

# STATEWIDE NG9-1-1 TRAINING GIS CONCEPTS 2



# TABLE OF CONTENTS

Overview	
About this Exercise	01
Helpful Links	01
Preparing Data for NG9-1-1	01
Section 1: Preparing Local Data and Building a New NG9-1-1 Compliant Geodatabase	
Create GDB	
Field Mapping	
Dissolve ESZ	06
Section 2: Pre-validation Data Preparation, Standardization, and Populating Mandatory Va	lues
Populate Mandatory Fields	08
Assign Unique NENA ID	09
Fix Street Type and Direction	10
Fix Domain Case	11
Calculate Parity	
Fix MSAGComm Spaces	13
Calculate FullName and FullAddr	14
Add/Validate NG9-1-1 Topology	15
Fix Submit	16
Populate GeoMSAG_L and GeoMSAG_R	17
Section 3: Validation and Geometry Data Quality Assessments	
Check Road ESN Values	18
Fix TopoExecpt	19
Find Address Range Overlaps	20
Geocompare	21
Populate RCLMATCH: NO_MATCH	22
Generate Fishbone Analysis	
Validate	25



# **OVERVIEW**

# **ABOUT THIS EXERCISE**

The Oklahoma NG9-1-1 Toolkit is a set of tools intended to assist users for preparing their GIS data for NG9-1-1. The Toolkit is meant to be approached like a toolkit in real life; as each user's data is unique so will the approach to NG9-1-1 readiness. Many tools may be executed in different orders if the parameters are met.

#### Always consult the ReadMe and/or Toolkit Manual for additional assistance.

This exercise is a suggested workflow which is fully customizable by each end user. The topics covered in this exercise are centered around the following areas:

- Section 1: Preparing local data and building a new NG9-1-1 compliant geodatabase
- Section 2: Pre-validation data preparation, standardization, and populating mandatory values
- ✓ Section 3: Validation and geometry data quality assessments

#### **HELPFUL LINKS** ·

#### **B1: GIS Standard Concept Course**

https://www.youtube.com/watch?v=5DkgocdYrWo

OK GIS Standard, Toolkit Manual, and Toolkit Download http://www.okmaps.onenet.net/address\_standards.htm

#### State of Oklahoma Data

https://okmaps.org/OGI/search.aspx

### **PREPARING DATA FOR NG9-1-1**

The Toolkit can be downloaded from the link posted above in Helpful Links. Unzip the Toolkit but leave it in its native folder structure. This is critical to preserve functionality. Review the readme location and documentation before running the toolkit.

*Scenario*: You are a GIS Analyst who is managing your county's GIS data within a geodatabase. The source geodatabase is called *OK\_SourceData\_Initial.gdb* and includes the following layers:

- Road Centerlines (Centerlines)
- Address Points (SSAP)
- Emergency Service Zones (ESZ)
- Discrepancy Agency Boundary (DISCREPANCYAGENCY\_BOUNDARY)\*
- PSAP Boundary (PSAP\_BOUNDARY)\*

\*These layers are managed by the State and downloaded from the link posted above in Helpful Links.

You are going to use the OK NG9-1-1 Toolkit to assess the data and prepare it to meet OK-compliant standards.

#### **Before You Begin**

Before preparing data for NG9-1-1, it is helpful to do an assessment to understand the level of effort required.

- Assess the data
  - Identify gaps
    - » Missing layers
    - » Missing fields
  - Be mindful of what applications are consuming the data
    - » Legacy fields
- Review the OK Standard
  - Consider if you will adopt the schema or create an ETL process

#### Is the GDB Standards-compliant?

The geodatabase requires a specific schema with domains and feature datasets. To determine if our source geodatabase is Standards-compliant, let's run the Check Template within the Validation tools.

- Expand Validation Tools, click Check Template, and input OK\_SourceData\_Initial.gdb.
- Check the boxes for Check Layer List and Check GDB Domains.

Results will be exported into two tables: FieldValuesCheckResults, and TemplateCheckResults. Examine the tables.

