



IOWA STANDARDIZED MODEL STRUCTURE



Midwest Travel Model Users Group

Spring 2016 Meeting
Wednesday, March 30th, 2016



Project Status

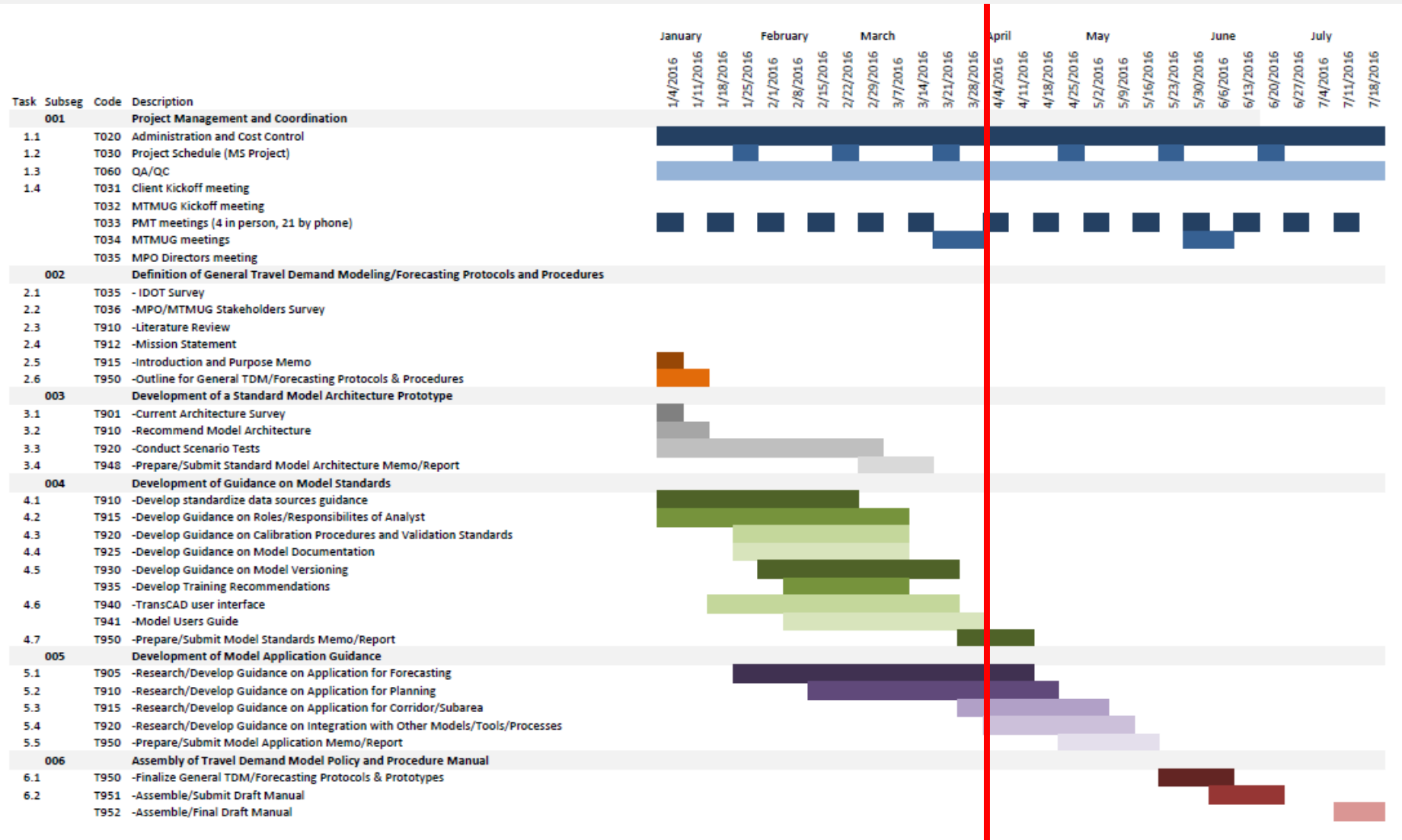
Progress Since November MTMUG Meeting

- Literature Review Report Completed
- MTMUG/DOT Survey Report Completed
- Goals/Objectives Finalized
- Policy and Procedures Document Started
- Data Source Exploration:
 - PUMS, LEHD
- Investigated Incorporation of Reliability
- Iowa MPO Model Inventory
- Tech Memos:
 - Standard Model Architecture
 - Parking Allocation Methodology
 - Transit On-Board Survey Guidance

