



# WHAT'S IN A NAME?

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*Unique Asset Identification  
using USNG Coordinates*

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# PROJECT BACKGROUND

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Mohawk Valley Water Authority

# About the Project

- The Mohawk Valley Water Authority (MVWA)
  - Serves the Greater Utica Area in Central NY
  - Serves a population of 130,000 (about 40k customers)
  - 700+ miles of pipe, 28 storage tanks, 21 pump stations
  - Produces an average of 19 MGD
- Mapping & Modeling Modernization Project (M<sup>3</sup>)
  - GIS Update
    - Workflow
    - Geodatabase redesign
  - Hydraulic Model Update
    - Move from all-pipe to all-pipe/valve/hydrant

# M<sup>3</sup> Project Component

- New Unique Asset Identifiers
  - Unique identifier (“name”) required for various systems such as GIS, CMMS, WOMS, or hydraulic models
  - At project onset, only hydrants had “meaningful” names

# M<sup>3</sup> Project Component

- New Unique Asset Identifiers
  - Unique identifier (“name”) required for various systems such as GIS, CMMS, WOMS, or hydraulic models
  - At project onset, only hydrants had “meaningful” names
- For this discussion, “asset” = fixed, field-based asset such as hydrants & valves

# Challenge

- Update water asset identifiers to be meaningful / logical unique names
- The MVWA has 22 feature classes in its water network geodatabase
  - Lines (3)
  - Facilities (11)
  - Features (8)

# MVWA WaterNet Feature Classes

- Lines
  - Pipes used in the transmission and distribution of water
  - Line Feature Classes (3)
    - MainLine
    - ServiceLine
    - VirtualLink

# MVWA WaterNet Feature Classes

## ■ Facilities

- Water network point facilities and junctions

## ■ Facility Feature Classes (11)

- Hydrant
- Storage
- MainLineValve
- ServiceLineValve
- SystemControlValve
- PressureRegulatingValve
- SystemMeter
- Pump
- CurbBox
- SamplingStation
- Fitting



# MVWA WaterNet Feature Classes

- Features
  - Spatial features that support the water network but do not transmit or control the flow of water
  - Feature Feature Classes (8)
    - Casing
    - AboveGroundFacility
    - UnderGroundFacility
    - Equipment
    - SCADAsensor
    - ServiceZone
    - MapScan
    - RedLine

# ASSET NAMING OPTIONS

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Field-based assets

# Identifier / Name Characteristics

- Required
  - Unique
- Desired
  - Meaningful
  - Hierarchical
  - Parsable
  - Same character length

# Asset Naming Schemes

- Numbering
  - Random
  - Sequential
- Hierarchical
  - Ex. site, building, asset type, asset number = MPHP04
- Spatial / Geographical
  - Grid-based
  - Coordinate-based
- Hybrid
  - Combination of schemes

# Hydrant Naming Thoughts

- Deserve a meaningful name, sure they're not as big as a building, but they're above ground 😊
- Need to communicate hydrant status information internally & with many fire departments and DPWs
- Experimented with various naming schemes
  - Including using an abbreviation for muni & street with nearest address number
  - Ex. UTGEN00258, MACAV15824



# Final Selection

- Street / address-based worked ok for hydrants, but wasn't ideal
- Heard a presentation about Hurricane Katrina response at the NYS GIS Conference in Lake Placid and started to explore using the USNG
- Using the USNG was a solid, logical choice...



USNG

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United States National Grid

# What is the USNG?

- Seamless, standardized alphanumeric point referencing system
- Universal coordinate system derived from UTM
- MGRS equivalent (NATO)
- Developed by FGDC
- Preferred grid for NSDI applications



# Why use the USNG?

- Single alphanumeric string
  - Ex. 18TVN80797206
- Navigable
- Universal
- Hurricane Katrina
  - Talbot Brooks

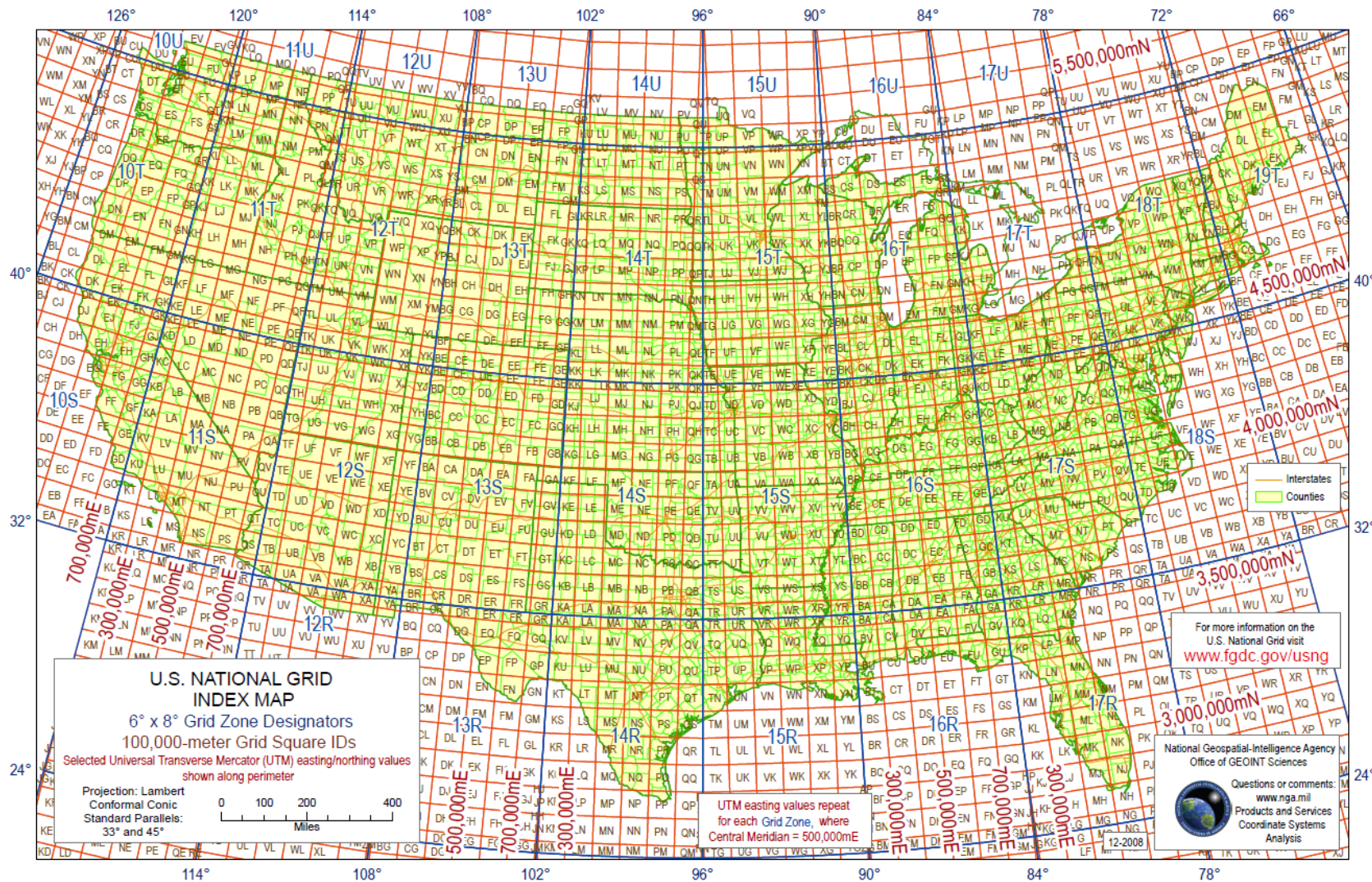
# The 3 USNG Components

- 1. GZD – Grid Zone Designation
- 2. 100,000 Meter Square Identification
- 3. Grid Coordinates

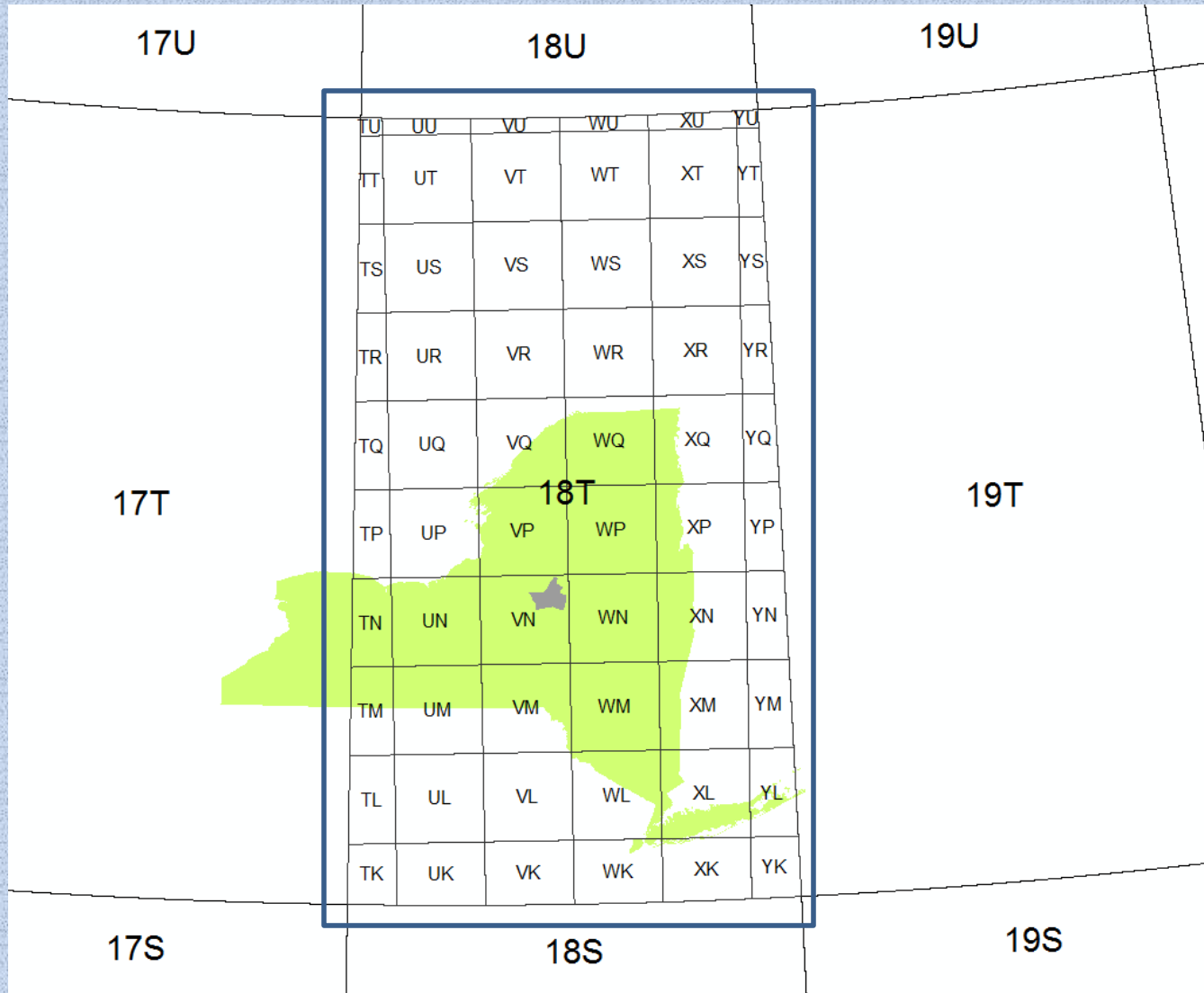
# The 3 USNG Components

- 1. GZD – Grid Zone Designation
  - The US is divided into 6-degree longitudinal zones designated by a number, and 8-degree latitudinal bands designated by a letter

