

Counting Your Change:

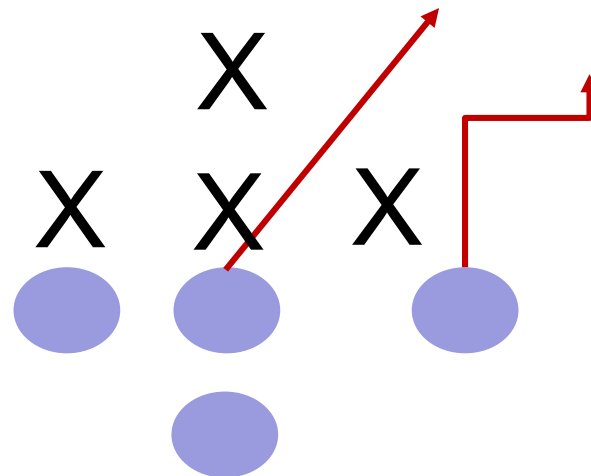
Data Supply Chain Extends Data Feedback Mechanism

Presentation by: James Meyer & Ryan Blum
April 23-26, 2019

AASHTO GIS-T 2019
Symposium

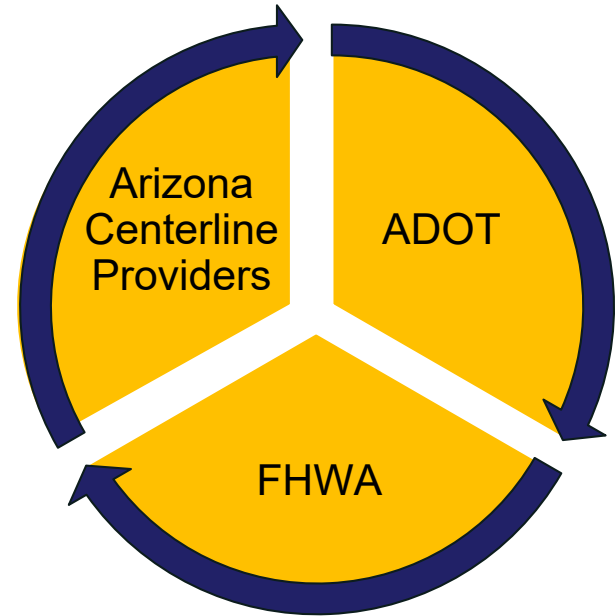
Data Supply Chain: What We'll Cover

- Data Supply Chain workflow / history
- What “change” is being detected
- Specific change detection results.
- Questions



Data Supply Chain: Serving FHWA, ADOT, and Arizona Needs

- **FHWA**
 - ARNOLD - All Roads Network of Linear Referenced Data
 - FHWA Requirement
- **ADOT**
 - ATIS – Arizona Transportation Information System
- **Arizona**
 - Any Agency Can Get Neighbors Data from One Source
 - LRS, Events, Centerlines, Etc.



Data Supply Chain: Many Benefits

- Statewide complete centerline file endowed with address attributes for E-911 and NG 9-1-1
- Statewide Linear Referencing for ADOT and the COG/MPOs
- Regional, State, National Layers
- Quality Assurance/Control
- Edge-matching with Demarcations Points
- Conflated & Condensed Output
- Target for Zero Redundancy
- Addresses and Attributes as Events
- Metrics on GIS Responsiveness
- Offsite Copy

Data Supply Chain: Phases & Accomplishments

- **Create Initial ARNOLD Submittal** (2013-2014)
- **Create AZGEO Centerline QAQC** (2016-2017)
- **Create AZGEO Centerline Change Detection** (2017-2018)

