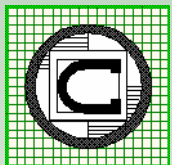# Traffic Sign Inventory and Maintenance

Nick Tonias, P.E.
The CEDRA Corporation

Christy Batterson
The City of Edmond
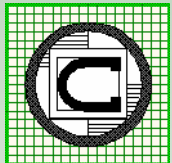
GIS/SIG 26th Annual Conference 2017

Topics to be Covered

◆ Brief Intro to CEDRA and City of Edmond

◆ Overview of Developing the Traffic Sign Inventory

◆ Traffic Sign Inventory Database Design

◆ Traffic Sign Inventory Collection Process
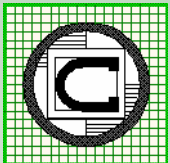
◆ Maintenance and Updating Process

◆ Summary then Q&A

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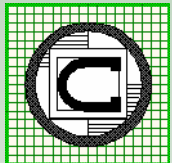# Before We Begin

◆ How many have a Traffic Sign Database they maintain?

◆ How many are thinking of developing a Traffic Sign Database?

Who Likes Puppies

The CEDRA Corporation

1985 The CEDRA Corporation is established.

1987 CEDRA begins a long standing relationship with Esri.

1993 CEDRA becomes an authorized Esri Business Partner and Developer.

CEDRA offers engineering/GIS solutions in the form of software and services to governmental agencies, engineering consultants, tax assessors, oil companies and various utility enterprises.
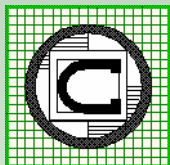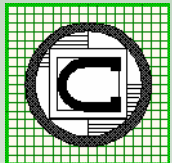
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The City of Edmond

❖ In 1996 The City began creating its GIS.

❖ The City utilizes an ArcGIS environment comprised of ArcGIS Desktop, ArcGIS Server and ArcGIS Online.

❖ The City utilizes Desktop and Web based applications.

❖ The City's GIS is an integral part of its daily operations.

❖ The City's population is approximately 90,000 with more than 27,000 water and 36,000 electric accounts.

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The City of Edmond

The City offers the following data layers amongst others:

Waste Water

Water

Storm Water

Parcels

Easements

Street Centerlines

Outdoor Warning Devices

Electric

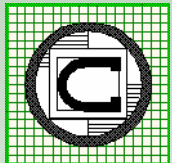Engineering Projects

Engineering Districts

Forestry

Public Trees

Fire Access

Storm Shelters

Planimetrics Topo

Ortho Photo

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Reasons for Creating Inventory
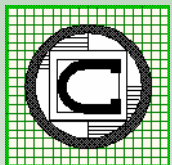
❖ Municipal owned assets.

❖ Safety/Design and Manual on Uniform Traffic Control Devices (MUTCD) standards need to be met.

❖ Signage may be needed where it is not present.

❖ Prioritization for Repair/Replacement.

❖ FHWA mandate.

Developing the Inventory

- ❖ 2012 The City undertakes the establishment of a Traffic Sign Inventory database.

- ❖ The Manual on Uniform Traffic Control Devices (MUTCD) was used as a guide.

- ❖ In-house staff used to collect the data.

- ❖ Trimble GeoExplorer 6000 Series GeoXH equipment used.

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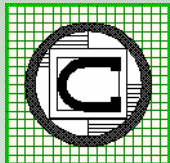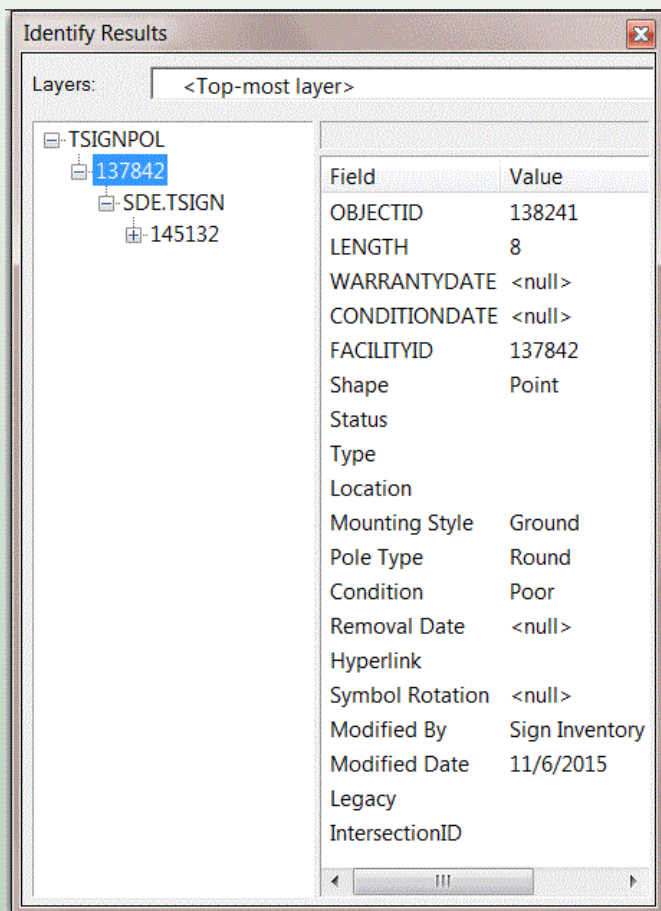
Inventory Database Design