# USNG Index Map



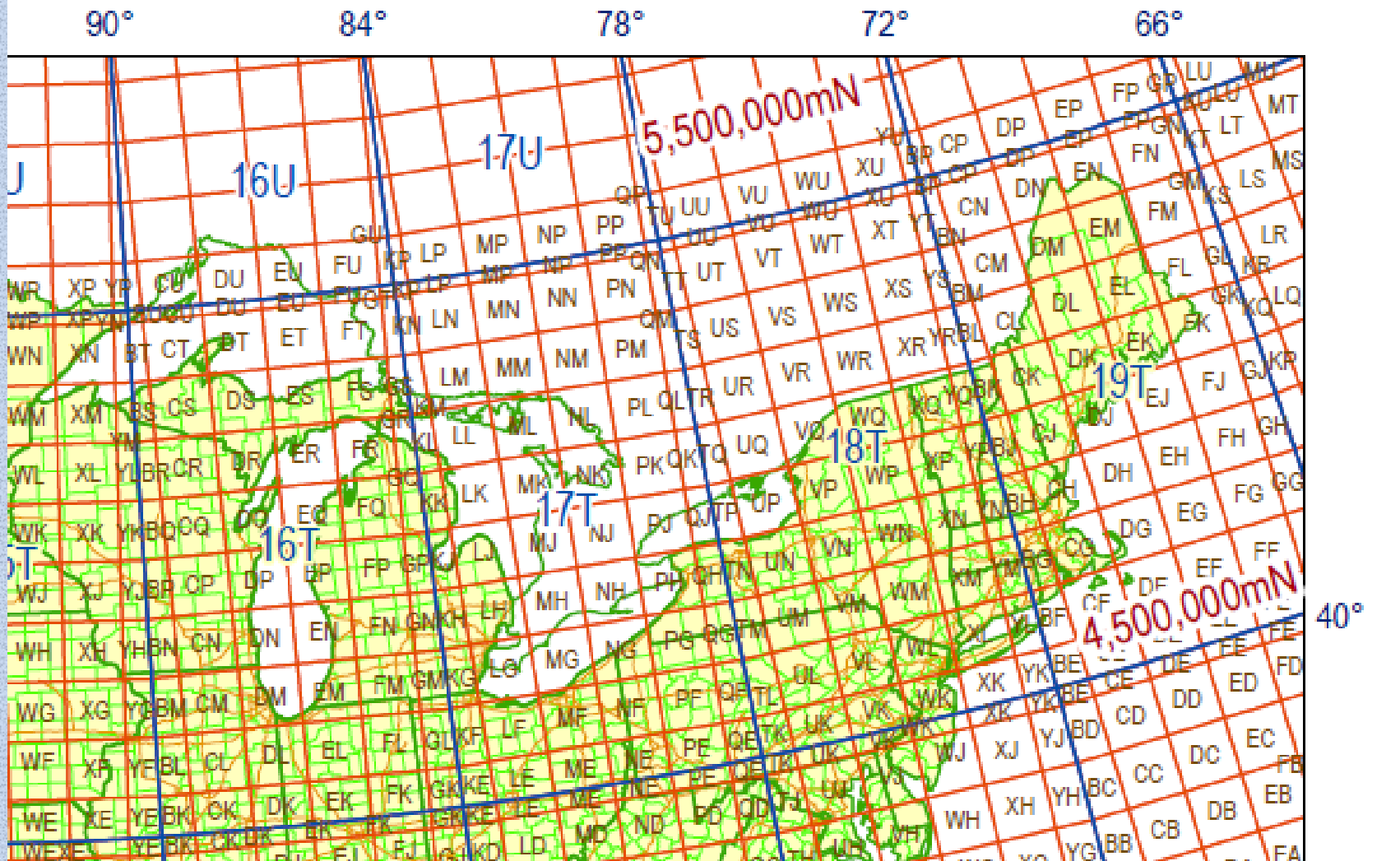
# GZD 18T



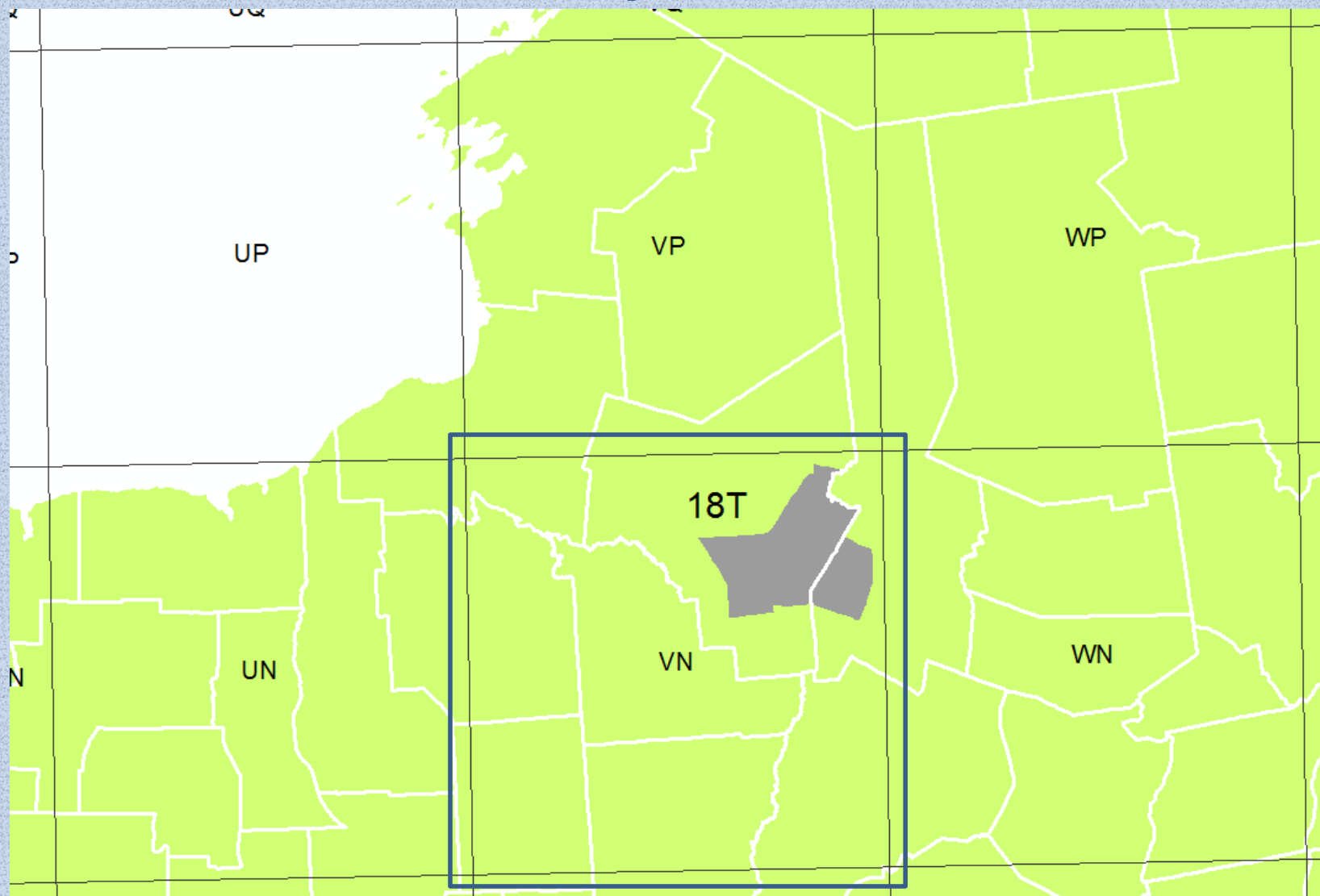
# The 3 USNG Components

- 1. GZD – Grid Zone Designation
  - The US is divided into 6-degree longitudinal zones designated by a number, and 8-degree latitudinal bands designated by a letter
- 2. 100,000 Meter Square Identification
  - Each GZD is gridded with 100,000 meter squares with a GZD-unique 2-letter designation