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# **SECTION 1**

# PREPARING LOCAL DATA AND BUILDING A NEW NG9-1-1 COMPLIANT GEODATABASE

OK\_SourceData\_Initial.gdb // NG911.gdb

# CREATE GDB - OK\_SOURCEDATA\_INITIAL.GDB

Create GDB creates a geodatabase with Standards-compliant feature datasets and domains. Create GDB can also create feature classes and bring existing Standards-compliant data into the geodatabase.

In our scenario, we already have several data layers, two of which are already compliant because they were provided by the State.

- Open the Create GDB Tool
- Choose the TOOL OUTPUTS folder for the new geodatabase
- Name the new geodatabase **NG911** (the Standards-compliant spatial reference is already selected)
- Because we already have an ESZ layer, we will create ESBs using Dissolve ESZ later.
- We can also use he **Create GDB Tool** to import in the parameters boxes for both the PSAP and Discrepancy Agency
- Point to the folder location for PSAP and Discrepancy Agency and select those data sets

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utput GDB Name		This tool creates a
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patial Reference		datasets and domains.
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ddress Point (optional)		may be provided, in which
	8	case each will be run through its respective field-
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		classes are provided, the
aad Centerline (optional)	-	geodatabase and its
		contain any feature
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screpancy Agency (optional)		and feature dataset
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Create ESB_Fire FC (optional)		
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SAP (optional)		
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Create PSAP FC (optional)	_	
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Click **OK** to run

The new geodatabase *NG911.gdb* has been created. Examine the contents. *NG911.gdb* is now Standards-compliant.

## **FIELD MAPPING**

We are going to field map our existing non-compliant data into the Standards-compliant geodatabase *NG911.gdb*. Only the **Centerlines** feature class will be mapped for this portion of the exercise.

The following layers within **NG911.gdb** are already Standards-compliant because they were downloaded from the State:

- DISCREPANCYAGENCY\_BOUNDARY
- PSAP\_BOUNDARY

Field map Centerlines into NG911.gdb:

- Open Road Field Map
- For Road Layer, choose Centerlines from OK\_SourceData\_Initial.gdb and click Add
- Choose NG911.gdb for the Output Geodatabase

Note that any source field names that are identical to Standards-compliant fields will be automatically populated. If source data fields are not provided in the field mapping, those fields will be created with Null values.

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Road Layer					~	Output Geodatat	oase
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Output Geodatabase						No description availab	le
C:\Oklahoma\OK - Course Datasets (2)\OK - C	ourse Datas	ets\TOOL OUTPI	JTS\TEST.gdb	6			
Discrepancy Agency ID [DiscrpAgID] (optional)							
				~			
Modified TimeStamp [RevDate] (optional)							
				~	-		
Most recent editor of data [RevEditor] (optional	)						
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and any time record to an example to take cirec	e parrecaulou	el fobuerel		~			
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NENA Globally Unique ID [NGUID_RDCL] (option	al)						
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extension that precedes address number on rig	nt side of roa	ad [Add_R_Pre]	(optional)				
	OK	Cancel	Environments	<< Hide Held		Tool Help	

- Populate the address ranges with the following values:
  - Left From low address [Add\_L\_From]: FROMLEFT
  - Left To high address [Add\_L\_To]: TOLEFT
  - Right From low address [Add\_R\_From]: FROMRIGHT
  - Right To high address [Add\_R\_To]: **TORIGHT**

County on right side of road [County_R] (optional)		
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extension that precedes address number on left side of road [Add L Pre] (optional)	·	
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even or Odd Property of address number range on left side of road [Parity_L] (optional)	.	
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ven or Odd Property of address number range on right side of road [Parity_R] (optional)	1	
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Click **OK** to run

The Standards-compliant ROAD\_CENTERLINE feature class is now field mapped into *NG911.gdb*. Examine the attribute table for ROAD\_CENTERLINE.

## **DISSOLVE ESZ**

Use Dissolve ESZ\* to dissolve the geometry of the polygon feature class based on individual service types. The tool assumes that all service areas are defined in separate fields within the attribute table. The tool will only work if there are individual fields defining service types.

The source data contains an existing ESZ boundary feature class which includes fields delineating the service type for Fire, Law, and EMS. Use the Dissolve ESZ tool to create individual ESBs based on those service types. The outputs are separate Standards-compliant feature classes for Fire, Law, and EMS ESBs.

