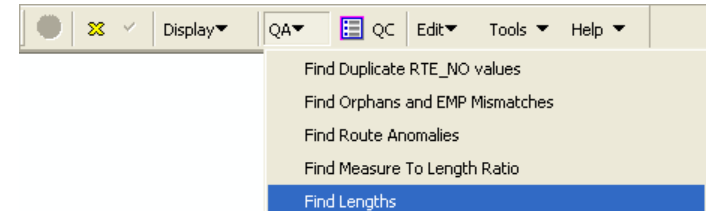
Step 5: Find Lengths

The Find Lengths tool identifies routes with EMP values higher than the maximum measure length set in the travel routes assistant dialog window. The purpose of this tool is to identify routes that have been calibrated incorrectly. The transportation engineer should

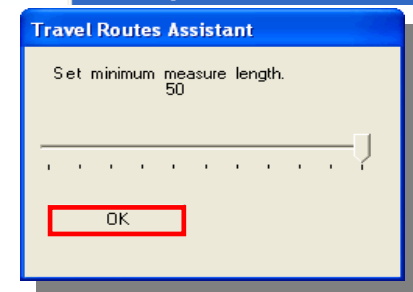
Maintaining Travel Route Feature Class

be consulted to find out the longest road in the forest. The minimum measure length should be set to one mile above the longest route identified by the transportation engineer.

- a. From the I-Web Spatial Editor Travel Routes toolbar, click **QA → Find Lengths**.



- b. In the Travel Routes Assistant window adjust the slide window to the right setting the Maximum Measure length to **50** and then click **OK**. This measurement should be derived by the size of the forest. For this test you will select routes with an EMP value over 50.



- c. From the I-Web Spatial Editor Travel Routes toolbar click **QA → Create QA Report**.
- d. Review the I-Web Spatial Editor Travel Routes QA Report and scroll down and view the first route having the error "Exceeds Length > 50".

Pending	50150	Exceeds Length > 50	91.388	80
Pending	50150	Exceeds Length > 50	91.388	104
Pending	50150	Exceeds Length > 50	91.388	357
Pending	50150	Exceeds Length > 50	91.388	417
Pending	50150	Exceeds Length > 50	91.388	434
Pending	50150	Exceeds Length > 50	91.388	458

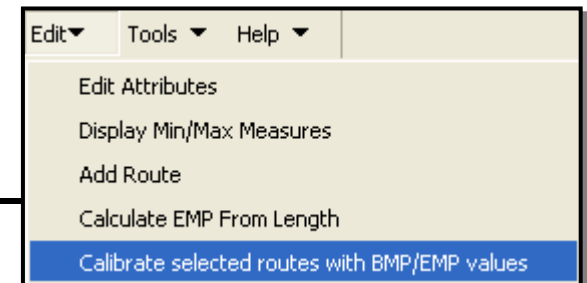
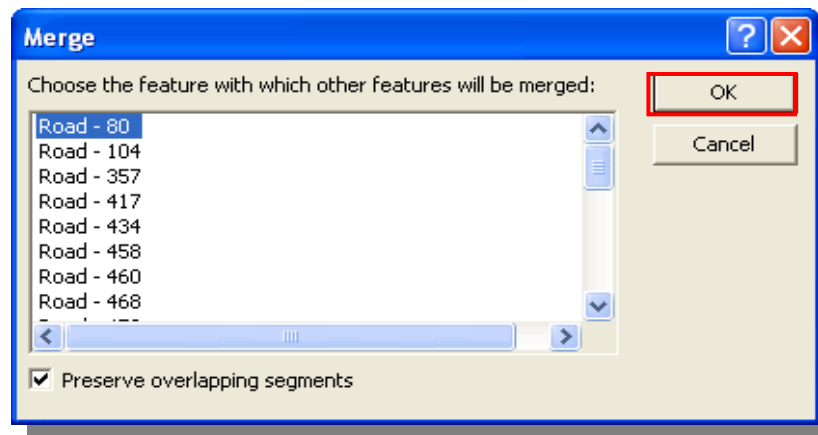
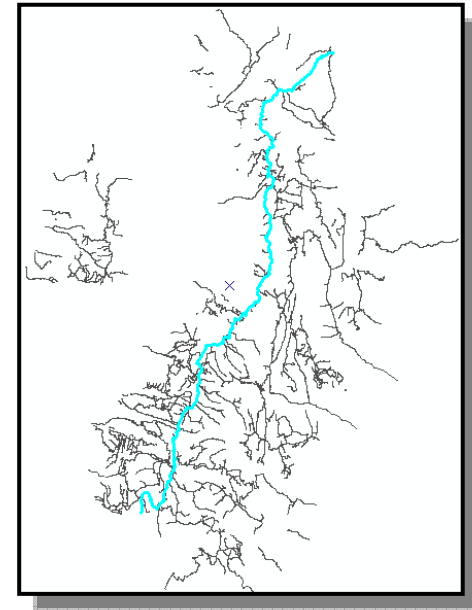
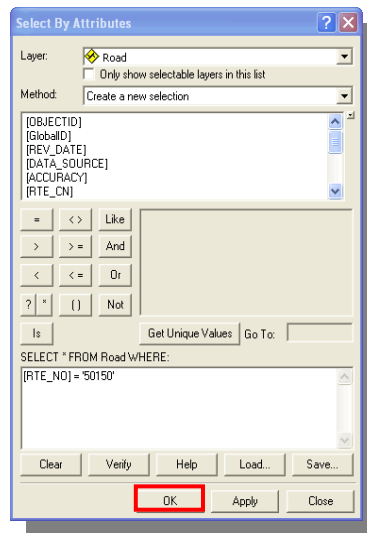
Not that all the features listed in the QA report have the same route number of **50150** and value of **91.388**. The repeating route number and values show this is a segmented route. These features need to be merged together.