# USNG Index Map

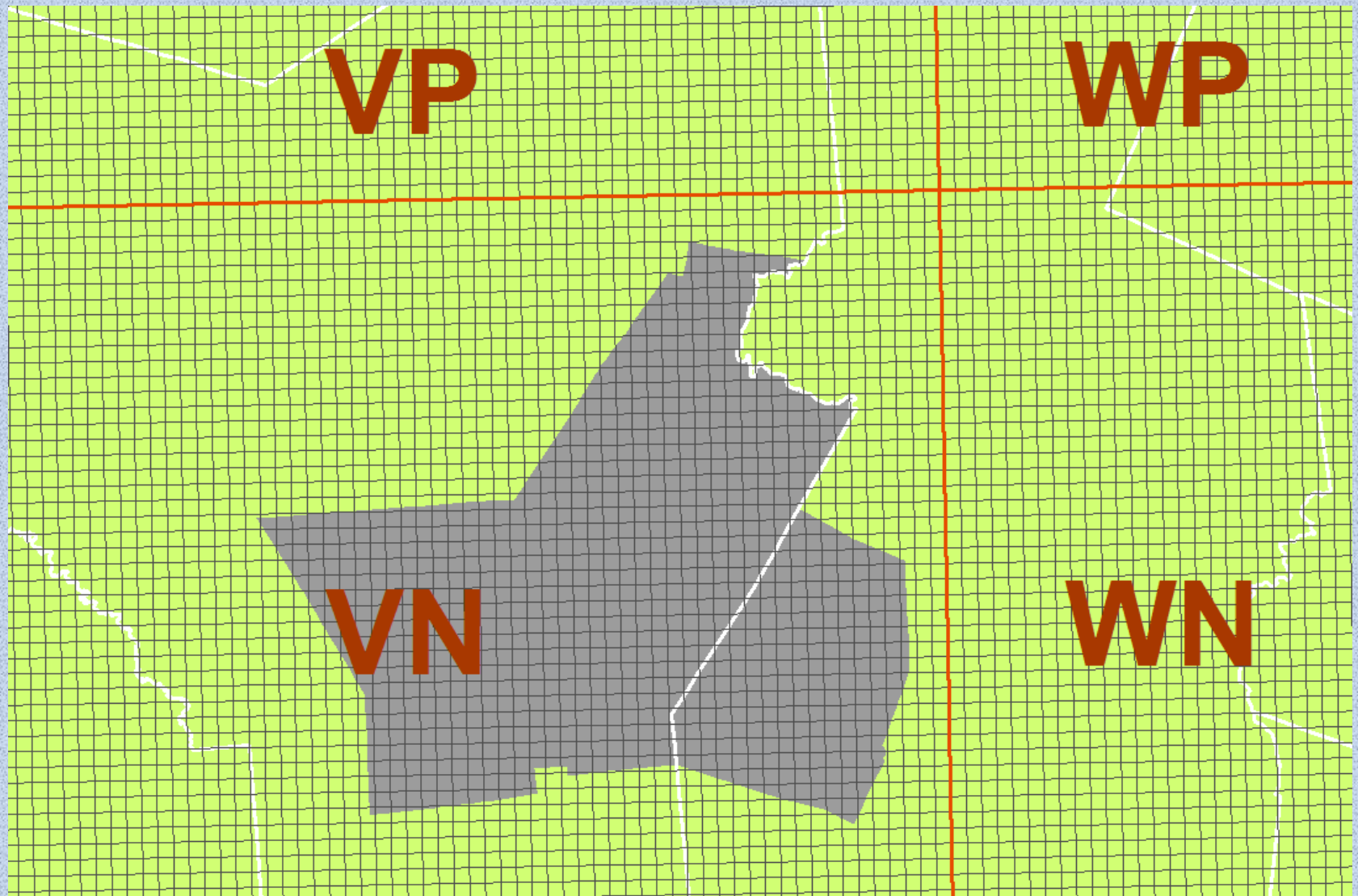


# 100,000 Meter Square VN





# 1 km Grid within VN



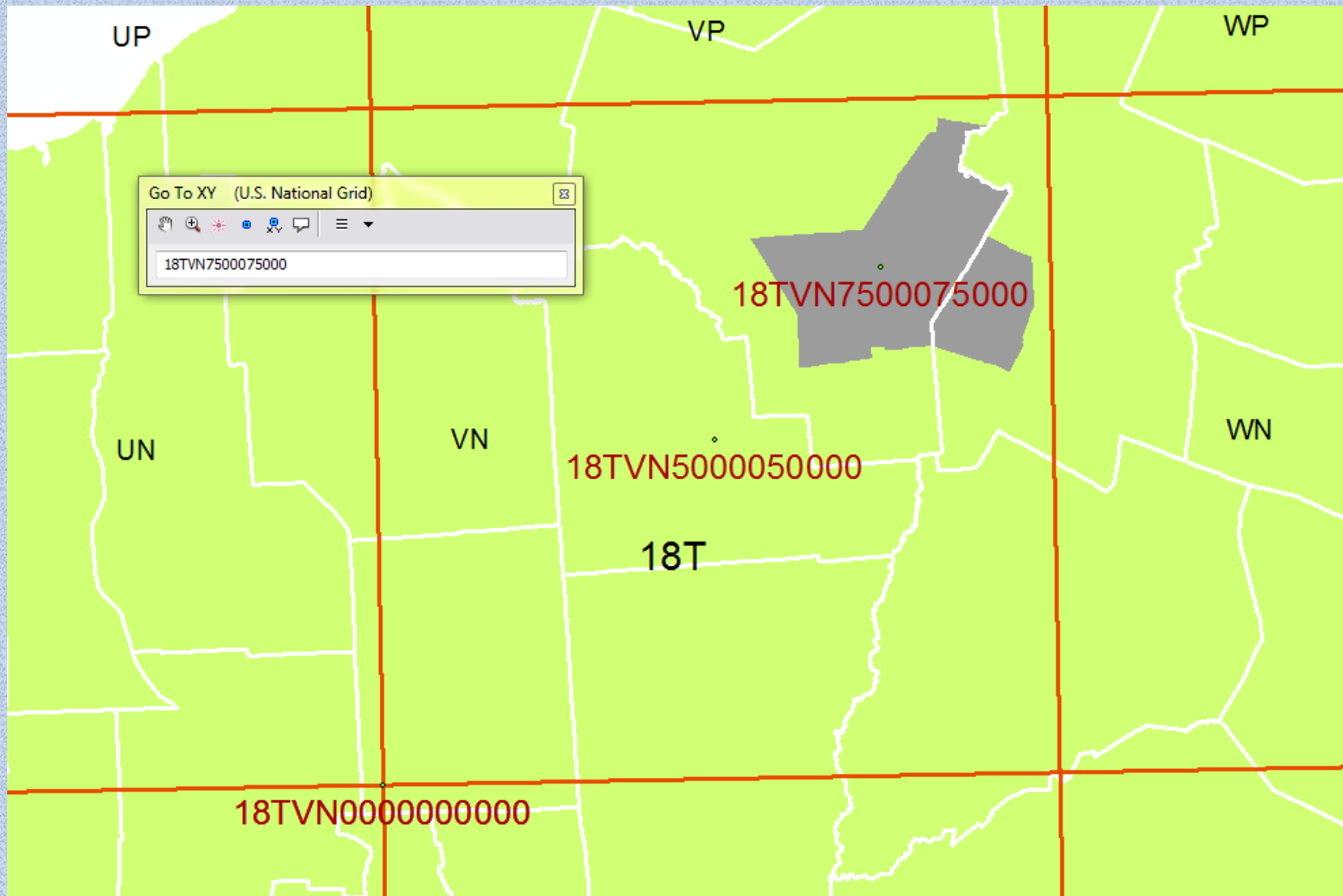
# The 3 USNG Components

- 1. GZD – Grid Zone Designation
  - The US is divided into 6-degree longitudinal zones designated by a number, and 8-degree latitudinal bands designated by a letter
- 2. 100,000 Meter Square Identification
  - Each GZD is gridded with 100,000 meter squares with a GZD-unique 2-letter designation
- 3. Grid Coordinates
  - Point positions within the 100,000m square are given UTM grid coordinates (easting then northing)
  - An equal number of digits is used for each position
  - The number of digits is determined by the desired precision

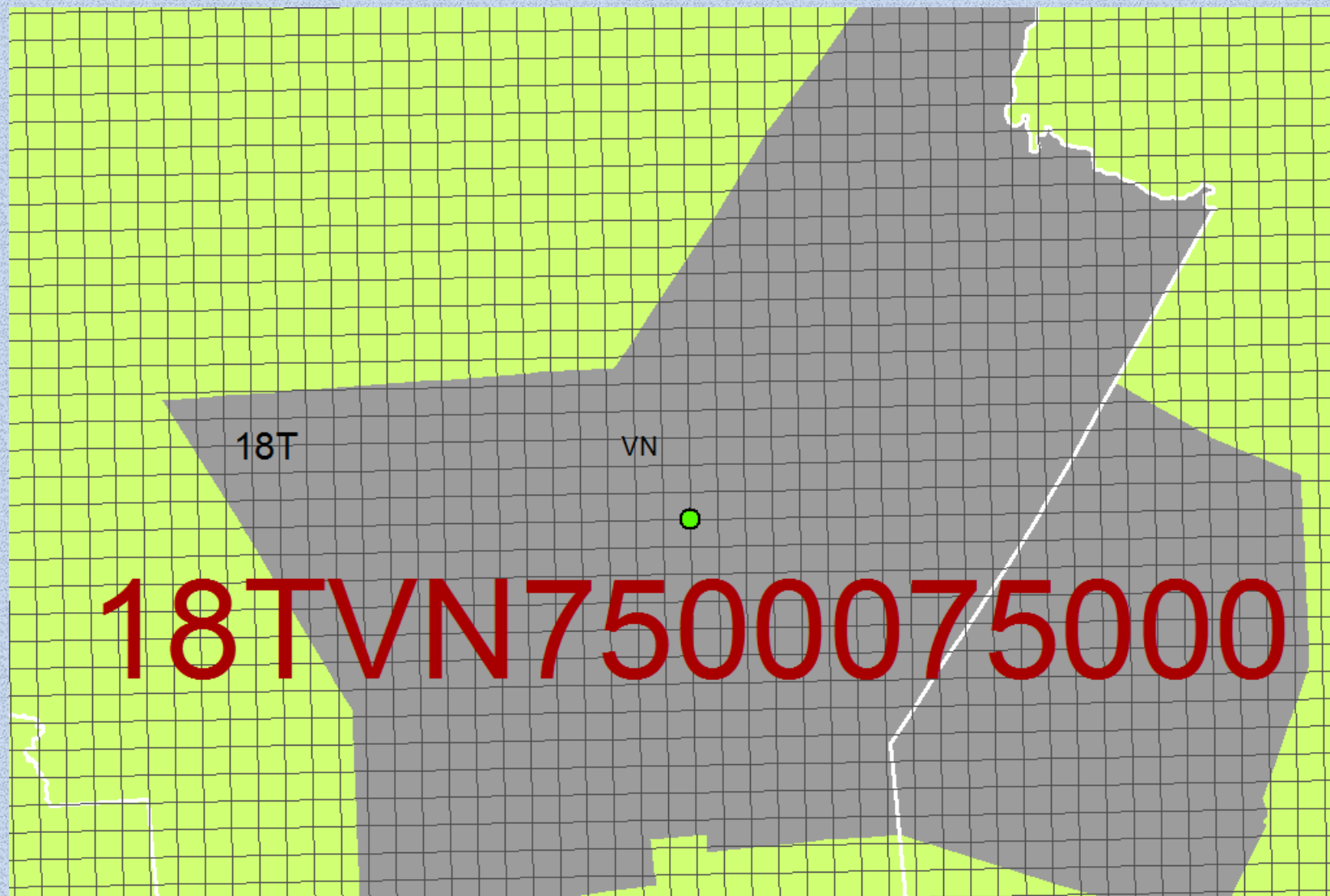
# USNG Grid Coordinate Precision Levels

USNG Level	Coord Digits
100,000 m	0
10,000 m	2
1,000 m	4
100 m	6
10 m	8
1 m	10
0.1 m	12