Data Supply Chain: Change Detection Summary

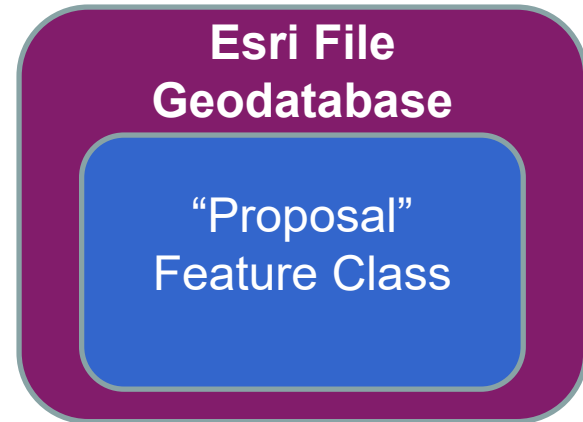
- Compares newer centerline vintage against an older vintage through the [AZGEO Centerline Data Validation System](#)
- Detects Both Attributes (Scalar) and Shape Changes
- Returns Comparison Results to Supplier
road name | shape | address changes
- Accommodates all 17 data providers

Data Supply Chain: Output Format Details

The output (Proposal) contains a spatial representation of what has changed between an older (base) centerline file and a newer (update) centerline file.

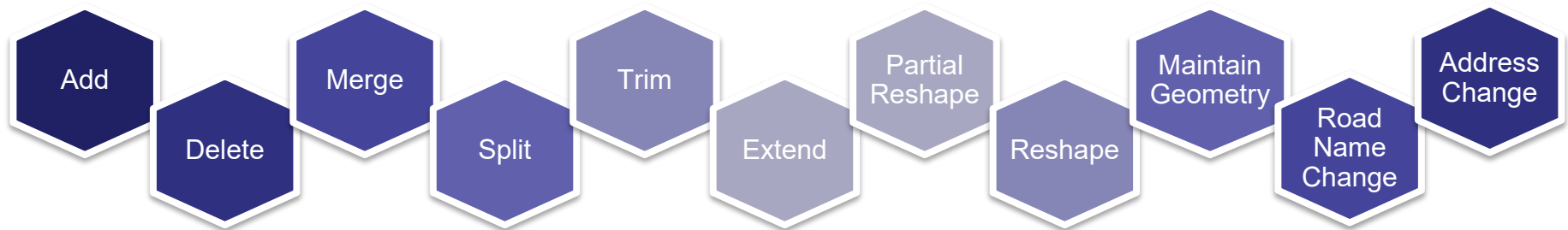
Output Details:

- **Esri File Geodatabase**
- **Contains “Proposal” Feature Class**
- **24 fields within**
- **Records without change are not included in output**



Data Supply Chain: Output Format Details Cont.

- 'Type' field designates type of change detected
- Both Shape and Scalar Changes



Older Centerline (Base)

Change Type: Add



Newer Centerline (Update)



Change Detection Output (PROPOSAL)



Definition: This is a new centerline that did not exist in the older centerline file (base)

Older Centerline (Base)

Change Type: Delete



Newer Centerline (Update)



Change Detection Output (PROPOSAL)



Definition: This is a centerline that no longer exists in the newer centerline file (update)

Older Centerline (Base)

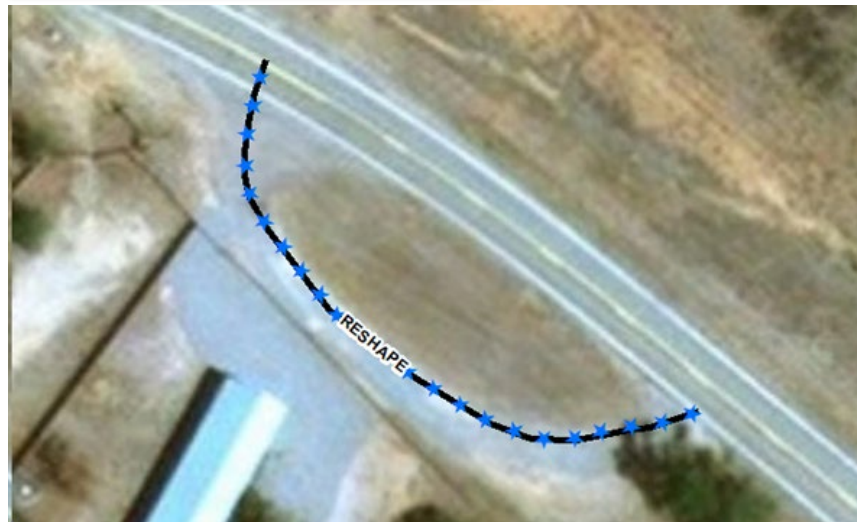
Change Type: Reshape



Newer Centerline (Update)