Progress Since November MTMUG Meeting

- Beta Testing:
 - Ames Model as Testbed
 - Prototype GUI Development/GISDK Scripting
 - Folder/File Organization
 - Standard Model Output Report
 - Investigated NHB Hybrid Model
 - LEHD to Inform Income Segmentation
 - Employment Data QC
 - Parcel-based Trip Generation
 - Intersection Delay
 - Master Network Concept

Updated Project Schedule



Meetings

Client Kickoff:

- ✓ August 17th-18th

MTMUG Meetings:

- ✓ September 2nd 2015
- ✓ Winter 2015 (November 19th 2015)
- ✓ Spring 2016 (March 30th 2016)

MPO Directors' Meeting:

- ✓ December 1st, 2015

Progress Meetings:

- ✓ September 2nd
- ✓ October 2015
- ✓ January 2016
- ☐ April 2016
- ☐ June 2016

Bi-Weekly Project Management Team Meetings (Conference/Web Calls)

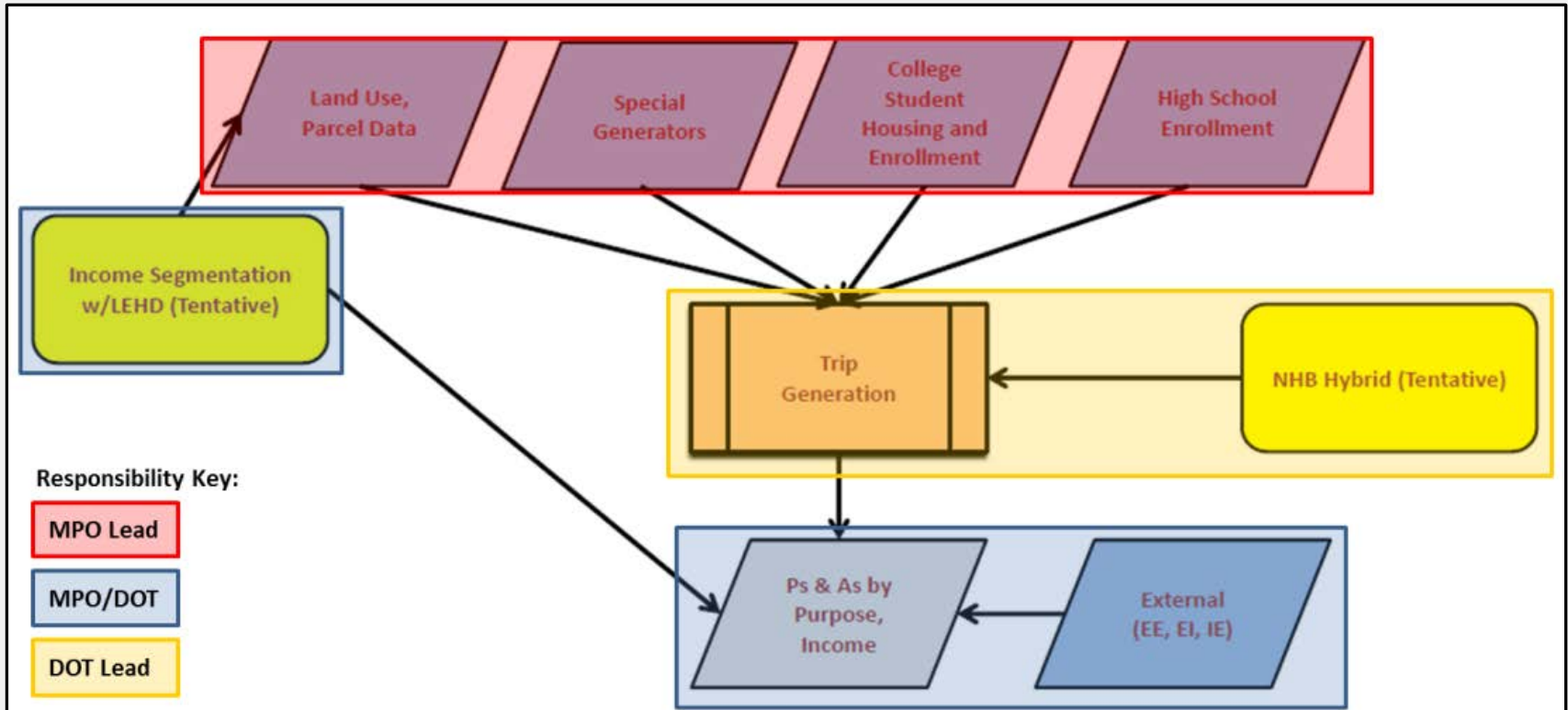
Inventory of Iowa MPO Models

Inventory List

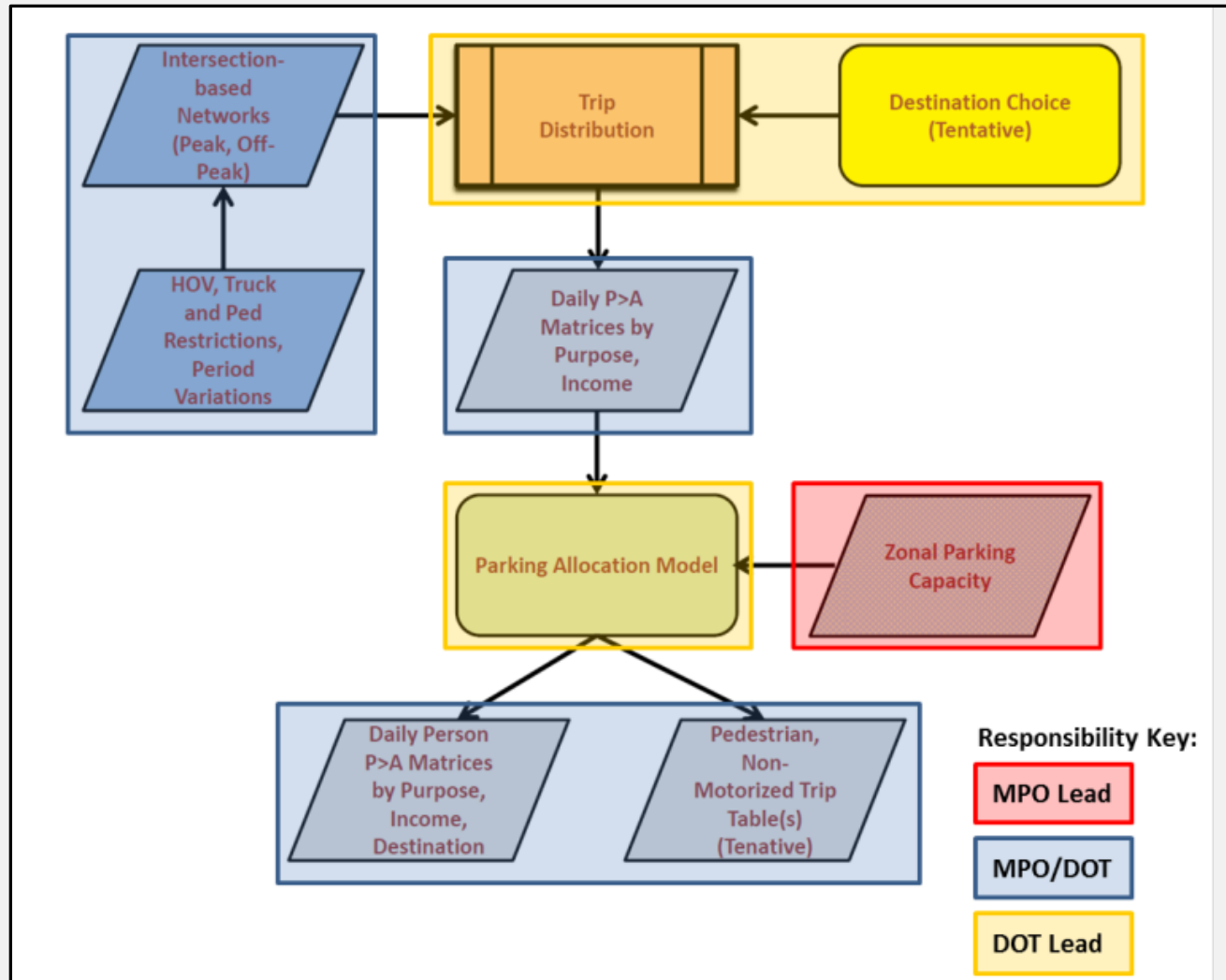
- Trip Purposes
- Trip Generation Methods
- Trip Generation Rates
- Representation of External Trip Making
- Special Generators
- Trip Balancing
- Trip Distribution Methods (Single, Doubly-Constrained Gravity)
- Trip Distribution Parameters (Friction, K-Factors)
- Basic Takeaway: Not Much Standardization Across MPO Models