❖ The design is based upon a Traffic Sign Pole feature layer and a Traffic Sign table.

❖ Features in the layer represent traffic sign poles.

❖ Records in the table represent signs on a pole.

❖ Records in the table are linked to features in the layer based upon a Traffic Sign Pole Facility ID value.
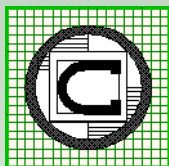
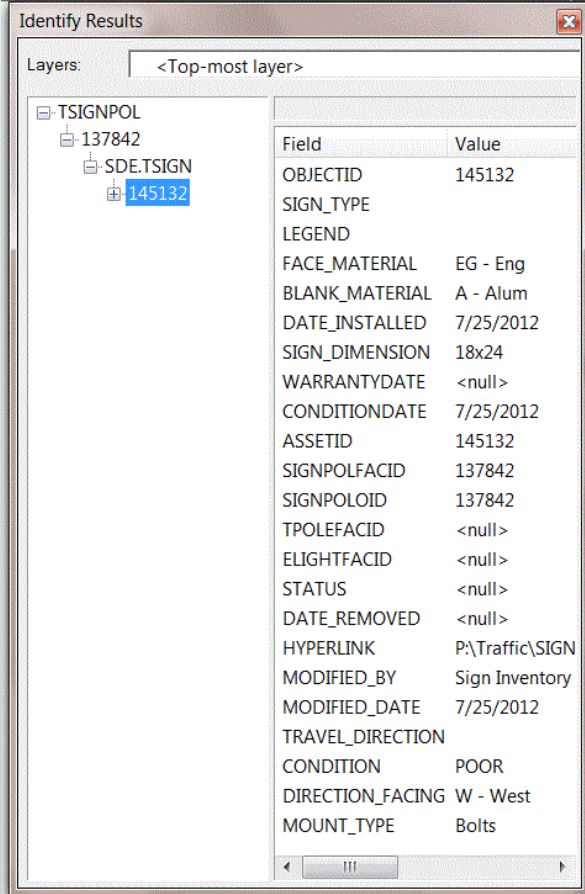❖ Traffic Sign Poles can have one or more signs.
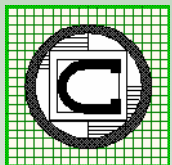
Traffic Sign Pole Attributes

Identify Results

Layers: <Top-most layer>

- TSIGNPOL
  - 137842
    - SDE.TSIGN
      - 145132

Field	Value
OBJECTID	138241
LENGTH	8
WARRANTYDATE	<null>
CONDITIONDATE	<null>
FACILITYID	137842
Shape	Point
Status	
Type	
Location	
Mounting Style	Ground
Pole Type	Round
Condition	Poor
Removal Date	<null>
Hyperlink	
Symbol Rotation	<null>
Modified By	Sign Inventory
Modified Date	11/6/2015
Legacy	
IntersectionID	

The FACILITYID attribute is the one that is used to relate the Traffic Sign to the Traffic Sign Pole

This value will appear in the Traffic Sign Table for every sign belonging to the Pole

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Traffic Sign Attributes

Identify Results

Layers: <Top-most layer>

- TSIGNPOL
  - 137842
    - SDE.TSIGN
      - 145132

| Field	Value
OBJECTID	145132
SIGN_TYPE	
LEGEND	
FACE_MATERIAL	EG - Eng
BLANK_MATERIAL	A - Alum
DATE_INSTALLED	7/25/2012
SIGN_DIMENSION	18x24
WARRANTYDATE	<null>
CONDITIONDATE	7/25/2012
ASSETID	145132
SIGNPOLFACID	137842
SIGNPOLOID	137842
TPOLEFACID	<null>
ELIGHTFACID	<null>
STATUS	<null>
DATE_REMOVED	<null>
HYPERLINK	P:\Traffic\SIGN
MODIFIED_BY	Sign Inventory
MODIFIED_DATE	7/25/2012
TRAVEL_DIRECTION	
CONDITION	POOR
DIRECTION_FACING	W - West
MOUNT_TYPE	Bolts

Pertinent Sign information such as the Sign's Face Material, Installation Date, Condition and so forth are stored in the Traffic Sign Table