Change Detection Output (PROPOSAL)



Definition: This is a new centerline record (update) that has changed shape in its entirety from its older centerline representation (base)

Older Centerline (Base)

Change Type: Trim



Newer Centerline (Update)

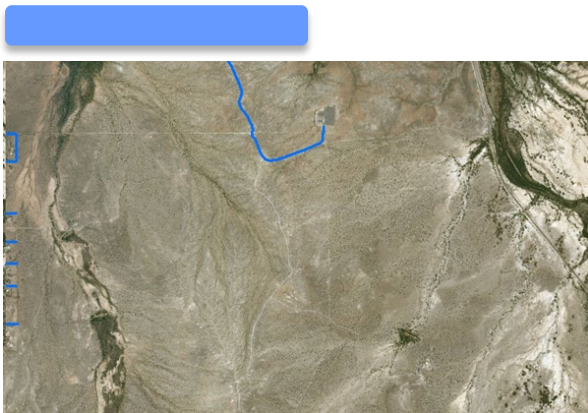


Change Detection Output (PROPOSAL)



Definition: This is a new centerline record (update) that had its beginning or ending shortened as compared to its older centerline representation (base).

Change Type: Extension



Newer Centerline (Update)



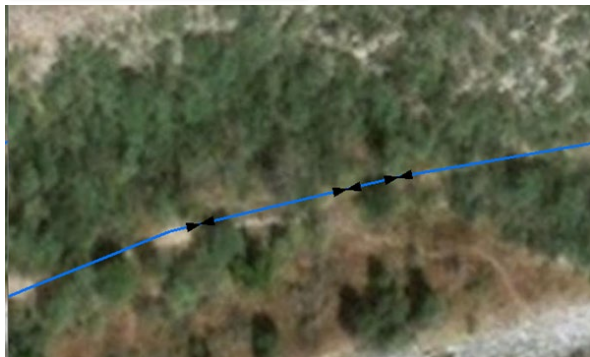
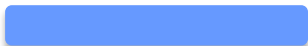
Change Detection Output (PROPOSAL)



Definition: This is a new centerline record (update) that had its beginning or ending extended as compared to its older centerline representation (base).

Older Centerline (Base)

Change Type: Merge



Newer Centerline (Update)

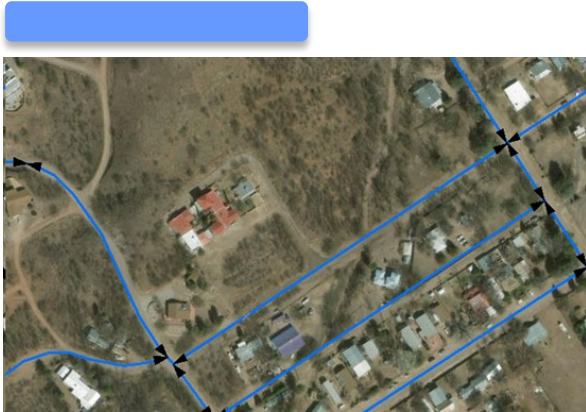


Change Detection Output (PROPOSAL)



Definition: When multiple older centerline records (base) are now 1 record in the new centerline representation (update)

Change Type: Split



Newer Centerline (Update)



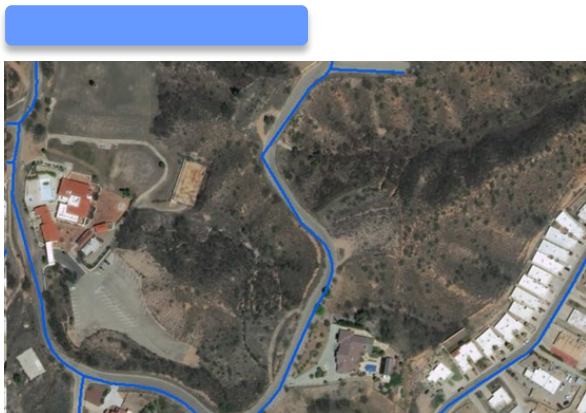
Change Detection Output (PROPOSAL)



Definition: When multiple older centerline records (base) are now 1 record in the new centerline representation (update)

Older Centerline (Base)

Change Type(s): Partial Reshape, Retain Geometry



Newer Centerline (Update)



Change Detection Output (PROPOSAL)



Definition(s): The partial reshape and retain geometry output records represent a centerline in which only a portion its shape has changed. The partial reshape record designates the portion of the centerline record that has changed between the older centerline (base) and the new centerline (update). The retain geometry record designates the portion of the centerline record that has NOT changed between the older centerline (base) and the new centerline (update).