Review of Recommended Model Architecture

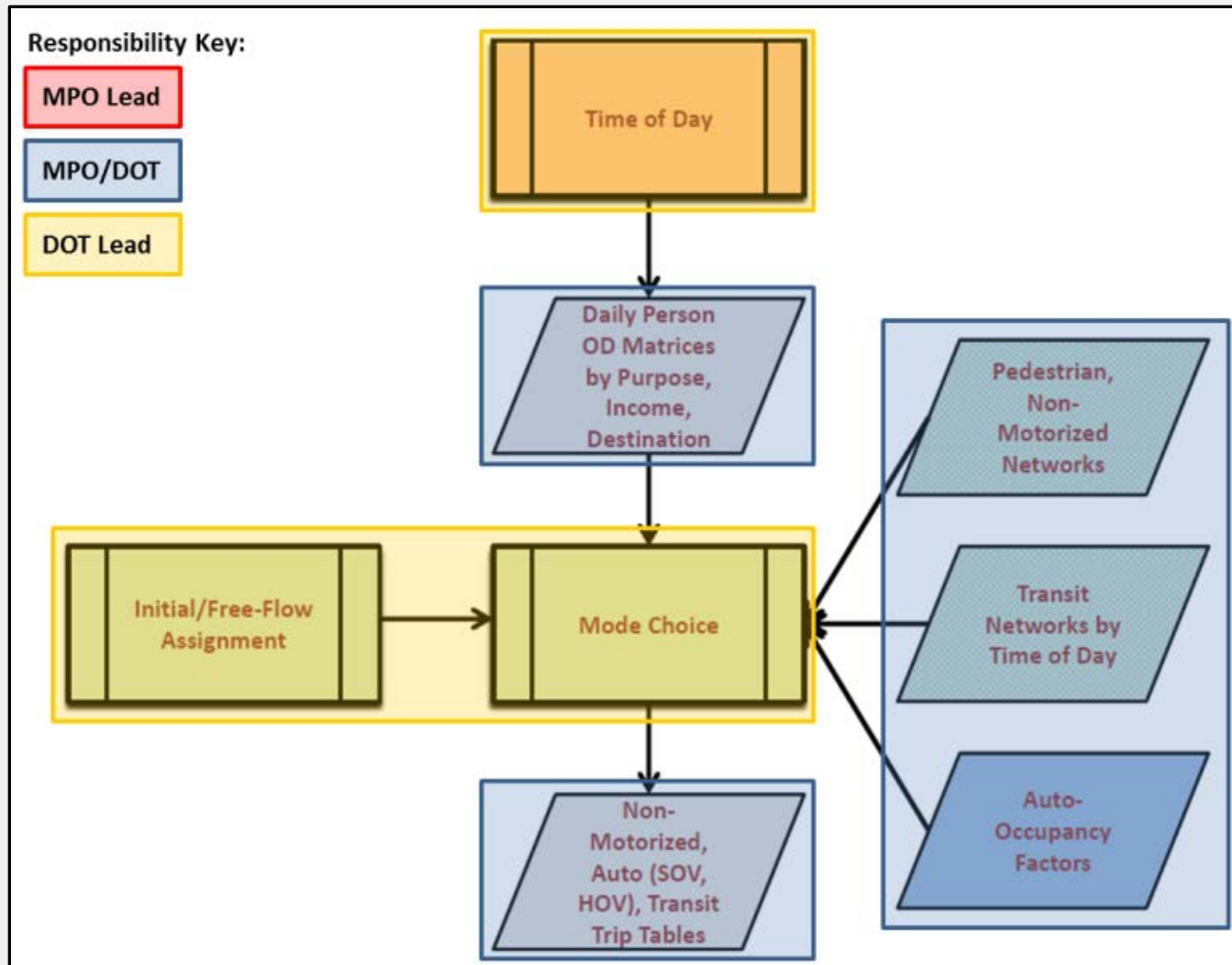