This information can then be analyzed

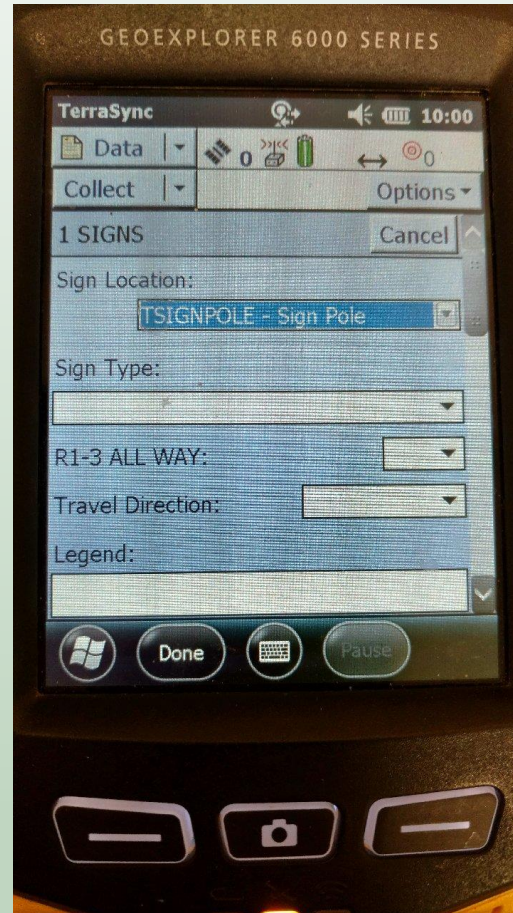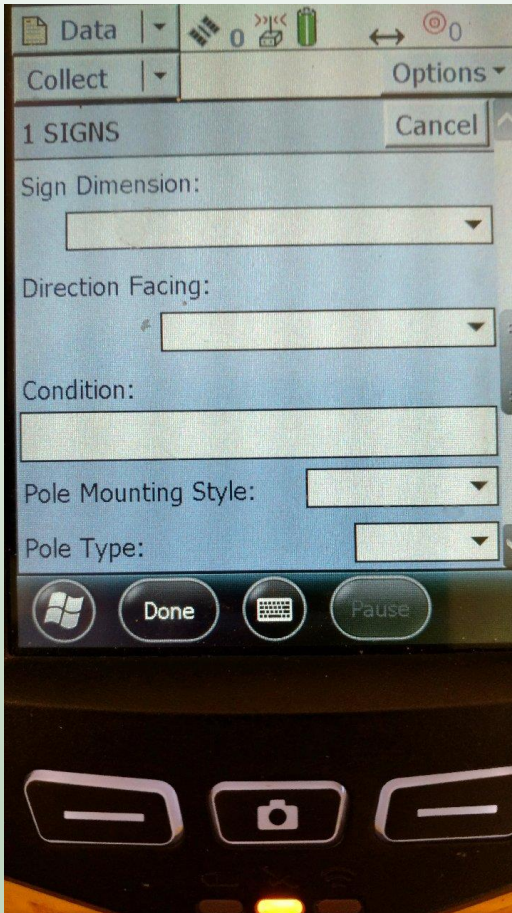*GIS/SIG 26th Annual Conference 2017*

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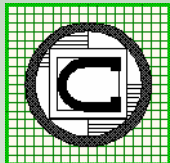
Inventory Collection Process

- ❖ A form filled template was created enabling the crews to enter the appropriate information.

- ❖ Multiple crews used to collect field data.

- ❖ 2.5 year period to collect majority of inventory.

- ❖ ~8000 Poles and >14,000 Signs collected.

- ❖ On going collection being performed.

- ❖ Digital images of signs were taken.

YIELD

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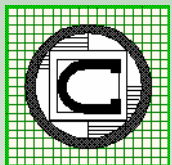
Field Collection Process



On average 1 to 2 minutes to collect data per sign, 17 attributes
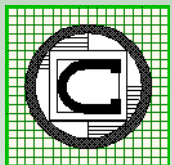
Maintaining/Updating Process

❖ Field crews were bringing in many files that needed to be processed.

❖ An automated process was needed to update the TSignPole Layer and TSign Table.

❖ The ability to handle addition of new features as well as modifying existing features.

❖ The ability to check the results prior to committing to the database (i.e. Work_Type codes, existing database Street Names).