Change Type: Scalar_Update



Newer Centerline (Update)

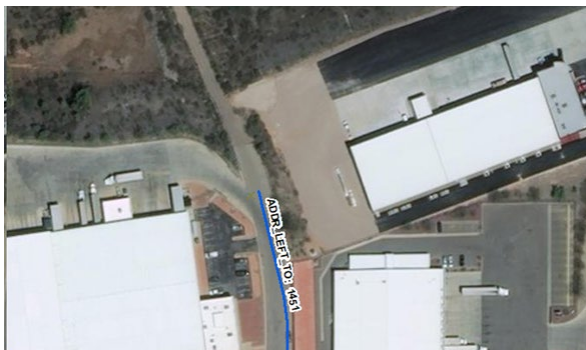


Change Detection Output (PROPOSAL)



Definition: When a record has no shape change between the older (base) and newer (update) centerline, but an address value and/or a road name value has changed

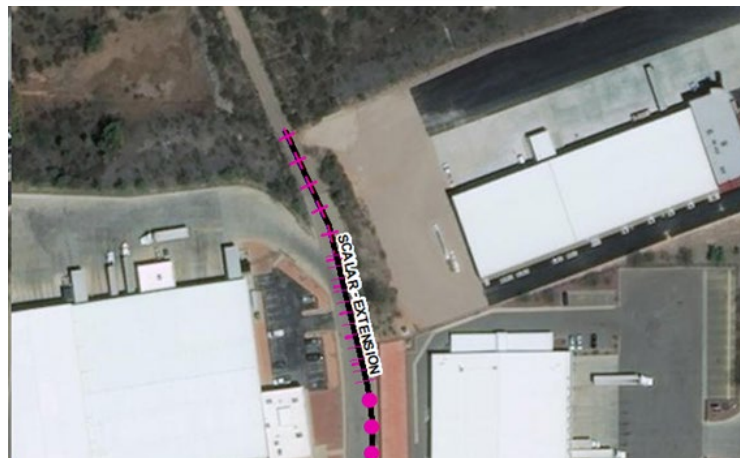
Change Type: Scalar_ 'Change Type'



Newer Centerline (Update)



Change Detection Output (PROPOSAL)



Definition: This change type represents an output record that has both a road name and/or address value change as well as a shape change. In the 'TYPE' field of the output it is labelled as SCALAR – 'One of the Change Types'. For example a centerline record whose shape was shortened as well as having a road name change would be labelled as 'SCALAR – TRIM'.

Output Data (Proposal) Attribute Table

ADDRESS_CHANGE	BASE_ADDR_LEFT_F	BASE_ADDR_LEFT_T	BASE_ADDR_RIGHT_F	BASE_ADDR_RIGHT_T	BASE_ID	BASE_NAME	GEOM_CHANGE	MANY_BASE_ID	MANY_RELATIONSHIP	MANY_UPDATE_ID	NAME_CHANGE
Y	1201	<Null>	1200	<Null>	4834	<Null>	Y	<Null>	<Null>	<Null>	N
Y	1201	<Null>	1200	<Null>	4834	<Null>	N	<Null>	<Null>	<Null>	N
<Null>	<Null>	<Null>	<Null>	<Null>	3758	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
Y	0	0	0	0	4394	UNRESOLVED RD	Y	<Null>	<Null>	<Null>	Y
N	<Null>	<Null>	<Null>	<Null>	564	<Null>	Y	<Null>	<Null>	<Null>	N
N	<Null>	<Null>	<Null>	<Null>	423	<Null>	N	<Null>	<Null>	<Null>	N
N	<Null>	<Null>	<Null>	<Null>	3397	<Null>	Y	<Null>	<Null>	<Null>	N
N	<Null>	<Null>	<Null>	<Null>	3397	<Null>	N	<Null>	<Null>	<Null>	N
Y	<Null>	1451	<Null>	1450	5597	<Null>	N	<Null>	<Null>	<Null>	N
N	<Null>	<Null>	<Null>	<Null>	6336	<Null>	Y	<Null>	<Null>	<Null>	N
N	<Null>	<Null>	<Null>	<Null>	6336	<Null>	N	<Null>	<Null>	<Null>	N
<Null>	<Null>	<Null>	<Null>	<Null>	2070	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
N	<Null>	<Null>	<Null>	<Null>	1553	<Null>	Y	<Null>	<Null>	<Null>	N
N	<Null>	<Null>	<Null>	<Null>	1553	<Null>	N	<Null>	<Null>	<Null>	N