#### Run Dissolve ESZ before field mapping the source ESZs into the Standards-compliant schema.

Examine the fields within the ESZs. Notice that service types are stored in separate fields.

- In the Toolkit, open **Dissolve ESZ**
- For Combined Input, choose the ESZ feature class from OK\_SourceData\_Initial.gdb
- For the Output Geodatabase, choose **NG911.gdb**
- In the drop down for EMS Field, choose MEDICAL
- In the drop down for FIRE Field, choose FIRE
- In the drop down for LAW Field, choose POLICE

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utput Geodatabase	·	Use this tool in the case
C:\Oklahoma\OK - Course Datasets (2)\OK - Course Datasets\TOOL OUTPUTS\TEST.gdb		that emergency service
MS Field		law enforcement, fire, and
MEDICAL V		emergency medical
IRE Field		services are combined in
FIRE V		one polygon feature class
W Field		these services.
POLICE ~		
		Formerly "5.4 Split ESN"

Click OK to run

The Standards-compliant feature class ESBs for Fire, Law, and EMS are created in *NG911.gdb*.

#### If the ESZ data does not define service types in separate fields, choose one of the following options:

#### If one or more ESBs exist:

\*

Use the ESB field mapping tools for each service type. If any ESBs are missing, create the missing feature class during Create GDB or run Add Blank FCs.

#### If service types are in one field:

If the ESZ service types are defined in one field, the user should do a select by service type and export individual feature classes then perform ESB field mapping.

#### If the service type is unknown:

If the service type within the ESZ layer is unknown, the GIS staff should work with the PSAP authority for assistance defining the ESZ using the information in the attribute table or by geometry.

#### If the user has no ESZs:

If no ESZs exist, GIS staff should work with the PSAP to define and create them.

# **SECTION 2**

# PRE-VALIDATION DATA PREPARATION, STANDARDIZATION, AND POPULATING MANDATORY VALUES

OK\_StandardData\_Initial.gdb

# **POPULATE MANDATORY FIELDS**

**OK\_StandardsData\_Initial.gdb** is Standards-compliant and contains all required feature classes and fields. The next step is to populate data within the Mandatory fields.

The Toolkit has several tools which populate some fields in the data. However, some will need to be populated manually. For this exercise, we are only populating fields within two feature classes.

 Open ArcMap and add ROAD\_CENTERLINES and ESB\_FIRE\_BOUNDARY from OK\_StandardsData\_Initial.gdb to the map

#### Populate ESB\_FIRE\_BOUNDARY:

- Start an editing session and open the attribute table for ESB\_FIRE\_BOUNDARY
- Populate the following fields:
  - Country: "US"
  - State: "OK"
  - Agency\_ID: "cog.acog.ok.gov"
  - Agency: "ACOG"
  - DiscrpAgID: "cog.acog.ok.gov"
  - NGUID\_FIRE: See Assign Unique NENA ID section

#### Populate ROAD\_CENTERLINE:

- In the same editing session, open the attribute table for ROAD\_CENTERLINE
- Populate the following fields:
  - Agency\_ID: "cog.acog.ok.gov"
  - DiscrpAgID: "cog.acog.ok.gov"
  - NGUID\_RDCL: See Assign Unique NENA ID section
  - Legacy fields: See Fix Street Type and Direction section
    - » LgcyPreDir
    - » LgcyStreet
    - » LgcyType
    - » LgcySufDir

# **ASSIGN UNIQUE NENA ID**

Every record within every NG9-1-1 data layer requires an NGUID (NENA Globally Unique ID). Use Assign Unique NENA ID within Enhancement Tools to populate this value.