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Case 1
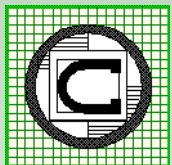
New Post with One Sign

In this case, the field survey point is not close to any existing poles and there is only one field survey point at this location. Under this condition, the command adds one feature to the TSIGNPOLE layer and one record to the TSIGN table. The coordinates of the new Traffic Sign Pole feature will match those of the field survey point.
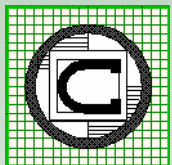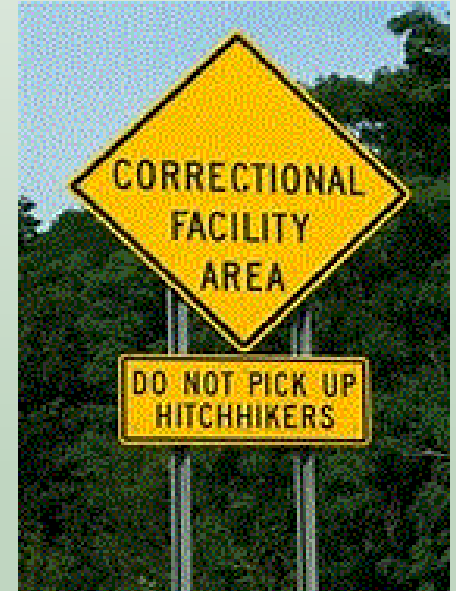
Case 2

New Post with Multiple Signs
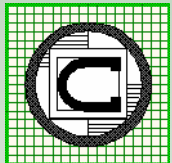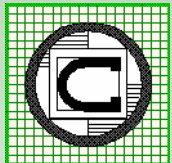
In this case, there are field survey points that are not close to an existing pole and these points are within the proximity tolerance. Under this condition, the command will add one feature to the TSIGNPOLE layer and one record for every field survey point to the TSIGN table. The coordinates of the Traffic Sign Pole feature will be the average of the field survey points.

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Case 3

Add Sign(s) to Existing Post

In this case the field survey point is close to an existing post. Additionally, the field survey point must have the WORK_TYPE attribute with the value NEW_SIGN assigned to it in order for this case to function. Under this condition, the command will add one record to the TSIGN table for every sign appearing at the existing post.

Case 4

Replace Sign(s) on Existing Post

In this case the field survey point is close to an existing post. Additionally, the field survey point has the WORK_TYPE attribute value set to "REPLACE_SIGN" or the attribute is not present. In order to determine which sign is to be replaced the SIGN_TYPE and LEGEND fields in the field survey shapefile are examined. Using the SIGN_TYPE attribute, a sign code is extracted using the space character as the delineating character.
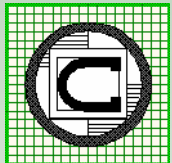
Case 4 (cont'd)

Replace Sign(s) on Existing Post

In the TSIGN table the records associated with a post will contain the post's Facility ID. These records are then examined to make a match on the sign code. If there is only one record in the TSIGN table the existing record is modified using the TSIGN field mapping information. If there are two or more records the processing varies depending upon the sign code value.

Substantial Custom Logic Involved in this Case

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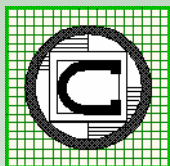
All Cases

Attribute Assignment

In all 4 cases previously mentioned, field survey data needed to be transferred to the appropriate fields in the Traffic Sign Pole Layer and Traffic Sign table.

Two text files called TSIGNPOLEMAPPING and TSIGNMAPPING files are used to indicate what fields the survey information is to be stored in the Traffic Sign Pole Layer and Traffic Sign table.
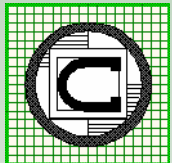
edmond
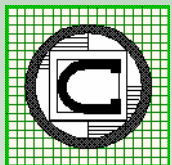
Field Mapping Files

TSIGNPOLEMAPPING

```
/*
POLE_TYPE,POLE_TYPE
/*
POLE_LENGT,LENGTH
/*
POLE_MOUNT,MOUNTING_STYLE
/*
GPS_DATE,MODIFIED_DATE
/*
/* Hard coded value to be stored in MODIFIED_BY
"SIGN_INVENTORY",MODIFIED_BY
```

TSIGNMAPPING

```
/*
SIGN_DIMEN,SIGN_DIMENSION
/*
DIRECTION_,DIRECTION_FACING
/*
CONDITION,CONDITION
/*
REPLACEMEN,REPLACEMENT_SIGN
/*
DATE_INSTA,DATE_INSTALLED
/*
COMMENTS,COMMENTS
/*
IMAGERY,HYPERLINK
```
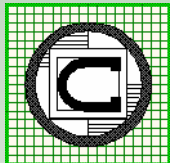
Survey GPS Shapefile