Notes	PROPOSAL_ID	Shape_Length	TYPE	UPDATE_ADDR_LEFT_F	UPDATE_ADDR_LEFT_T	UPDATE_ADDR_RIGHT_F	UPDATE_ADDR_RIGHT_T	UPDATE_ID	UPDATE_NAME	OBJECTID*	SHAPE*
<Null>	5	55.922434	SCALAR - PARTIAL RESHAPE	1191	<Null>	1190	<Null>	4830	<Null>	6	Polyline
<Null>	6	1402.816917	SCALAR - RETAIN GEOM	1191	<Null>	1190	<Null>	4830	<Null>	7	Polyline
Possible merge or reshape	7	2021.957725	DELETE	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	8	Polyline
<Null>	8	1858.177058	SCALAR - RESHAPE	1751	1829	1750	1830	3756	N LOMA MARIPOSA RD	9	Polyline
<Null>	9	507.830782	PARTIAL RESHAPE	<Null>	<Null>	<Null>	<Null>	564	<Null>	10	Polyline
<Null>	10	1842.036679	RETAIN GEOM	<Null>	<Null>	<Null>	<Null>	423	<Null>	11	Polyline
<Null>	11	131.851053	PARTIAL RESHAPE	<Null>	<Null>	<Null>	<Null>	3395	<Null>	12	Polyline
<Null>	12	1594.341201	RETAIN GEOM	<Null>	<Null>	<Null>	<Null>	3395	<Null>	13	Polyline
<Null>	13	320.2875	SCALAR - EXTENSION	<Null>	1481	<Null>	1480	5592	<Null>	14	Polyline
<Null>	14	59.494076	TRIM	<Null>	<Null>	<Null>	<Null>	6330	<Null>	15	Polyline
<Null>	15	840.338886	RETAIN GEOM	<Null>	<Null>	<Null>	<Null>	6330	<Null>	16	Polyline
Possible merge or reshape	16	631.144527	DELETE	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	17	Polyline
<Null>	17	179.008601	PARTIAL RESHAPE	<Null>	<Null>	<Null>	<Null>	1552	<Null>	18	Polyline
<Null>	18	786.53979	RETAIN GEOM	<Null>	<Null>	<Null>	<Null>	1552	<Null>	19	Polyline

Change Designation Fields (4 of 24 Fields)

TYPE – Contains the change types which we went over in the previous slides

ADDRESS_CHANGE - Indicates whether the record represents an Address Change Y (Yes), N (No), NULL (N/A)

NAME_CHANGE - Indicates whether the record represents a road name change Y (Yes), N (No), NULL (N/A)

GEOM_CHANGE - Indicates whether the record represents a shape change Y (Yes), N (No), NULL (N/A)

TYPE	ADDRESS_CHANGE	NAME_CHANGE	GEOM_CHANGE
SCALAR - TRIM	Y	N	N
SCALAR - RETAIN GEOM	Y	N	N
PARTIAL RESHAPE	N	N	Y
RETAIN GEOM	N	N	N
SCALAR - MERGE	N	Y	Y
RETAIN GEOM	N	N	N
SPLIT	N	N	Y
ADD	<Null>	<Null>	<Null>
DELETE	<Null>	<Null>	<Null>
SCALAR UPDATE	N	Y	<Null>
SCALAR UPDATE	Y	Y	<Null>
RESHAPE	N	N	Y
SCALAR - MERGE	N	Y	Y
SCALAR UPDATE	N	Y	<Null>
DELETE	<Null>	<Null>	<Null>
RETAIN GEOM	N	N	N
DELETE	<Null>	<Null>	<Null>
MERGE	N	N	Y