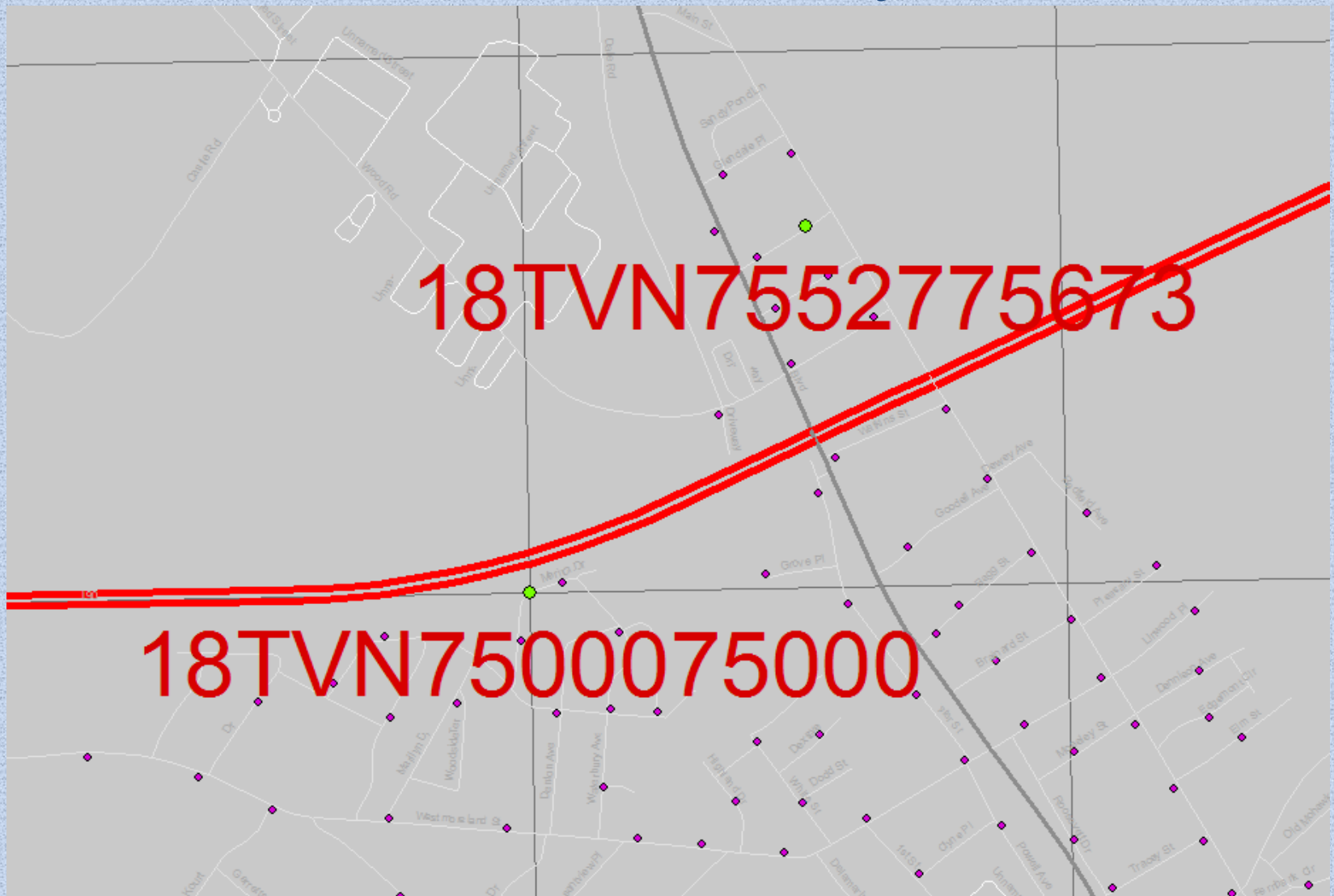
# ArcMAP "Go To XY" Tool



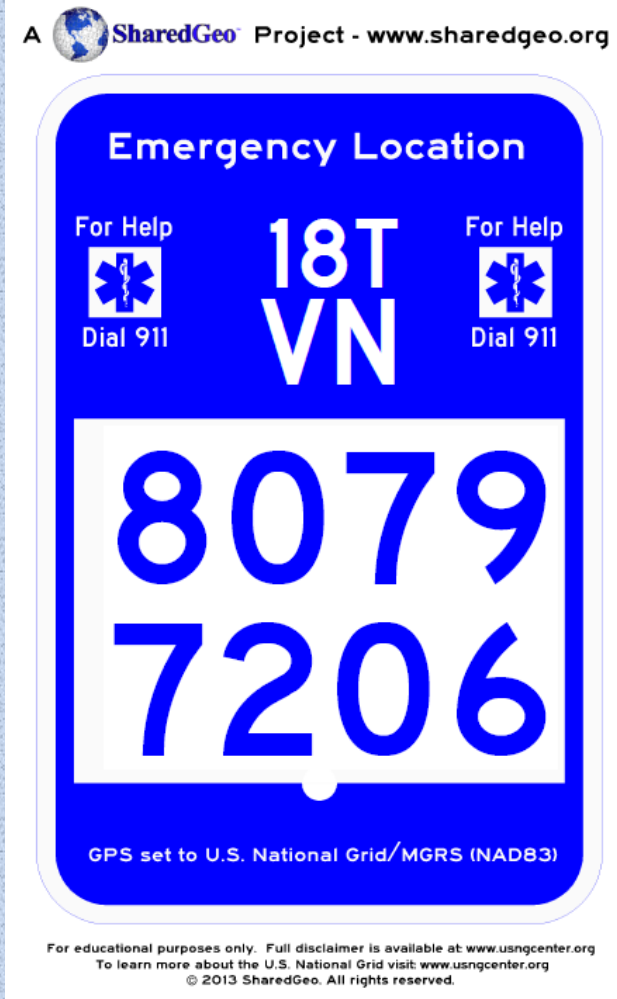
1 km USNG Coord = 18TVN7575



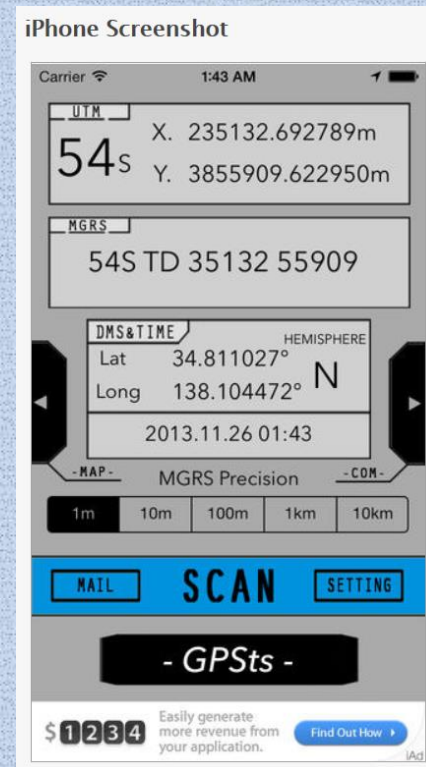
# 1m USNG Coord over Hydrant



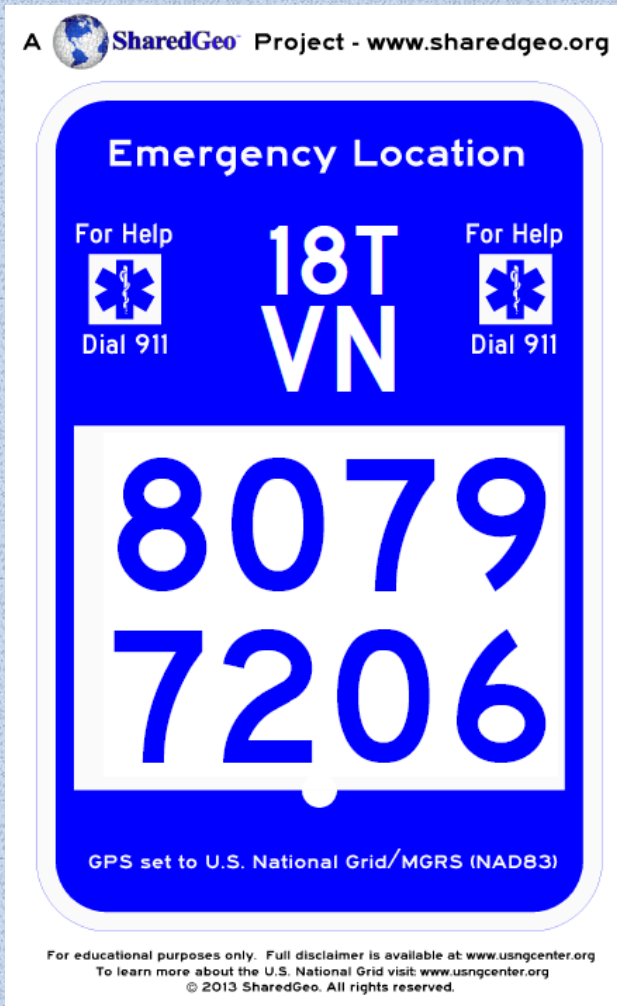
# USNG In Use



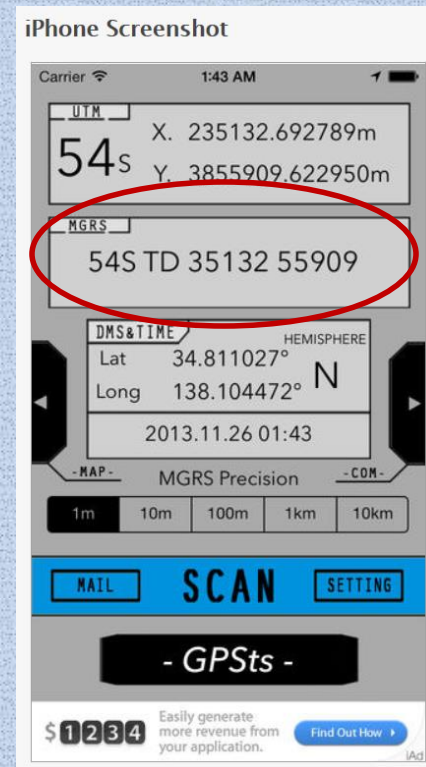
- Smart phone apps
  - GPSts



# USNG In Use



- Smart phone apps
  - GPSts





# USNG ASSET NAMING

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Planning

# Using USNG for Asset Naming

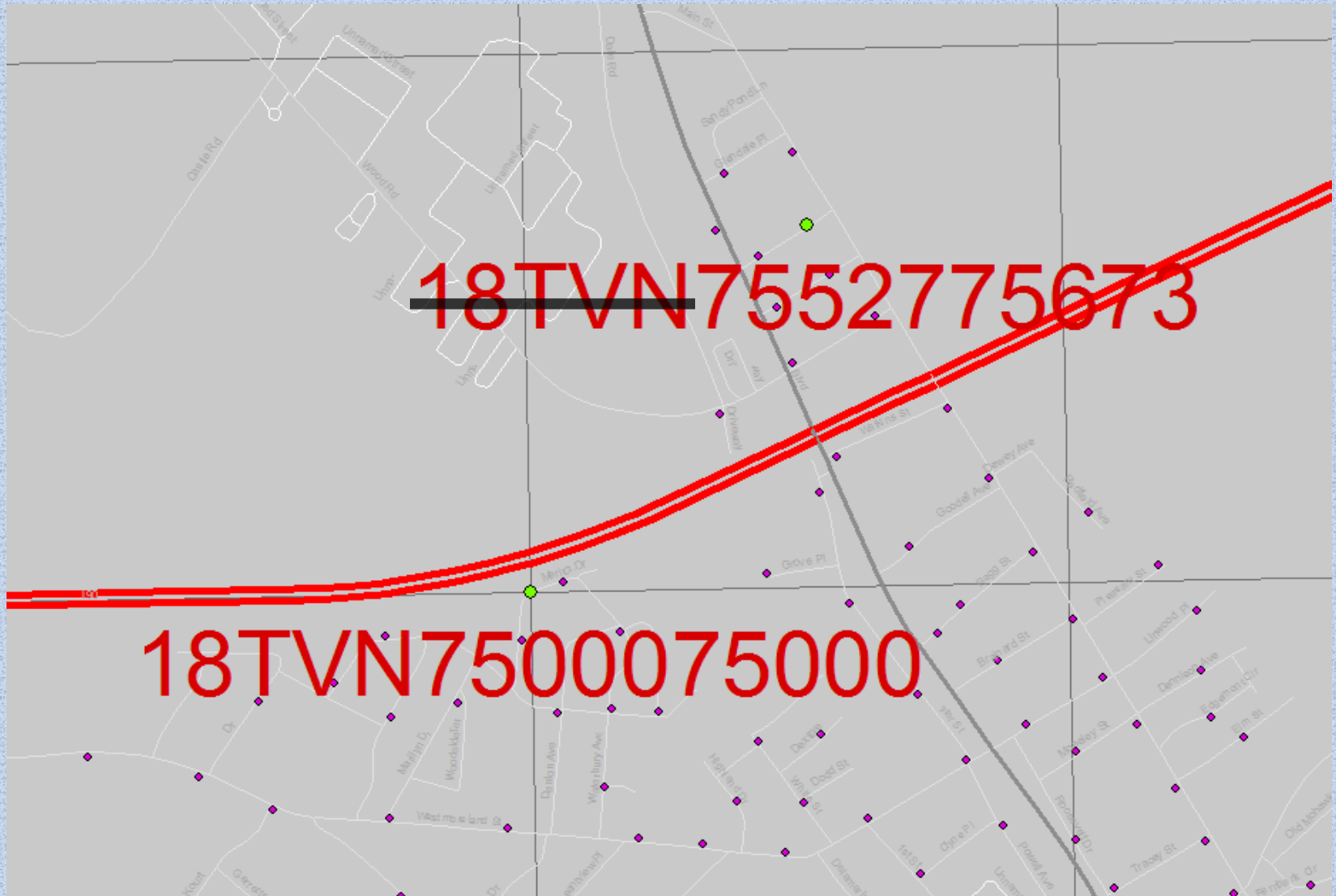
- Opportunities

- Since service area is within same 100km grid, MVWA could truncate first 5 digits of USNG coordinate (18T VN)