- Open the Assign Unique NENA ID tool
- For Layer Name, choose **ROAD\_CENTERLINE**
- For Feature Class, navigate to **OK\_StandardsData\_Initial.gdb** and choose ROAD\_CENTERLINE
- In NENA Unique ID Field, choose NGUID\_RDCL
- In Data Agency [Agency\_ID], choose Agency\_ID

ayer Name				Assign Unique
ROAD_CENTERLINE			~	NENA ID
eature Class				20201000000000
C:\Oldahoma\OK - Course Datasets (2)\OK	- Course Datasets\OK_S	itandardsData_Initial.gdb	WG911\ROA	Assigns a correctly-
ENA Unique ID Field				to features in the provided
NGUID_RDCL			~	feature class.
ata Agency [Agency_ID]				
Agency_LD			~	
nque Locar9111D (number) (optional)			~	
_			*	
Overwrite All Unique IDs (optional)				
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- Click **OK** to run
- Open the attribute table for ROAD\_CENTERLINE and verify the NGUID\_RDCL field is populated with a unique value
- Run the tool for **ESB\_FIRE\_BOUNDARY**

# **FIX STREET TYPE AND DIRECTION**

This tool fixes the Street Type and Direction fields to be correctly formatted to current standards. Additionally, the tool has an option to copy the values to legacy fields before adjusting the data to meet the Standard.

The ROAD\_CENTERLINE and ADDRESS\_POINT feature classes contain fields to populate legacy data to continue supporting existing applications. In this exercise, the legacy fields have already been populated for ADDRESS\_POINT, so we will run the tool on ROAD\_CENTERLINE.

- Open and run **Fix Street Type and Direction**
- Choose **ROAD\_CENTERLINE** for Feature Class
- For Street Type Field, select **StreetType**
- For PreType Field, select **PreType**
- For Directional Prefix Field, select PreDir
- For Directional Suffix Field, select SufDir
- · Check the boxes to copy the values to the Legacy fields

Feature Class	Copy SufDir to
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Street Type Field (optional)	0.1
StreetType v	Option to copy SufDir to
PreType Field (optional)	- geyouou
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Directional Suffix Field (SufDir) (optional)	
sufor v	
Copy PreDir to LgcyPreDir	
Copy Street to LgcyStreet	
Copy Street Type to LgcyType	
Copy Sul/Dirto LgcySul/Dir	
Calminite Longhid	
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OK Cancel Environments << Hide Heip	Tool Help

- Click **OK** to run
- Open the attribute table for **ROAD\_CENTERLINE** and verify the Legacy Fields are populated

# **FIX DOMAIN CASE**

Fix Domain Case adjusts any data with domain values and changes the case to UPPER. This is a good tool to use for QC and standardizing the data.

Open Fix Domain Case and select OK\_StandardsData\_Initial.gdb

💲 Fix Domain Case						- 0
Fix Domain Case  NG911 Geodatabase  C:\Oklahoma\DK - Course Datasets (2)\DK -	- Course Datase	ts/DK_Standard	sData_Inital.gdb		· ·	Full path to the NG911 geodatabase
	OK	Cancel	Environments.	<< Hide H	elp	Tool Help

- Click **OK** to run
- Open the attribute table for ROAD\_CENTERLINE and verify the values in the state and Country fields now have the proper domain values and are UPPER case.

# **CALCULATE PARITY**

Calculates the Parity\_L and Parity\_R fields within ROAD\_CENTERLINE.

Parity represents the the even or odd property of the address number range on the Left or Right side of the road segment relative to the FROM Node. Appropriate values can be O=Odd; E=Even; B=Both; Z=Address Range 0-0.

• Open Calculate Parity and select ROAD\_CENTERLINE in OK\_StandardsData\_Initial.gdb



- Click **OK** to run
- Open the attribute table for ROAD\_CENTERLINE and confirm Parity\_L and Parity\_R fields are populated

## **FIX MSAGCOMM SPACES**

- Open Fix MSAGComm Spaces
- Select OK\_StandardsData\_Initial.gdb



• Click **OK** to run

# **CALCULATE FULLNAME AND FULLADDR**

Calculate FullName and FullAddr uses the following fields within ROAD\_CENTERLINE and ADDRESS\_POINT feature classes to calculate the FullName field within ROAD\_CENTERLINE and ADDRESS\_POINT or FullAddr within ADDRESS\_POINT.

For the FullAddr field, the fields used for the calculation are: AddPre, Address, AddSuf, PreDir, PreMod, PreType, PreTypeSep, Street, StreetType, SufDir, SufMod, BldgName, BldgUnit.