Relationship Fields (3 of 24 Fields)

BASE_ID – The OBJECTID of the older centerline record (base) which this output data file (proposal) record is referencing

UPDATE_ID – The OBJECTID of the newer centerline record (update) which this output data file (proposal) record is referencing

PROPOSAL_ID – A unique ID for the output data file (proposal)

TYPE	BASE_ID	UPDATE_ID	PROPOSAL_ID
SPLIT	6699	6693	27
SCALAR UPDATE	1958	1957	28
SCALAR - TRIM	5597	5592	29
SCALAR - RETAIN GEOM	5597	5592	30
PARTIAL RESHAPE	3481	3479	31
RETAIN GEOM	3481	3479	32
SCALAR - MERGE	7047	1144	33
RETAIN GEOM	6322	8367	34
SPLIT	6699	8368	35
ADD	<Null>	8369	36
DELETE	828	<Null>	37
SCALAR UPDATE	886	885	38
SCALAR UPDATE	8358	8349	39
RESHAPE	5152	5147	40
SCALAR - MERGE	7132	1144	41
SCALAR UPDATE	6215	6210	42
DELETE	4835	<Null>	43

Attribute Value (Scalar) Change Fields (6 of 24 Fields)

BASE_NAME – The road name of the older centerline record (base). This is only populated if there is a road name change in the newer centerline record (update).

UPDATE_NAME – The road name of the older centerline record (base). This is only populated if there is a road name change in the newer centerline record (update).

BASE_ADDR_LEFT_F – The ‘left-from’ address value of the older centerline record (base). This is only populated if there is a ‘left-from’ address value change between the older (base) and newer centerline (update) record.

Other Base Address Fields: BASE_ADDR_LEFT_T, BASE_ADDR_RIGHT_F and BASE_ADDR_RIGHT_T

UPDATE_ADDR_LEFT_F – The ‘left-from’ address value of the newer centerline record (update). This is only populated if there is a ‘left-from’ address value change between the older (base) and newer centerline (update) record.

Other Update Address Fields: UPDATE_ADDR_LEFT_T, UPDATE_ADDR_RIGHT_F and UPDATE_ADDR_RIGHT_T

TYPE	BASE_NAME	UPDATE_NAME	BASE_ADDR_LEFT_F	UPDATE_ADDR_LEFT_F	BASE_ADDR_LEFT_T	UPDATE_ADDR_LEFT_T	BASE_ADDR_RIGHT_F	UPDATE_ADDR_RIGHT_F	BASE_ADDR_RIGHT_T	UPDATE_ADDR_RIGHT_T
SCALAR - PARTIAL RESHA	<Null>	<Null>	1201	1191	<Null>	<Null>	1200	1190	<Null>	<Null>
SCALAR - RETAIN GEOM	<Null>	<Null>	1201	1191	<Null>	<Null>	1200	1190	<Null>	<Null>
SCALAR - RESHAPE	UNRESOLVED RD	N LOMA MARIPOSA RD	0	1751	0	1829	0	1750	0	1830
SCALAR - EXTENSION	<Null>	<Null>	<Null>	<Null>	1451	1481	<Null>	<Null>	1450	1480
SCALAR - TRIM	<Null>	<Null>	<Null>	<Null>	1451	1481	<Null>	<Null>	1450	1480
SCALAR - RETAIN GEOM	<Null>	<Null>	<Null>	<Null>	1451	1481	<Null>	<Null>	1450	1480
SCALAR - PARTIAL RESHA	<Null>	<Null>	<Null>	<Null>	1149	1189	<Null>	<Null>	1148	1188
SCALAR - RETAIN GEOM	<Null>	<Null>	<Null>	<Null>	1149	1189	<Null>	<Null>	1148	1188
SCALAR UPDATE	<Null>	CANELO HILLS RD	<Null>	0	<Null>	0	<Null>	0	<Null>	0
SCALAR - MERGE	UNRESOLVED RD	FOREST SERVICE 818 RD	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
SCALAR - MERGE	UNRESOLVED RD	FOREST SERVICE 818 RD	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
SCALAR UPDATE	UNRESOLVED RD	FOREST SERVICE 4871 RD	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
SCALAR UPDATE	UNRESOLVED RD	FOREST SERVICE 4653 RD	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
SCALAR UPDATE	UNRESOLVED RD	FOREST SERVICE 4201 RD	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>