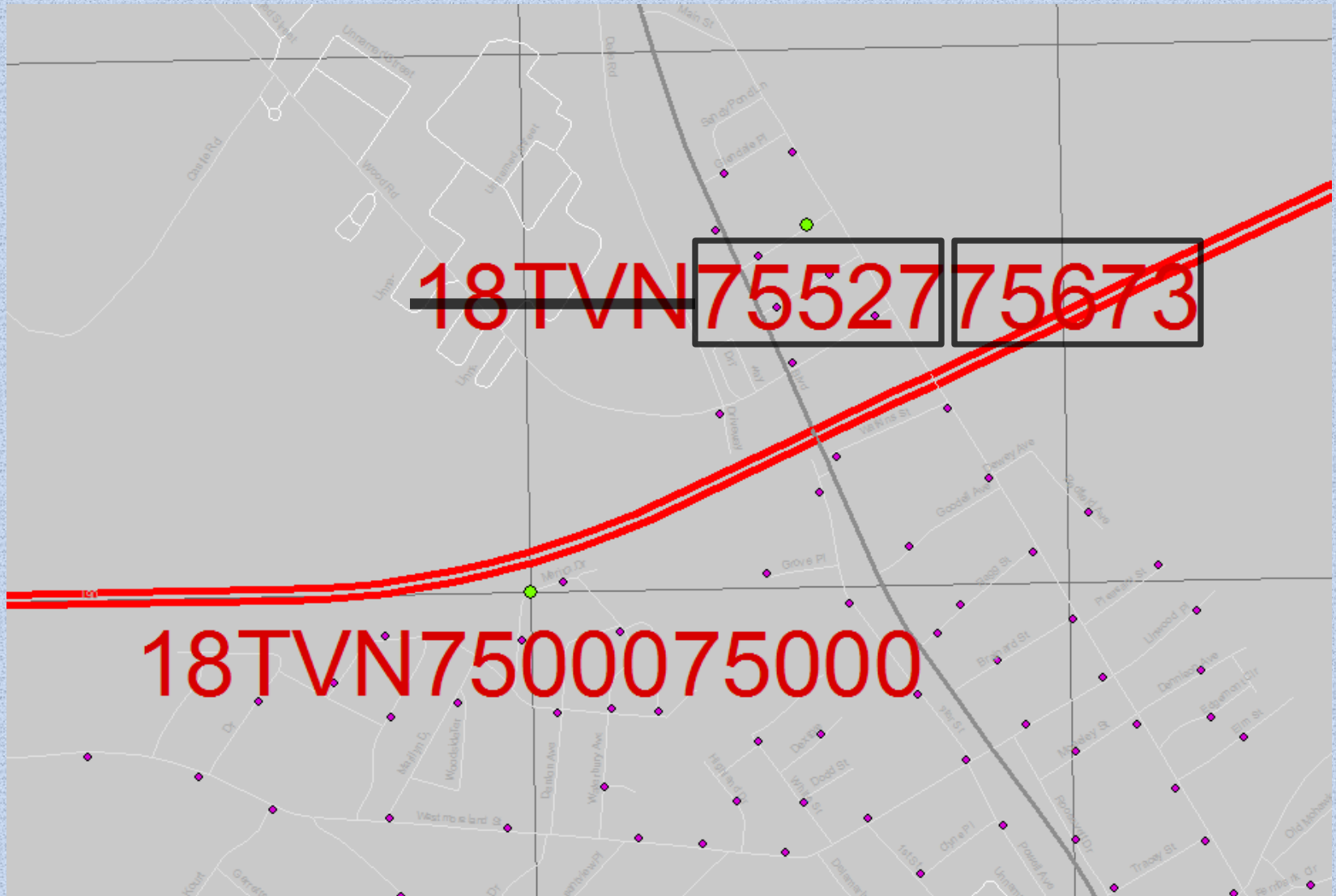
- Challenges

- Only good to meter level without modifications
  - Sometimes there are multiple features within a square meter
  - Needed to extend USNG to the decimeter level

# 1m USNG Coord over Hydrant



# 1m USNG Coord over Hydrant



# Original USNG Naming Plan

- Add prefix to differentiate feature type
- Extend USNG to get to decimeter level

# Original USNG Naming Plan

MVWA WaterNet Feature	USNG Level	Coord Digits	Prefix	Total Length
Hydrant	1 m	10	H	11
Storage	10 m	8	T	9
MainLineValve	0.1 m	12	MV	14
ServiceLineValve	0.1 m	12	SV	14
SystemControlValve	0.1 m	12	CV	14
PressureRegulatingValve	0.1 m	12	PV	14
SystemMeter	0.1 m	12	SM	14
Pump	0.1 m	12	P	13
CurbBox	0.1 m	12	C	13
SamplingStation	100 m	6	SS	8
Fitting	0.1 m	12	F	13

# Original USNG Naming Plan

- Add prefix to differentiate feature type
- Extend USNG to get to decimeter level
  - Issue
    - Determined that this did not produce unique names for our features
  - Possible Solutions
    - Do we shift coordinates so names are unique?
    - Do we extend the USNG in some other way?

# Revised USNG Naming Plan

- Decided that it was ok that multiple features could occupy a square meter
- Checked USNG coordinate for uniqueness & added a suffix
  - “-0” if unique
  - “-0”, “-1”, “-2”, etc. if not unique
- Separated prefix with a “-” for legibility
- Separated coordinates with a “-” for legibility



# Revised USNG Naming Plan

- Examples

- MV-33452-14903-1 (1m for Main Line Valves)
- H-167-028-0 (100m for Hydrants)

- Benefits

- Could “shorten” asset names
  - H6809208332 became H-680-083-0
- Asset names are easier to communicate
  - Since the vast majority of MVWA hydrants (>92%) do not have duplicates closer than 100m, most suffixes can be eliminated when communicating



# Revised USNG Naming Plan

MVWA WaterNet Feature	USNG Level	Coord Digits	Prefix	Total Digits
Hydrant	100 m	6	H	11
Storage	1000 m	4	T	9
MainLineValve	1 m	10	MV	16
ServiceLineValve	10 m	8	SV	14
SystemControlValve	10 m	8	CV	14
PressureRegulatingValve	10 m	8	PV	14
SystemMeter	100 m	6	SM	12
Pump	1 m	10	P	15
CurbBox	1 m	10	C	15
SamplingStation	1000 m	4	SS	10
Fitting	1 m	10	F	15

# Revised USNG Naming Plan

MVWA WaterNet Feature	Original USNG Level	Original Length	Revised USNG Level	Revised Length
Hydrant	1 m	11	100 m	11
Storage	10 m	9	1000 m	9
MainLineValve	0.1 m	14	1 m	16
ServiceLineValve	0.1 m	14	10 m	14
SystemControlValve	0.1 m	14	10 m	14
PressureRegulatingValve	0.1 m	14	10 m	14
SystemMeter	0.1 m	14	100 m	12
Pump	0.1 m	13	1 m	15
CurbBox	0.1 m	13	1 m	15
SamplingStation	100 m	8	1000 m	10
Fitting	0.1 m	13	1 m	15

# USNG ASSET NAMING

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Implementation

# USNG Naming Process

- Data needs to be in UTM, NAD-83 to create USNG asset names
- Create asset ID field = String, 20

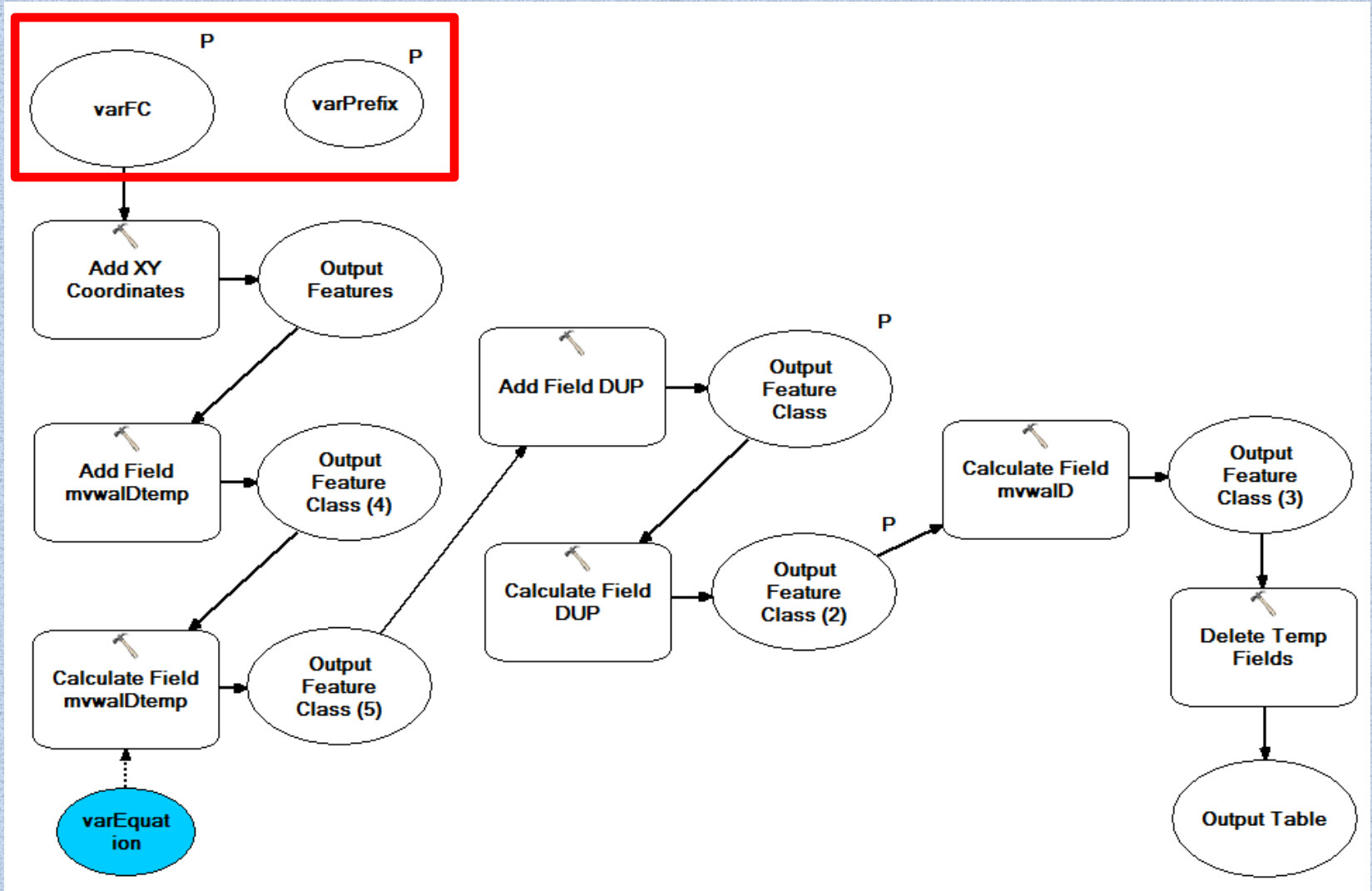
# USNG Naming with Lines & Polygons

- Since USNG is a Point-based referencing system, points are needed...
  - For Line Features – Find midpoint (use Feature to Point (inside option) to create temp point fc)
  - For Polygon Features – Find centroid (use Feature to Point (inside option) to create temp point fc)
- Important that line and polygon feature classes have a unique temp ID before running Feature to Point so that USNG IDs can be joined to original feature