- e. From the main menu bar, choose **Selection → Select by Attributes**. Create a query that selects routes with a RTE_NO value of 50150.

Maintaining Travel Route Feature Class

The query should yield 25 features selected.

- f. In the Editor Toolbar click **Editor** → **Merge** and merge the selected features together.




Maintaining Travel Route Feature Class

- g. With the feature still selected go to the I-Web Spatial Editor Travel Routes toolbar and click **Edit → Calibrate selected routes with BMP/EMP values**.

Now that the route has been recalibrated, compare the Shape_Length value to the EMP value as another check. To do this we need to convert the length in meters to miles. The conversion factor is 1609.3.



- h. On the Edit toolbar click the **Attribute** button to view the features attributes. Divide the Shape_Length value of the feature by 1609.3 (147805.97/1609.344). This equation should give a result equivalent to the EMP. Because the difference is significant the Transportation engineer should review the data assigned to this route.
- i. Save all of the edits, stop editing and close the document.

 **NOTE:** This tool can be run multiple times for different lengths. The error for each maximum length QA check will be stored in the QA report.

In this exercise you used the QA tools provided on the Spatial Editor Travel Routes toolbar. You found errors in the data by searching for: duplicate routes numbers, routes with no matches in the Infra or GIS data, routes that were not calibrated properly, and routes where the lengths were possibly too long. By going through these tools you also prepared QA reports helped you view and prioritize errors.

End Exercise.

Appendix A – Common Route Anomaly Problems

Maintaining Travel Route Feature Class

How to resolve duplicate route numbers in your GIS data. Common if forests have been combined in the past, uncommon if not.

- Look at lengths. If you are lucky, one is 2 miles one is 10 miles. Therefore you can associate the correct feature with the Infra record if the GIS length more or less matches the Infra length.
- Look at what is described in the beginning termini and ending termini fields in Infra. There may be enough information there to determine which feature belongs to which Infra record.
- Look at the Infra fields for Legal, Cong district, admin_org, county, or any other field, including description that may give a clue to which route belongs to which Infra record.
- Look at a map to see if one of the road numbers is incorrect.

How to resolve Orphans

- Are any of them duplicates, mistyped road numbers?
- If a road has been decommissioned some time ago, there may be a GIS record of it and no Infra record, or vice versa. The business rule is you never delete either the GIS or the Infra record of roads or trails, just change the status to 'Decommissioned'. However, in the past, this rule may not have been followed. It might be proper to replace the missing information, if available, in either the GIS data or the Infra data. But perhaps this type of correction could wait until later.

How to resolve EMP mismatches – Where the EMP on the feature is different than what is in Infra.

- If this is the first time you are doing this check, perhaps taking the EMP values from Infra would be the best solution. Afterwards, run the check that compares the EMP with the GIS length and resolve those discrepancies.
- If you are doing an update or a periodic check of your data and have previously matched the GIS EMP with the Infra EMP, then you know any discrepancy is now due to a change in Infra of the EMP. If the difference is small, you may choose to accept the change and recalibrate. If the change is greater, you will have to compare the new EMP to the GIS length and see if

Maintaining Travel Route Feature Class

further action is necessary. If the new EMP appears to disagree with the GIS length, then further investigation is necessary. See section on comparing lengths.

Anomalies – Problems with the measures

- A route with no M value, a value of NaN, or 0 indicates a route that is not calibrated. Calibrate the route using the BMP and EMP on the feature.
- A route with EMP = 0 or BMP greater than EMP should have the milepost values updated from Infra.
- A route with the maximum M value not equal to the EMP should be recalibrated to the EMP value.

GIS length (shape_length) not matching the EMP – after converting meters to miles.

- This is reported as a positive or negative percentage of discrepancy.
- This occurs when the digitized shape of the road does not perfectly account for the on the ground length. There can be many reasons for this that would not indicate an error. A road with many curves probably is not digitized perfectly and would result in the digitized length being shorter. It could also be due to differences in elevation along the route (slope distance being greater than horizontal distance). Small discrepancies caused by these situations are normal.
- Larger differences need investigation.
- Perhaps the spatial location is not perfect, ending short of or extending past the official end of the road.
- Perhaps the EMP of the road was changed in error. This can commonly occur with ERL data.
- Check that the road number is correct. Also check that the correct road on the ground is represented.

Routes that exceed a specified distance – Roads calibrated to a length longer than the longest road in the database.

Maintaining Travel Route Feature Class

- This is likely because a route is being calibrated in meters. Distances will be approx 1600 times longer than the EMP. If calibrated in feet, distances will be approx 5300 times longer than the EMP.