Many Relationship Fields (3 of 24 Fields)

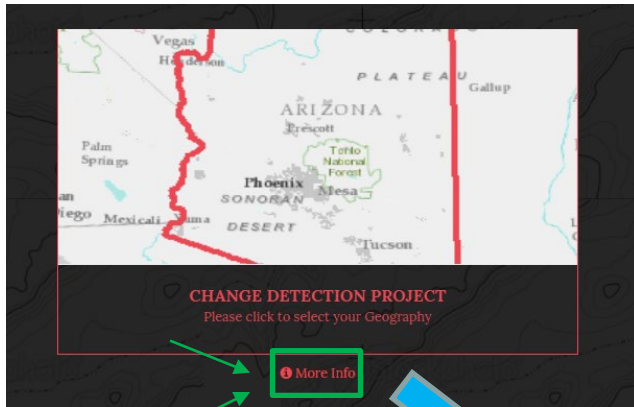
MANY_RELATIONS – Has a value of ‘Y’ if the process output record (proposal) represents a relationship between more than 1 newer centerline record (update) and/or more than 1 older centerline record (base)

MANY_BASE_ID – If a ‘many relationship’ involves multiple older centerline records (base), this field is populated with the ‘BASE_ID’ values of those records separated by a ‘|’ (pipe delimited)

MANY_UPDATE_ID – If a ‘many relationship’ involves multiple newer centerline records (base), this field is populated with the ‘UPDATE_ID’ values of those records separated by a ‘|’ (pipe delimited)

TYPE	MANY_RELATIONS	MANY_BASE_ID	MANY_UPDATE_ID
MERGE	Y	1145 7047 7132 7	<Null>
SCALAR - MERGE	Y	1145 7047 7132 7	<Null>
SCALAR - MERGE	Y	1145 7047 7132 7	<Null>
MERGE	Y	1145 7047 7132 7	<Null>
SPLIT	Y	<Null>	6693 8368
SPLIT	Y	<Null>	6693 8368

Help Documentation



ABOUT ARIZONA GEODATA SUPPLY CHAIN VALIDATION SYSTEM

New and updated copies of local data can be provided through this system and validated using Integrate Data Validation. New and updated copies of local data can also be provided through the AZGEO Contribute application. You can limit the availability of your data to a specific group(s) by designating on the Access tab of the Create Dataset page. If you have traditionally supplied updated datasets to the Arizona Centerline Unification group via e-mail or your own FTP, you may also continue to do so if you prefer.

OPEN HELP DOCUMENTATION FOR
CENTERLINE DATA COMPARISON

Centerline Data Comparison Help and Info

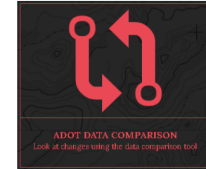


Table of Contents

Data Prep for AZGEO Centerline Data Comparison:	1
Centerline Feature Class Requirements Reference Table (Centerline Comparison)	3
Running AZGEO Centerline Comparison:	4
Data Post Processing for AZGEO Centerline Comparison:	8
Centerline Comparison Output (Proposal) Change Type Definitions:	10
Centerline Comparison Output (Proposal) Fields:	21

Centerline Feature Class Requirements Reference Table (Centerline Comparison)