Trip Generation



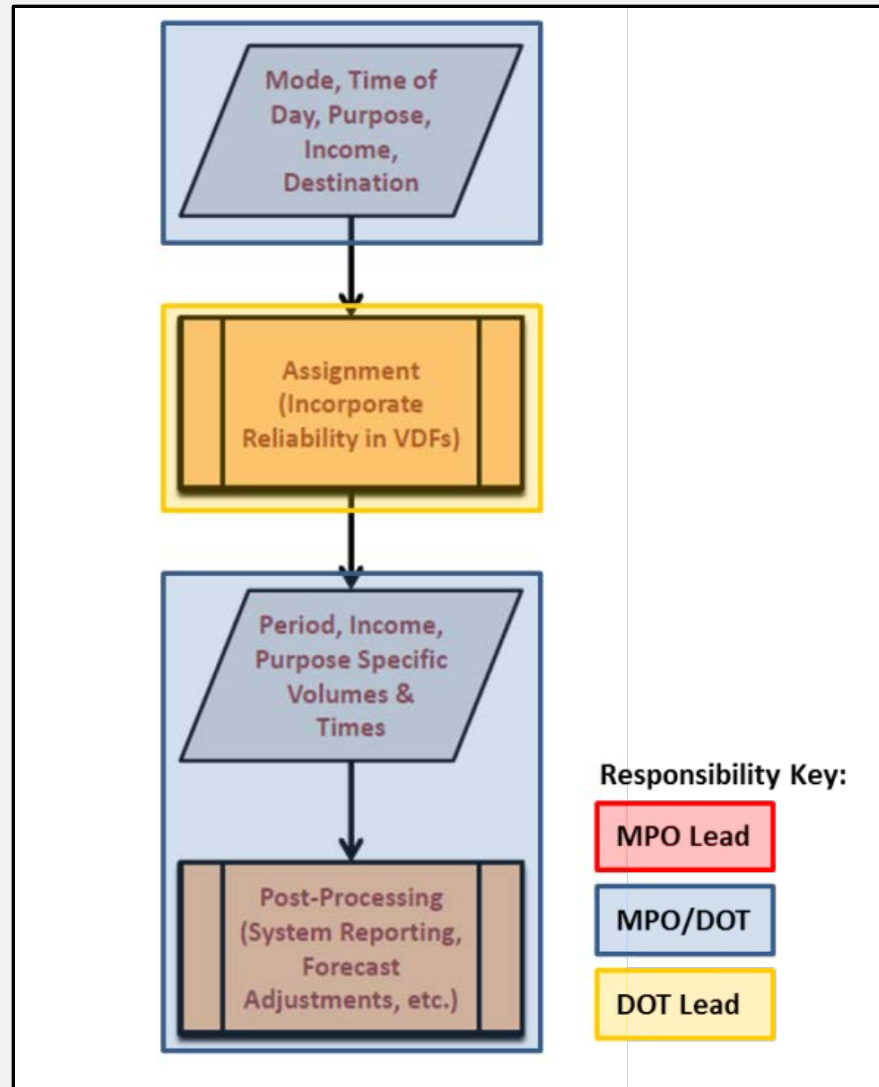
Trip Distribution



Mode Choice