# USNG Naming Process

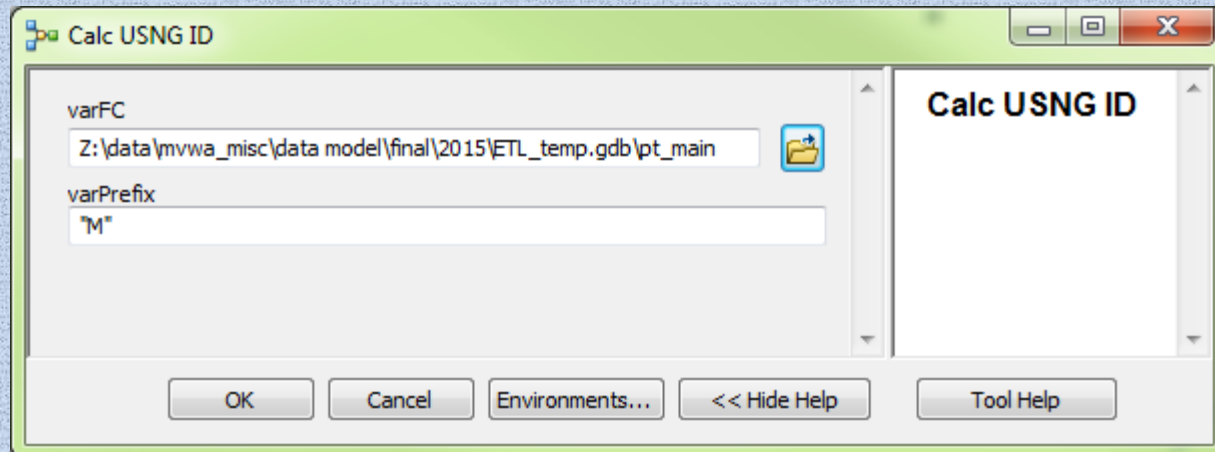
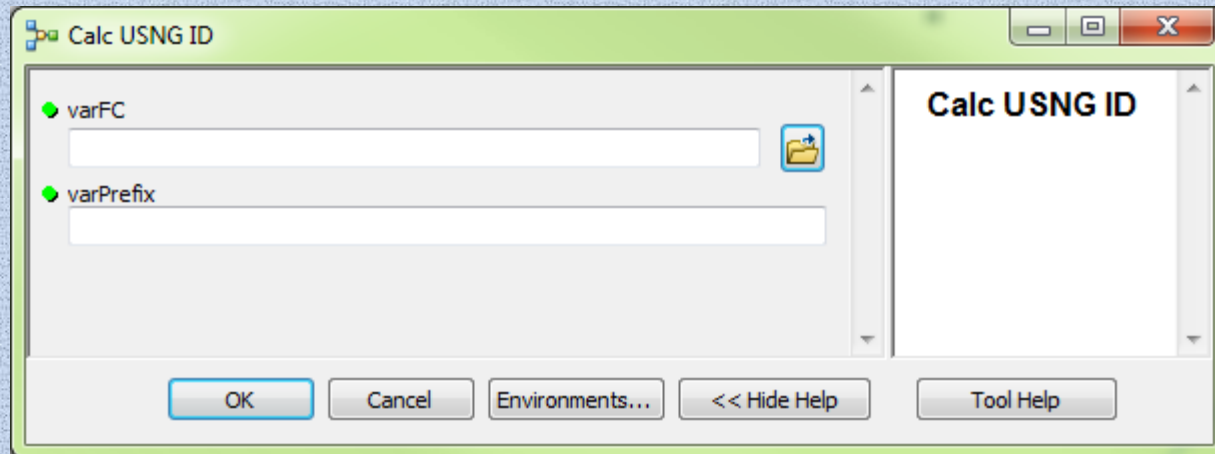
- Add XY Coordinates (creating POINT\_X & POINT\_Y fields)
- Use POINT\_X & POINT\_Y to create USNG coordinate (in tempID field)
- Check for duplicates & create duplicate field
- Create final asset name using prefix, USNG coordinate, & duplicate suffix
- Clean up temp fields