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Sign Pole Layer - TSIGNPOLE

Attributes of TSIGNPOLE

FID	Shape *	LENGTH	WARRANTYDA	CONDITIOND	FACILITYID	STATUS	TYPE	LOCATION	MOUNTING_S	POLE_TYPE	CONDITION	REMOVAL_DA	HYPERLINK	SYMBOL_ROT
475	Point	90	<Null>	<Null>	1962	Inactive		HOLLOWDALE	Ground	Standard		<Null>		0
476	Point	100	<Null>	<Null>	1963	Active			Ground	Standard		<Null>		0
477	Point	100	<Null>	<Null>	1965	Active			Ground	Standard		<Null>		0
478	Point	100	<Null>	<Null>	1966	Inactive			Ground	Standard		<Null>		0
479	Point	105	<Null>	<Null>	1967				Ground	Standard		<Null>		0
480	Point	100	<Null>	<Null>	1968				Ground	Standard		<Null>		0
481	Point	70	<Null>	<Null>	1969				Break Away	Standard		<Null>		0
482	Point	70	<Null>	<Null>	1970				Break Away	Standard		<Null>		0
483	Point	70	<Null>	<Null>	1971	Inactive			Break Away	Standard		<Null>		0
484	Point	105	<Null>	<Null>	1972				Ground	Standard		<Null>		0
485	Point	50	<Null>	<Null>	1974				Ground	Standard		<Null>		0
486	Point	50	<Null>	<Null>	1975				Ground	Standard		<Null>		0

Record: 92   Show: All Selected   Records (0 out of 7708 Selected)   Options

Attributes of TSIGNPOLE

FACILITYID	STATUS	TYPE	LOCATION	MOUNTING_S	POLE_TYPE	CONDITION	REMOVAL_DA	HYPERLINK	SYMBOL_ROT	MODIFIED_B	MODIFIED_D	LEGACYID	INTERSECTI
1962	Inactive		HOLLOWDALE	Ground	Standard		<Null>		0		<Null>		
1963	Active			Ground	Standard		<Null>		0		<Null>		
1965	Active			Ground	Standard		<Null>		0		<Null>		
1966	Inactive			Ground	Standard		<Null>		0		<Null>		
1967				Ground	Standard		<Null>		0		<Null>		
1968				Ground	Standard		<Null>		0		<Null>		
1969				Break Away	Standard		<Null>		0		<Null>		
1970				Break Away	Standard		<Null>		0		<Null>		
1971	Inactive			Break Away	Standard		<Null>		0		<Null>		
1972				Ground	Standard		<Null>		0		<Null>		
1974				Ground	Standard		<Null>		0		<Null>		
1975				Ground	Standard		<Null>		0		<Null>		

Record: 92   Show: All Selected   Records (0 out of 7708 Selected)   Options
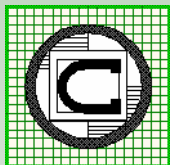
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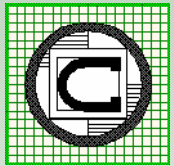
Sign Table - TSIGN

Attributes of TSIGN

OID	OBJECTID	SIGN_TYPE	LEGEND	FACE_MATER	BLANK_MATE	DATE_INSTA	SIGN_DIMEN	WARRANTYDA	CONDITIOND	ASSETID	SIGNPOLFAC	SIGNPOLOID	TPOLEFACID
10694	145482	OM-3R		VIP	A	11/7/2012	12x36	<Null>	<Null>		138079	138079	
10695	145483	OM-3L		VIP	A	11/7/2012	12x36	<Null>	<Null>		138080	138080	
10696	145484	R2-1	35 MPH	EG	A	11/7/2012	24x30	<Null>	<Null>		138081	138081	
10697	145485	OM-3L		EG	A	11/7/2012	12x36	<Null>	<Null>		138082	138082	
10698	145486	R10-10R		EG	A	11/7/2012	12x36	<Null>	<Null>		138083	138083	
10699	145487	OM-3L		EG	A	11/7/2012	12x36	<Null>	<Null>		138084	138084	
10700	145488	R10-10R		EG	A	11/7/2012	12x36	<Null>	<Null>		138085	138085	
10701	145489	R2-1	45 MPH	VIP	A	11/7/2012	24x30	<Null>	<Null>		138086	138086	
10702	145490	R1-1		VIP	A	11/7/2012	36	<Null>	<Null>		138087	138087	
10703	145491	R2-1	45 MPH	EG	A	11/7/2012	24x30	<Null>	<Null>		138088	138088	
10704	145492	W3-1A		VIP	A	11/7/2012	36	<Null>	<Null>		138089	138089	
10705	145493	R1-1		VIP	A	11/7/2012	30	<Null>	<Null>		138090	138090	