For the FullName field, the fields used for the calculation are: *PreDir, PreMod, PreType, PreTypeSep, Street, StreetType, SufDir, SufMod.* 

- Open Calculate FullName and FullAddr
- For Input Feature Class, click the folder icon and select ROAD\_CENTERLINE feature class in OK\_StandardsData\_Initial.gdb, and then click Add



- Click OK to run
- The FullName field should now be populated within ROAD\_CENTERLINE

# **ADD/VALIDATE NG911 TOPOLOGY**

Creates and adds layers and rules to topology. Topology rules included are listed below. Reference the ReadMe for further information.

Polygon Layer Rules - All polygon feature classes must individually conform to the rule:

• Must Not Overlap (Area)

**ESB and PSAP Layer Rules -** The ESB\_EMS\_BOUNDARY, ESB\_FIRE\_BOUNDARY, ESB\_LAW\_BOUNDARY, and PSAP\_BOUNDARY must individually conform to the rule:

• Must Not Have Gaps (Area)

**ROAD\_CENTERLINE Layer Rules -** The ROAD\_CENTERLINE layer must conform to the following rules:

- Must Not Overlap (Line)
- Must Not Have Dangles (Line)
- Must Not Self-Overlap (Line)
- Must Not Self-Intersect (Line)
- Must Be Single Part (Line)

Note: the rule(s) in *italics* may be marked as exceptions on a per-feature basis.

- Open Add/Validate NG911 Topology
- Select OK\_StandardsData\_Initial.gdb
- Check the box to Validate Topology

C011 Candatabase					Validate Topology?	
C:\Oklahoma\OK - Course Datasets (2)\O	K - Course Datasets k	K_StandardsData	Initial.gdb	$\sim$	(optional)	1
☑ Validate Topology? (optional)					Check this box if you would like to validate the topology after adding it or verifying it	
				_		
				1		

- Click **OK** to run
- Open ArcMap and add the topology and layers into the map
- Review the Instructor examples of marking topology exceptions in ArcMap

# **FIX SUBMIT**

Required field indicating if a feature is a record for submission.

• Open Fix Submit and select OK\_StandardsData\_Initial.gdb

NG911 Geodatabase				 NG911 Geodatabas	e 🗠
C:\Oklahoma\2022 Training\OK - C	Course Dataset	s\OK_Standards	Data_Initial.gdb	 5 H	
Address Point (optional)				geodatabase.	
Road Centerline (optional)					
Discrepancy Agency Boundary	(optional)				
ESZ Boundary (optional)					
PSAP Boundary (optional)					
ESB EMS Boundary (optional)					
ESB Fire Boundary (optional)					
ESB Law Boundary (optional)					
					~

- Click **OK** to run
- Open the attribute table for one of the feature classes and verify SUBMIT field is populated

# **POPULATE GEOMSAG\_L AND GEOMSAG\_R**

These fields are directly correlated to a locality's MSAG and the Submit field. If a record is marked "Y" for submission, the GeoMSAG\_L and GeoMSAG\_R fields should also be marked "Y" for submission.

#### CURRENTLY, MSAG and TN Tools do NOT function as intended.

- Open ArcMap and add ROAD\_CENTERLINE from OK\_StandardsData\_Initial.gdb
- For GeoMSAG\_L and GeoMSAG\_R, field calculate the value "Y"

# **SECTION 3**

# VALIDATION AND GEOMETRY DATA QUALITY ASSESSMENTS

OK\_StandardsData\_Prepped.gdb

# **CHECK ROAD ESN VALUES**

Check Road ESN Values checks the road centerline ESN values against the ESN values of their spatial location.

Ensures the road centerline *Esn\_L* and *Esn\_R* values match the ESN values of the road's spatial location. Results will be reported in *FieldValuesCheckResults*. **This tool only produces Notices, not Errors, and therefore its results will not prevent submission.** ESZ required fields include *NGUID\_ESZ, ESN*, and *SUBMIT*. Road Centerline require fields include *NGUID\_RDCL, Esn\_L, Esn\_R* and *SUBMIT*. There is an option to run an Advanced License Analysis, which is a faster, more through analysis that requires an Advanced License to run.

- Open Check Road ESN Values and for NG911 Geodatabase
- Select OK\_StandardsData\_Prepped.gdb and click Add

K911 Geodatabase C: \Oldahoma \Class 2\OK - Course Datasets \OK - Course Datasets \OK_StandardsData_Initial.gd ☐ Run Advanced License Analysis	NG911 Geodatabase Full path to the NG911 geodatabase to be checked.