# Model Builder Diagram

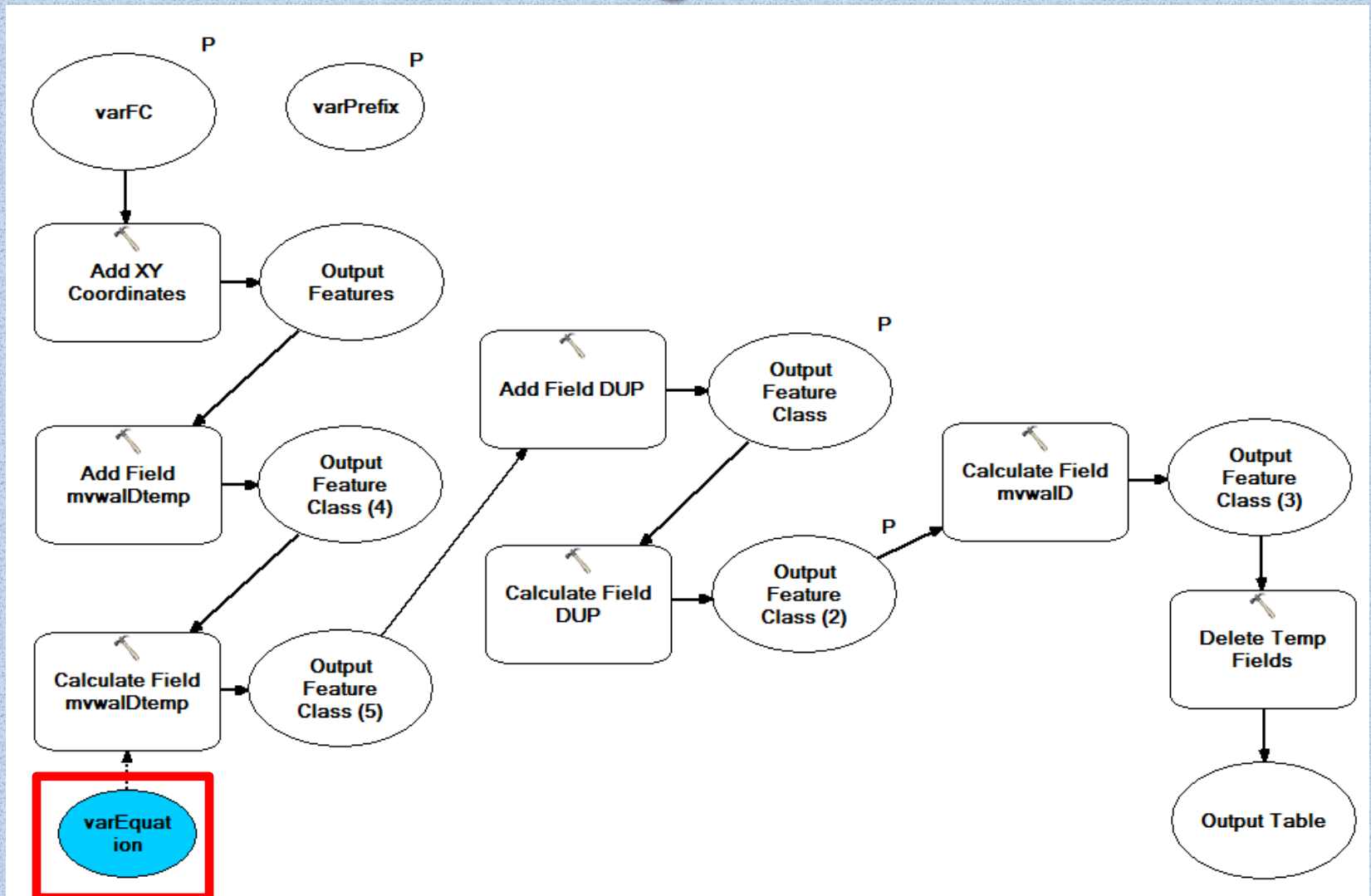




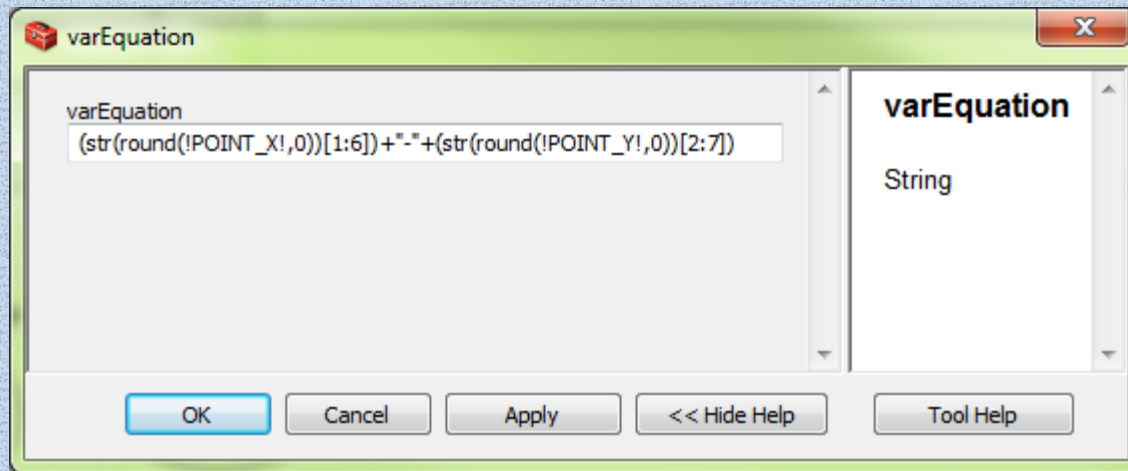
# Run Model



# Model Builder Diagram

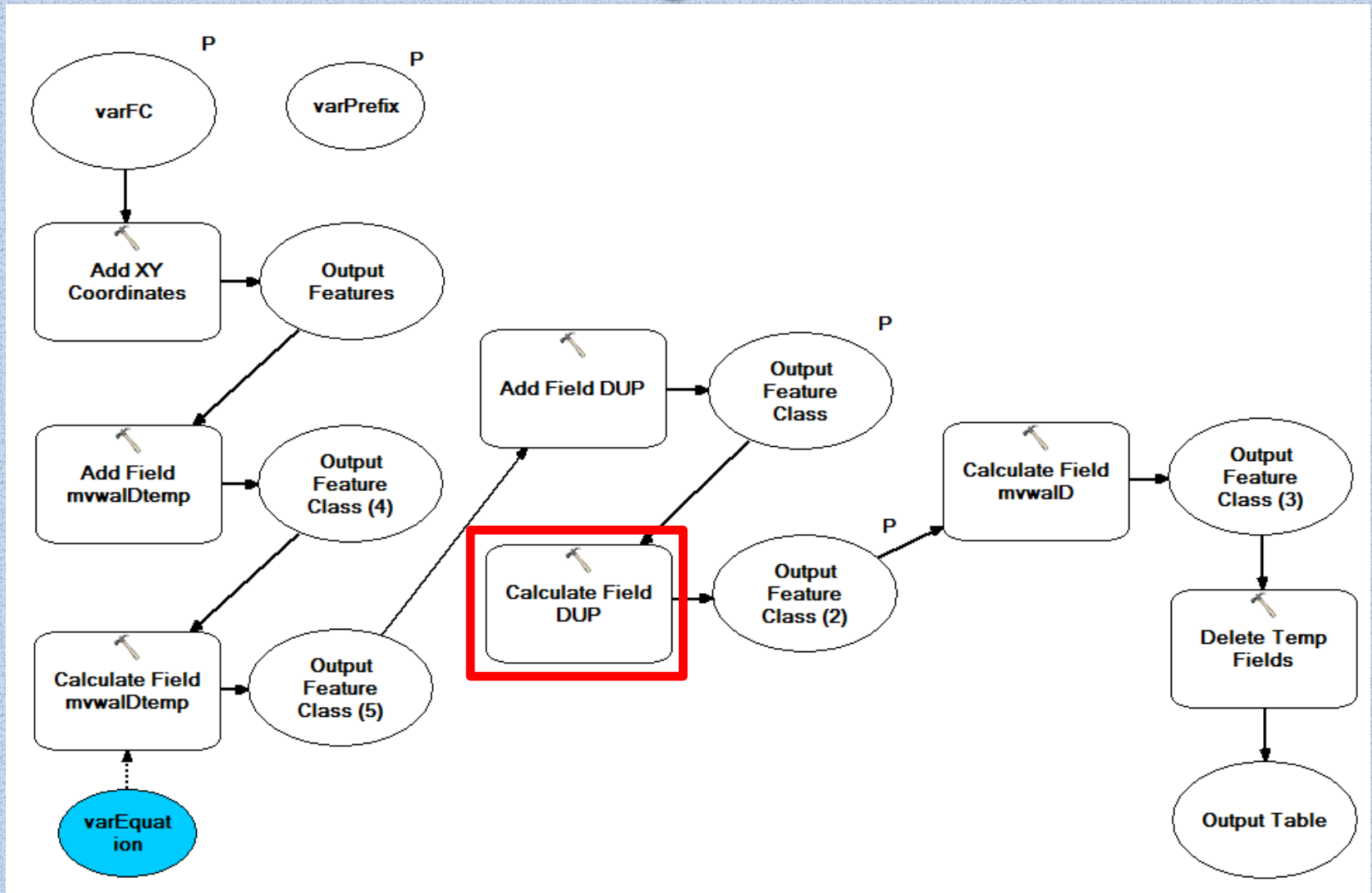


# Extract USNG Coordinate



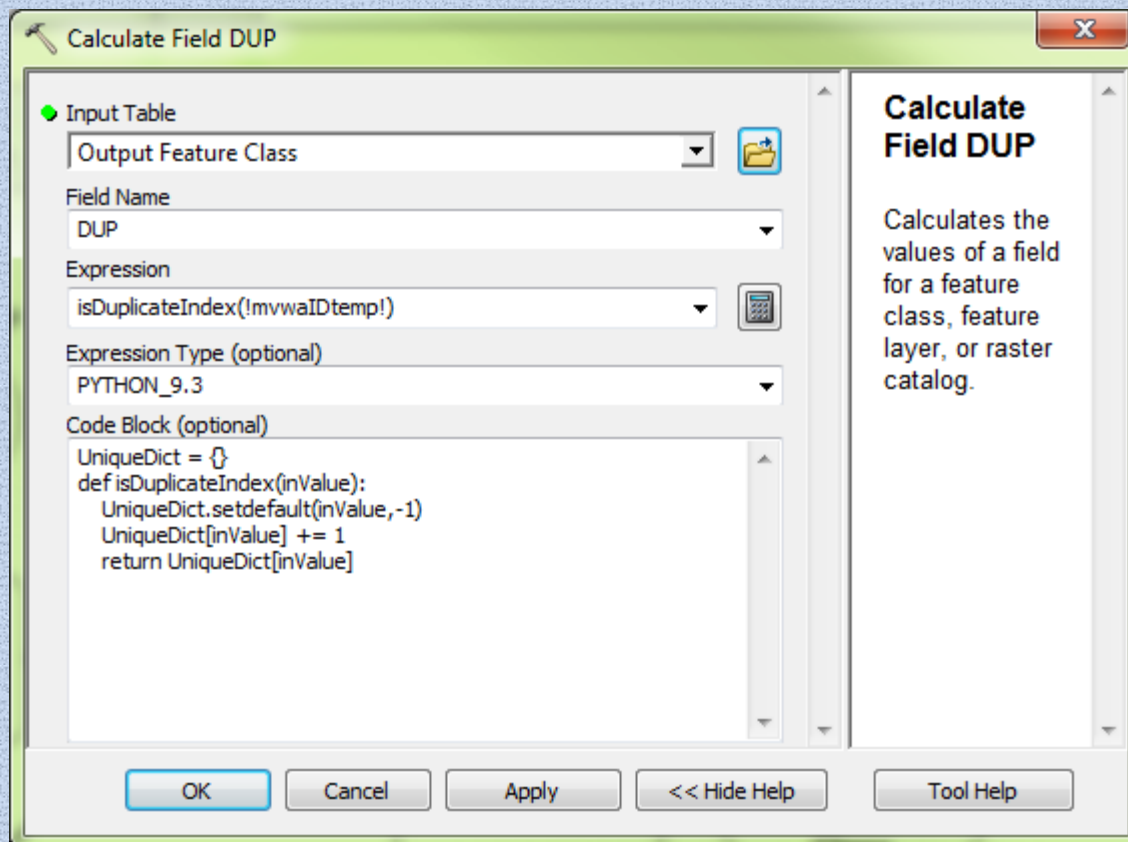
Accuracy	USNG Digits	varEquation
100 m	6	<code>(str(round((!POINT_X!*.01),0))[1:4])+"-"+(str(round((!Point_Y!*.01),0))[2:5])</code>
10 m	8	<code>(str(round((!POINT_X!*.1),0))[1:5])+"-"+(str(round((!Point_Y!*.1),0))[2:6])</code>
1 m	10	<code>(str(round(!POINT_X!,0))[1:6])+"-"+(str(round(!Point_Y!,0))[2:7])</code>
0.1 m	12	<code>(str(round((!POINT_X!*10),0))[1:7])+"-"+(str(round((!Point_Y!*10),0))[2:8])</code>