Record: 1   Show: All Selected   Records (0 out of 13524 Selected)   Options

Attributes of TSIGN

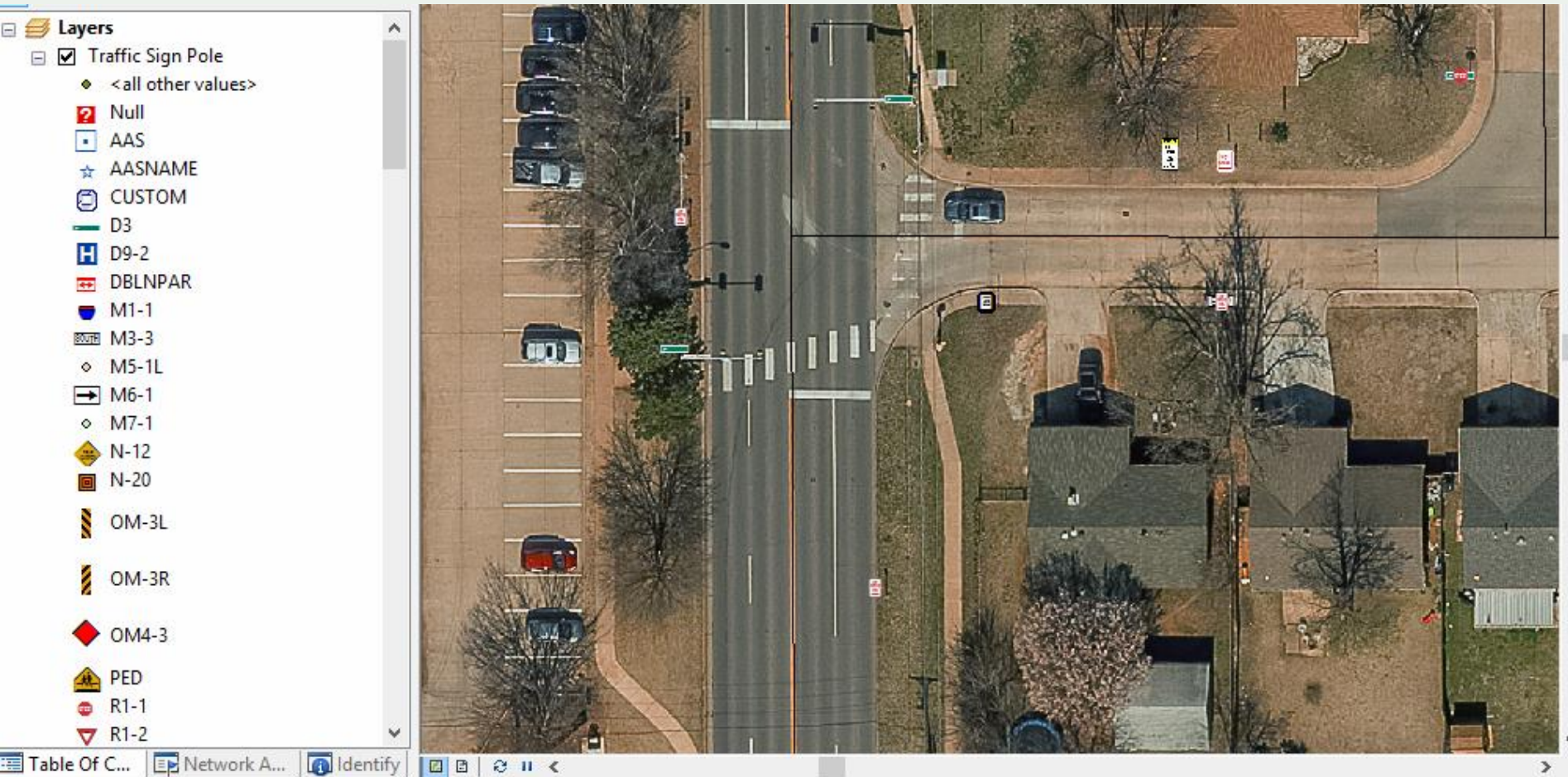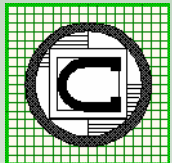| CONDITIOND	ASSETID	SIGNPOLFAC	SIGNPOLOID	TPOLEFACID	ELIGHTFACI	STATUS	DATE_REMOV	HYPERLINK	MODIFIED_B	MODIFIED_D	TRAVEL_DIR	CONDITION	DIRECTION_	MOUNT_TYPE
<Null>		138079	138079				<Null>		Sign Inventory	11/6/2015	WB	Good	E	Bolts
<Null>		138080	138080				<Null>		Sign Inventory	11/6/2015	WB	Good	E	Bolts
<Null>		138081	138081				<Null>		Sign Inventory	11/6/2015	WB	Fair	E	Bolts
<Null>		138082	138082				<Null>		Sign Inventory	11/6/2015	EB	Fair	W	Bolts
<Null>		138083	138083				<Null>		Sign Inventory	11/6/2015	EB	Fair	W	Bolts
<Null>		138084	138084				<Null>		Sign Inventory	11/6/2015	WB	Fair	E	Bolts
<Null>		138085	138085				<Null>		Sign Inventory	11/6/2015	WB	Fair	E	Bolts
<Null>		138086	138086				<Null>		Sign Inventory	11/6/2015	WB	Good	E	Pop Rivets
<Null>		138087	138087				<Null>		Sign Inventory	11/6/2015	NB	Fair	S	Pop Rivets
<Null>		138088	138088				<Null>		Sign Inventory	11/6/2015	SB	Fair	N	Bolts
<Null>		138089	138089				<Null>		Sign Inventory	11/6/2015	SB	Good	N	Bolts
<Null>		138090	138090				<Null>		Sign Inventory	11/6/2015	WB	Good	E	Bolts