- Click OK to run
- · Open FieldValuesCheckResults to examine the output

# **FIX TOPOEXCEPT**

TopoExcept is a Mandatory field for the ROAD\_CENTERLINE feature class in the Standard. This tool converts null and blank values to NOT\_EXCEPTION.

- Open Fix TopoExcept and for NG911 Geodatabase
- For Input Feature Class, select ROAD\_CENTERLINE from OK\_StandardsData\_Prepped.gdb
- For Dangles Exception Value, select DANGLE\_EXCEPTION
- Check the box to update Null values to "NO\_EXCEPTION"

Input Feature Class		Fix Domain in GBD (optional)	^		
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Fix Domain in GBD (optional)					
Iomain to Fix (ontional)					
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			~		

- Click **OK** to run
- Open the attribute table for ROAD\_CENTERLINE to verify the TopoExcept field is populated

## FIND ADDRESS RANGE OVERLAPS

Find Address Range Overlaps identifies road segments where address ranges overlap.

Results are populated in the *FieldValuesCheckResults* table within a feature class called AddressRange\_Overlap. **This tool only produces Notices, not Errors, and therefore its results will not prevent submission.** 

Open Find Address Range Overlaps and select OK\_StandardsData\_Prepped.gdb



Click **OK** to run

# **GEOCOMPARE**

Compares the address points against the road centerline data and calculates RCLMatch and RCLSide fields.

- Open Geocompare Address Points
- Select OK\_StandardsData\_Prepped.gdb



- Click **OK** to run (this may take a few minutes)
- A feature class called AddressPt\_GC\_Results is generated
- Open the attribute table for ADDRESS\_POINT and verify the fields RCLMatch and RCLSide are populated

# **POPULATE RCLMATCH: NO\_MATCH**

Populates any blank or null RCLMatch features with NO\_MATCH.

- Open Populate RCLMATCH: NO\_MATCH
- Select OK\_StandardsData\_Prepped.gdb



- Click **OK** to run
- Open the attribute table for ADDRESS\_POINT and verify blank values are populated with NO\_MATCH

# **GENERATE FISHBONE ANALYSIS**

Generate Fishbone Analysis is a visual representation of the relationship between address points and road centerlines. Fishbones assist in QA/QC of the data.

- Open Generate Fishbone Analysis
- Select OK\_StandardsData\_Prepped.gdb
- Select TOOL OUTPUTS for the Folder for Fishbone Analysis Outputs
- Check the box to Check for Intersecting Fishbones



- Click **OK** to run
- Open the TOOL OUTPUTS folder to see the results from the Fishbone Analysis Tool
  - TOOL OUTPUTS
     Address\_Points\_With\_LatLon.shp
     Fishbone\_Intersect.shp
     Fishbone\_Intersect\_Count.shp
     Fishbone\_Results.shp
     Fishbone\_Results\_Projected.shp
     Geocode\_Results.shp
     Locator
     Matched\_Geocode\_Results.shp

- Open ArcMap and add the Output files:
  - Address\_Points\_With\_LatLon.shp output of ADDRESS\_POINT which exclude null and zero values in lat/long fields.
  - Geocode\_Results.shp endpoint of the fishbone, the attribute table is a combination of ADDRESS\_POINT schema and geocode information
  - Matched\_Geocode\_Results.shp table containing only the matching records
  - **Fishbone\_Results.shp** Fishbone line drawn between ADDRESS\_POINT and the matched geocode results point
  - Fishbone\_Intersect Marks the location where fishbones intersect
  - Fishbone\_Intersect\_Count Number of fishbones intersecting at a location
  - Fishbone\_Results\_Projected Fishbone results projected into SPCS

# VALIDATE

The data validation tools perform a variety of basic verification checks against the NG911 Data Model template to determine if the data is ready for submission. Validations may be run against individual feature classes or the entire geodatabase. In this exercise, we will be utilizing the Check all Required function.

- Open Check all Required
- Select OK\_StandardsData\_Prepped.gdb



- Click **OK** to run
- Review the output from the validation check