Location	Feature Class Name (Case Sensitive)	Derived Road Name Field(s) (Case Sensitive)	LRS_FIX Field (Case Sensitive)	Address Field: Left From (Case Sensitive)	Address Field: Left To (Case Sensitive)	Address Field: Right From (Case Sensitive)	Address Field: Right To (Case Sensitive)	Projected Coordinate System
Apache County	Apache_Data	FULL_NAME	Lrs_Fix	FROM_ADD_L	TO_ADD_L	FROM_ADD_R	TO_ADD_R	NAD_1983_StatePlane_Arizona_East_FIPS_0201_Feet
City of Prescott	Prescott_Data	FULLST_NAME	LRS_FIX	FROMLEFT	TOLEFT	FROMRIGHT	TORIGHT	NAD_1983_StatePlane_Arizona_Central_FIPS_0202_Feet_Intl
Cochise County	Cochise_Data	STREET	LRS_FIX	FROMADDL	TOADDL	FROMADDR	TOADDR	NAD_1983_StatePlane_Arizona_East_FIPS_0201_Feet
Coconino County	Coconino_Data	FULLNAME	LRS_FIX	LEFTFROMADDR	LEFTTOADDR	RIGHTFROMADDR	RIGHTTOADDR	NAD_1983_StatePlane_Arizona_Central_FIPS_0202_Feet_Intl
Gila County	Gila_Data	RDNAME	LRS_FIX	LEFT_FROM	LEFT_TO	RIGHT_FROM	RIGHT_TO	NAD_1983_StatePlane_Arizona_Central_FIPS_0202_Feet_Intl
Graham County	Graham_Data	STREET	LRS_FIX	LLO	LHI	RLO	RHI	NAD_1983_StatePlane_Arizona_East_FIPS_0201_Feet
Greenlee County	Greenlee_Data	FULLNAME	Lrs_Fix	FROM_ADD_L	TO_ADD_L	FROM_ADD_R	TO_ADD_R	NAD_1983_UTM_Zone_12N
La Paz County	LaPaz_Data	FULL_NAME	LRS_FIX	FROM_ADD_L	TO_ADD_L	FROM_ADD_R	TO_ADD_R	NAD_1983_StatePlane_Arizona_West_FIPS_0203_Feet_Intl
Maricopa County (MCDOT)	Maricopa_Data	ROUTENAME	LRS_FIX	ADD1_L	ADD2_L	ADD1_R	ADD2_R	NAD_1983_HARN_StatePlane_Arizona_Central_FIPS_0202_Feet_Intl
Mohave County	Mohave_Data	FNM	LRS_FIX	LFROM	LTO	RFROM	RTO	NAD_1983_NSR52007_StatePlane_Arizona_West_FIPS_0203_Ft_Intl
Navajo County	Navajo_Data	FULL_NAME	Lrs_Fix	FROM_ADD_L	TO_ADD_L	FROM_ADD_R	TO_ADD_R	NAD_1983_StatePlane_Arizona_Central_FIPS_0202_Feet_Intl
Pima County	Pima_Data	STREET	LRS_FIX	L_ADD_FROM	L_ADD_TO	R_ADD_FROM	R_ADD_TO	NAD_1983_StatePlane_Arizona_Central_FIPS_0202_Feet_Intl
Pinal County	Pinal_Data	STS, STN	LRS_FIX	LLO	LHI	RLO	RHI	NAD_1983_StatePlane_Arizona_Central_FIPS_0202_IntlFeet
Santa Cruz County	SantaCruz_Data	STREET	LRS_FIX	L_F_ADD	L_T_ADD	R_F_ADD	R_T_ADD	NAD_1983_StatePlane_Arizona_Central_FIPS_0202_Feet
Yavapai County	Yavapai_Data	FULLST_NAME, MSAG_LEFT	LRS_FIX	FROMLEFT	TOLEFT	FROMRIGHT	TORIGHT	NAD_1983_StatePlane_Arizona_Central_FIPS_0202_Feet_Intl
Yuma County (From City of Yuma)	Yuma_Data	FullStreetName	LRS_Fix	FromAddr_L	ToAddr_L	FromAddr_R	ToAddr_R	NAD_1983_StatePlane_Arizona_West_FIPS_0203_Feet
Yuma County (From Yuma County)	Yuma_Data	FULL_NAME	LRS_FIX	FROM_ADD_L	TO_ADD_L	FROM_ADD_R	TO_ADD_R	NAD_1983_StatePlane_Arizona_West_FIPS_0203_Feet

Questions?

You know you want to ask...

James Meyer

Arizona Department of Transportation

Email: JMeyer@azdot.gov

Phone: 602.712.8037

Ryan Blum

Works Consulting

Email: rblum@gisworks.com

Phone: 480.813.0570 x303