Record: 1   Show: All Selected   Records (0 out of 13524 Selected)   Options
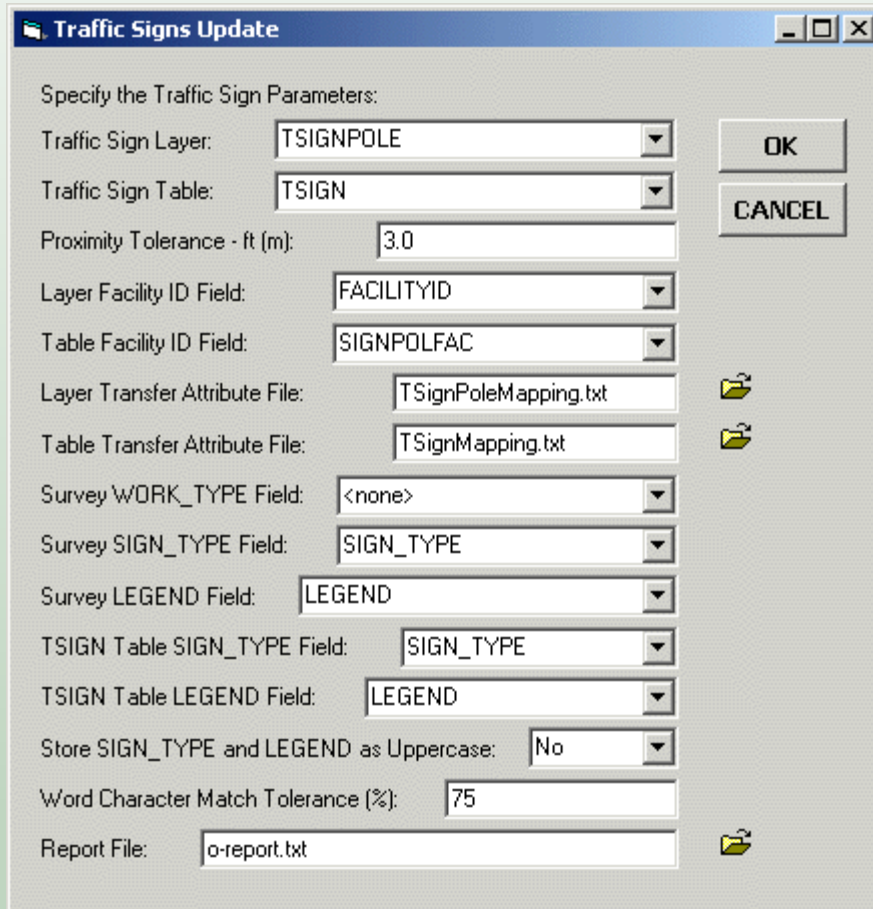
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Traffic Sign Type Classification

Traffic Sign Update Command
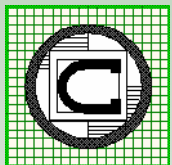

Prior to executing this command the user selects the GPS Shapefile(s) to be processed in the Table of Contents

A formal report file contains the results of the processing

The Report File - Header

Traffic Sign Data Processing

Traffic Sign Layer: TSIGNPOLE
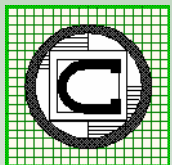
Traffic Sign Table: TSIGN

Layer Transfer Attribute File: TSignPoleMapping.txt

Table Transfer Attribute File: TSignMapping.txt

Proximity Tolerance: 3

TSIGNPOL Highest Facility ID currently assigned is: 140271

The Report File – Part 1

PART 1: Processing the active Survey Data Shapefiles

Processing SIGNS20120725 data

```
 1. FID 0 existing Traffic Sign
 2. FID 1 existing Traffic Sign
 3. FID 2 existing Traffic Sign
 4. FID 3 within 3 existing Traffic Signs
 5. FID 4 within 3 existing Traffic Signs
 6. FID 5 existing Traffic Sign
 7. FID 6 existing Traffic Sign
 8. FID 7 existing Traffic Sign
 9. FID 8 existing Traffic Sign
10. FID 9 existing Traffic Sign
11. FID 10 existing Traffic Sign
12. FID 11 existing Traffic Sign
13. FID 12 new Traffic Sign
14. FID 13 existing Traffic Sign
15. FID 14 existing Traffic Sign
```
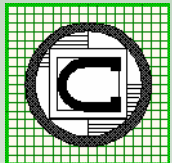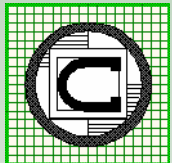