# Model Builder Diagram

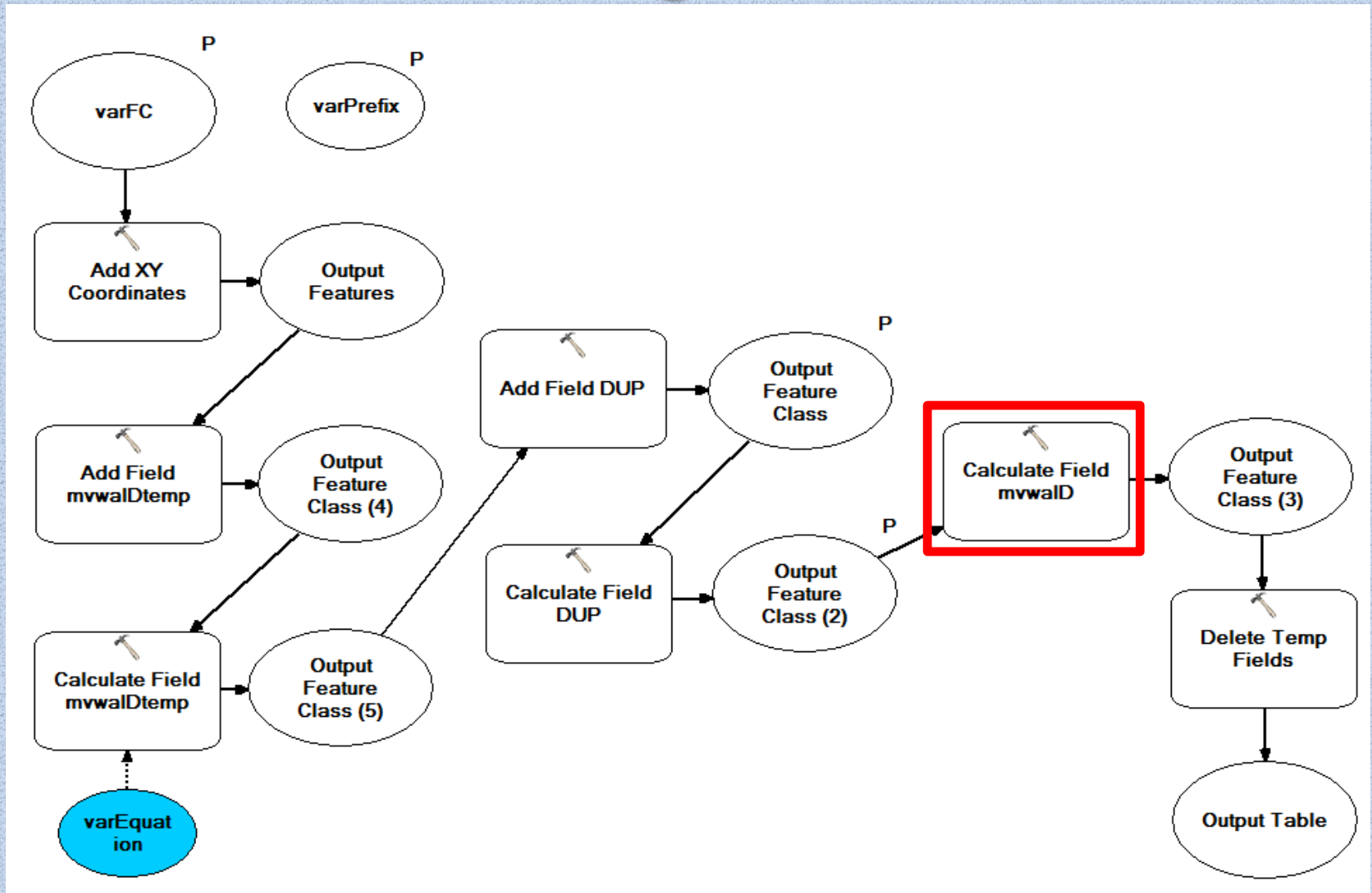


# Find Duplicates

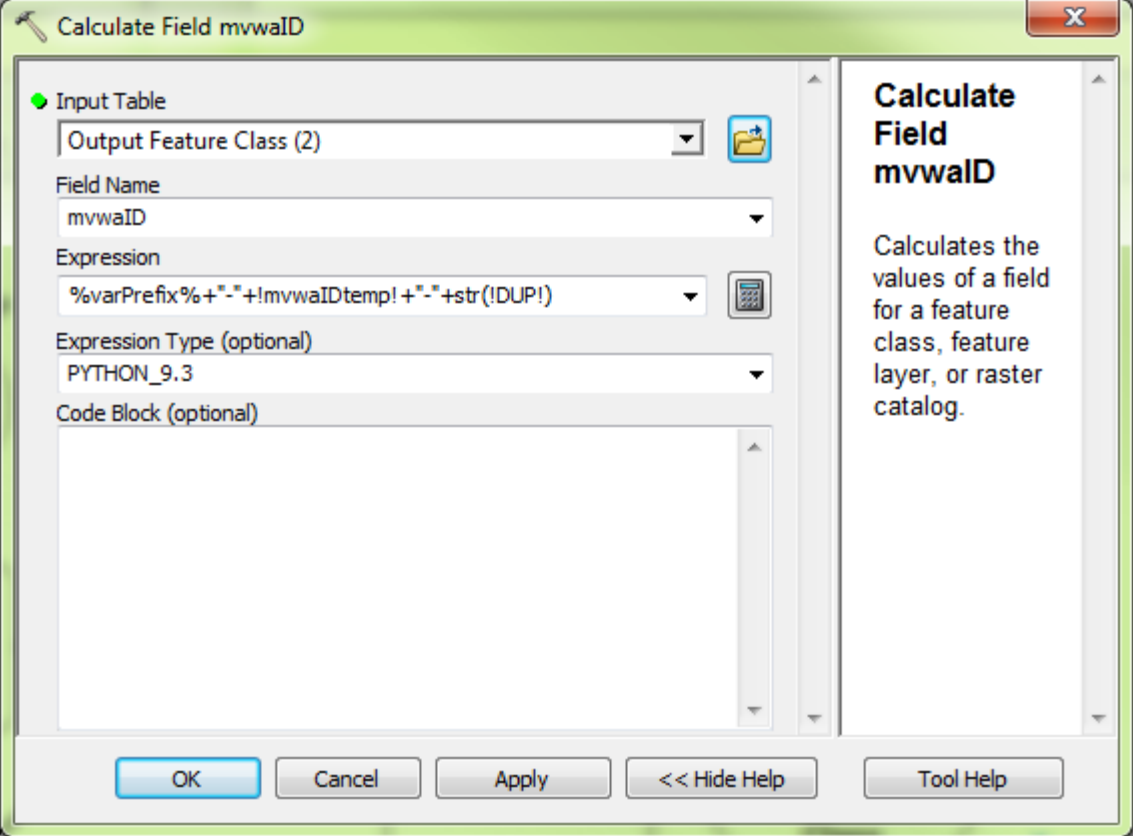
- DUP field is type Short



# Model Builder Diagram



# Create USNG Asset Name



**Calculate Field mvwaID**

Input Table  
Output Feature Class (2)

Field Name  
mvwaID

Expression  
%varPrefix%+"-"+!mvwaIDtemp!+"-"+str(!DUP!)

Expression Type (optional)  
PYTHON\_9.3

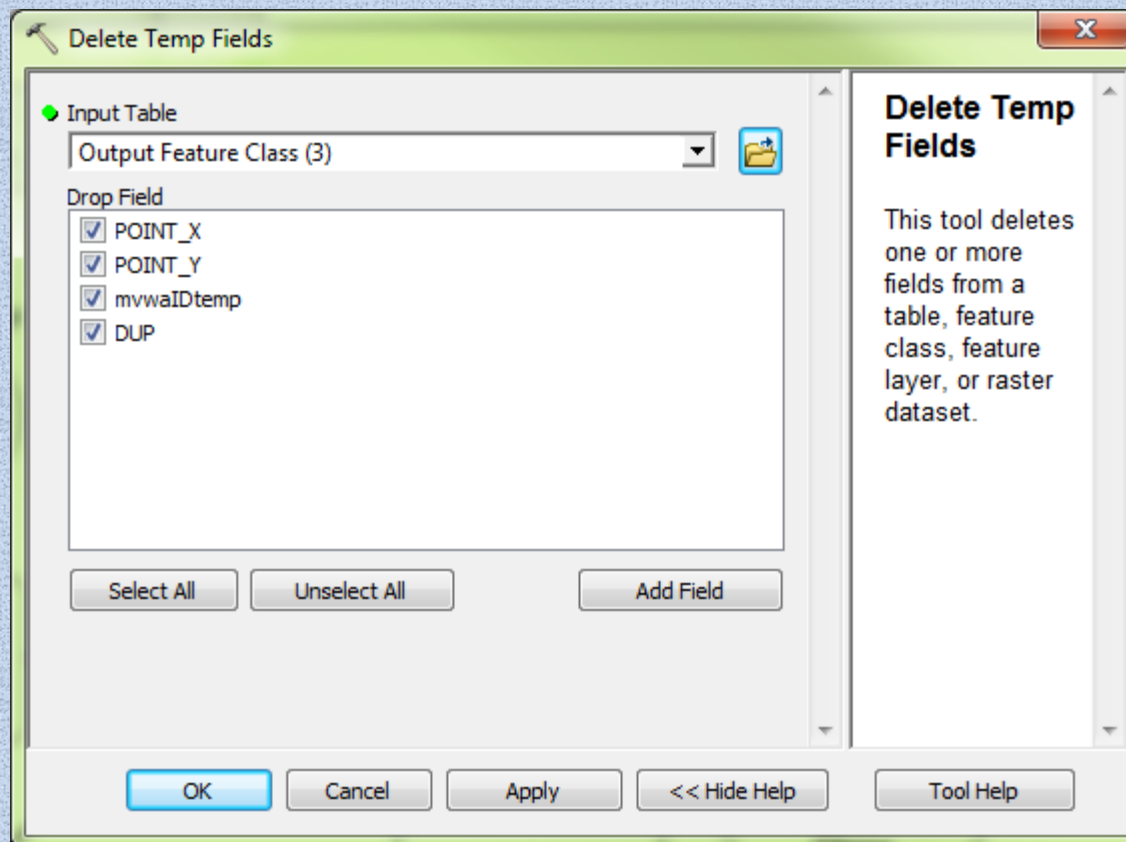
Code Block (optional)

**Calculate Field mvwaID**

Calculates the values of a field for a feature class, feature layer, or raster catalog.

OK Cancel Apply << Hide Help Tool Help

# Clean Up!





# Result

Table

Main Line

OBJECTID *	SHAPE	MVWA ID	Municipality	Install Year	Subtype	Street	Main Diameter	Main Material
8556	Polyline	M-70278-73678-0	Whitestown	2003	Supply Main	Stone Road	12"	Ductile Iron Cement
8557	Polyline	M-70296-73731-0	Whitestown	2003	Supply Main	Westmoreland Road	12"	Ductile Iron Cement
8558	Polyline	M-70281-73729-0	Whitestown	2003	Supply Main	Stone Road	12"	Ductile Iron Cement
9155	Polyline	M-82000-75573-0	Deerfield	2003	Supply Main	Horatio Street	8"	Ductile Iron Cement
9314	Polyline	M-79842-66685-0	New Hartford (T)	2003	Supply Main	Pebble Creek Lane	8"	Ductile Iron Cement
9318	Polyline	M-80033-66624-0	New Hartford (T)	2003	Supply Main	Augusta Drive	8"	Ductile Iron Cement
9468	Polyline	M-80205-66538-0	New Hartford (T)	2003	Supply Main	Augusta Drive	8"	Ductile Iron Cement
11196	Polyline	M-74238-74032-0	Whitestown	2003	Supply Main	Matts Drive	6"	Ductile Iron Cement
11197	Polyline	M-74152-74018-0	Whitestown	2003	Supply Main	George Avenue	6"	Ductile Iron Cement
11198	Polyline	M-74216-73945-0	Whitestown	2003	Supply Main	Bretts Way	6"	Ductile Iron Cement
11199	Polyline	M-74300-73949-0	Whitestown	2003	Supply Main	Bretts Way	8"	Ductile Iron Cement
11200	Polyline	M-74239-73898-0	Whitestown	2003	Supply Main	Bretts Way	8"	Ductile Iron Cement
11291	Polyline	M-77701-76529-0	Marcy	2003	Supply Main	State Highway 49	8"	Ductile Iron Cement
11339	Polyline	M-71729-73171-0	Whitestown	2003	Supply Main	Judd Road Extension	12"	Ductile Iron Cement
11340	Polyline	M-71365-73505-0	Whitestown	2003	Supply Main	Driveway	12"	Ductile Iron Cement
11441	Polyline	M-80230-66460-0	New Hartford (T)	2003	Supply Main	Augusta Drive	8"	Ductile Iron Cement
11442	Polyline	M-80274-66411-0	New Hartford (T)	2003	Supply Main	Kingfisher Lane	8"	Ductile Iron Cement
11556	Polyline	M-77412-79830-0	Marcy	2003	Supply Main	Brian Street	6"	Ductile Iron Cement
11557	Polyline	M-77334-79715-0	Marcy	2003	Supply Main	Corey Court	8"	Ductile Iron Cement
11562	Polyline	M-77500-79668-0	Marcy	2003	Supply Main	Shelley Drive	8"	Ductile Iron Cement
11565	Polyline	M-77092-79545-0	Marcy	2003	Supply Main	Brooks Boulevard	6"	Ductile Iron Cement
11566	Polyline	M-77166-79480-0	Marcy	2003	Supply Main	Shelley Drive	8"	Ductile Iron Cement
11652	Polyline	M-77248-79602-0	Marcy	2003	Supply Main	Corey Court	8"	Ductile Iron Cement
12769	Polyline	M-71184-78298-0	Whitestown	2003	Supply Main	Paradise Lane	8"	Ductile Iron Cement
12788	Polyline	M-71486-78285-0	Whitestown	2003	Supply Main	Cider Street	8"	Ductile Iron Cement
12817	Polyline	M-77161-79484-0	Marcy	2003	Supply Main	Brooks Boulevard	8"	Ductile Iron Cement
12859	Polyline	M-77379-79777-0	Marcy	2003	Supply Main	Shelley Drive	8"	Ductile Iron Cement
12860	Polyline	M-77379-79777-1	Marcy	2003	Supply Main	Shelley Drive	8"	Ductile Iron Cement

0 (0 out of 13481 Selected)

MAP\_SCANS pt\_map\_scan\_singleprpt Main Line temp\_map\_scan\_singleprpt pt\_virtual pt\_virtual\_1

# Future Enhancements

- Incorporate look-up table so that model automatically determines prefix and coordinate length based on feature class
- Incorporate into Attribute Assistant so that USNG ID is automatically generated when features are added



# Questions?



For additional questions, scripts, & updates to this USNG Asset Naming Project, please contact:

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