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The Report File – Part 1

The end of Part 1 contains a summary of the survey data that was processed

```
Total Points Processed: 51
Total Points not close to Existing Sign: 5
Total Points close to Existing Sign: 42
Total Points close to Multiple Existing Signs: 4
```
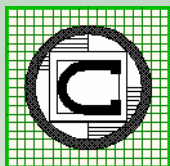
The Report File – Part 2

PART 2: Adding New Features to TSIGNPOLE and New Records to TSIGN

```
1. Layer: SIGNS20120725 FID 12 added to TSIGNPOL and assigned Facility ID 140272
   Table: SIGNS20120725 FID 12 added to TSIGN and assigned Facility ID 140272

2. Layer: SIGNS20120725 FID 20 added to TSIGNPOL and assigned Facility ID 140273
   Table: SIGNS20120725 FID 20 added to TSIGN and assigned Facility ID 140273

3. Layer: SIGNS20120725 FID 24 added to TSIGNPOL and assigned Facility ID 140274
   Table: SIGNS20120725 FID 24 added to TSIGN and assigned Facility ID 140274

4. Layer: SIGNS20120725 FID 31 added to TSIGNPOL and assigned Facility ID 140275
   Table: SIGNS20120725 FID 31 added to TSIGN and assigned Facility ID 140275
   Table: SIGNS20120725 FID 32 added to TSIGN and assigned Facility ID 140275

Total New Traffic Poles Created: 4
Total New Traffic Sign Data Created: 5
```

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The Report File – Part 3

```
PART 3: Modifying Existing Data in TSIGNPOLE and the Table TSIGN


1. Layer: SIGNS20120725 FID 0 within proximity of TSIGNPOL FID 2328
         SIGN_TYPE: W3-1 STOP AHEAD LEGEND:

         Modified TSIGNPOL OID 2328

   Table: SIGNS20120725 FID 0 within proximity of TSIGN OID 4249
         SIGN_TYPE: W3-1A              LEGEND: STOP AHEAD SYMBOL

         Modified TSIGN OID 4249 SIGN_TYPE: W3-1 LEGEND:

2. Layer: SIGNS20120725 FID 1 within proximity of TSIGNPOL FID 987
         SIGN_TYPE: R1-1 STOP LEGEND:

         Modified TSIGNPOL OID 987

   Table: SIGNS20120725 FID 1 within proximity of TSIGN OID 2157
         SIGN_TYPE: R1-1       LEGEND:
   Table: SIGNS20120725 FID 1 within proximity of TSIGN OID 3164
         SIGN_TYPE: R1-3-4     LEGEND:

         Modified TSIGN OID 2157 SIGN_TYPE: R1-1 LEGEND:
```
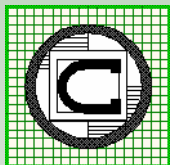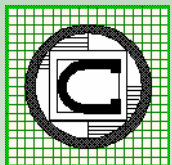
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The Report File – Times

At the end of the report file is the date and time the report file was generated

```
Started:  02:27:11 PM 7 Mar 2017
Stopped:  02:27:31 PM 7 Mar 2017
Duration: 00:00:20
```
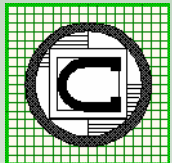

DO NOT READ THIS SIGN Under Penalty of Law

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Update Confirmation

❖   The Edits made to the TSignPole Layer and TSign Table are not committed but rather are placed in an Undo operation.

❖   The User can review the Report File and check if any problems exist.

❖   If there are problems the User can Undo the operation, make the appropriate modifications and then re-execute the command.

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Summary

❖ Without the Traffic Sign Updating Tool a series of steps had to be manually performed that was time intensive and had to be repeated for every GPS file that was brought into the office.

❖ The Traffic Sign Updating Tool greatly reduced the time to process the GPS files and virtually eliminated user processing errors since an automated repeatable process was in place.
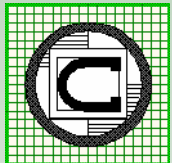
Series of Steps to Couple Button Clicks

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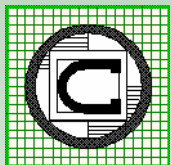
Thank you!

Questions
And
Answers