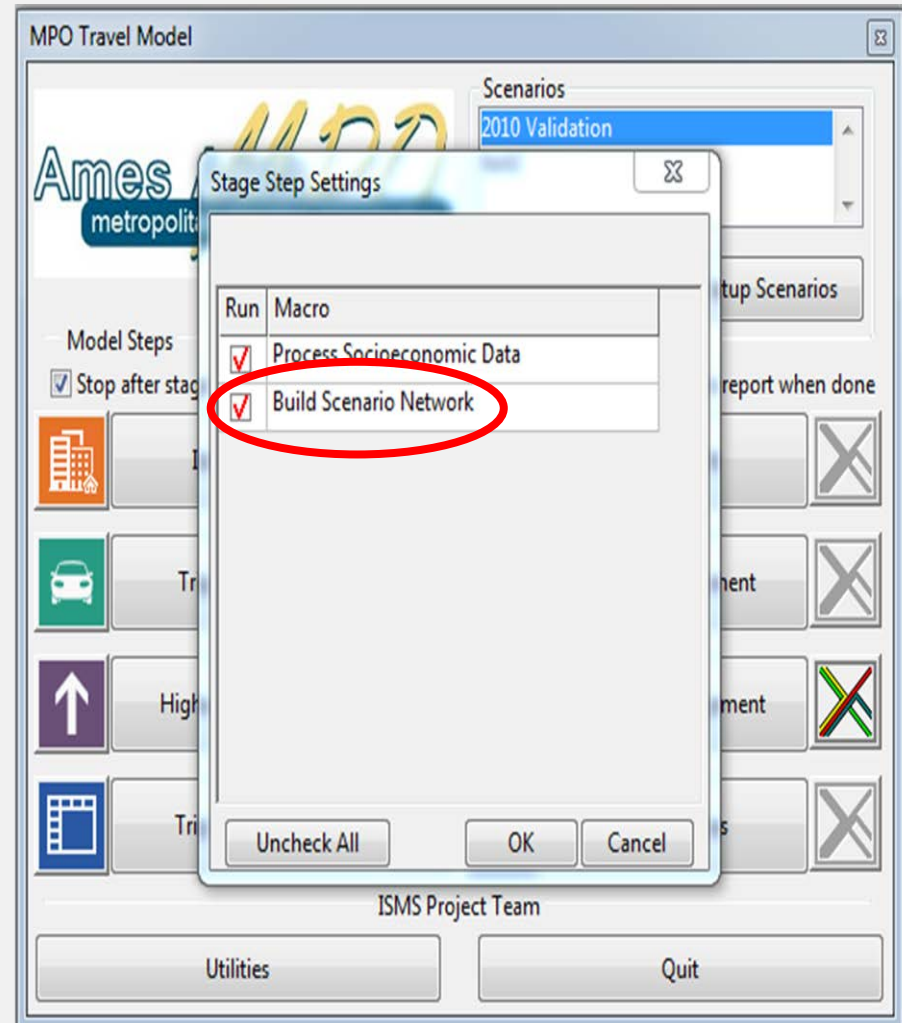
Assignment



Master Network Approach

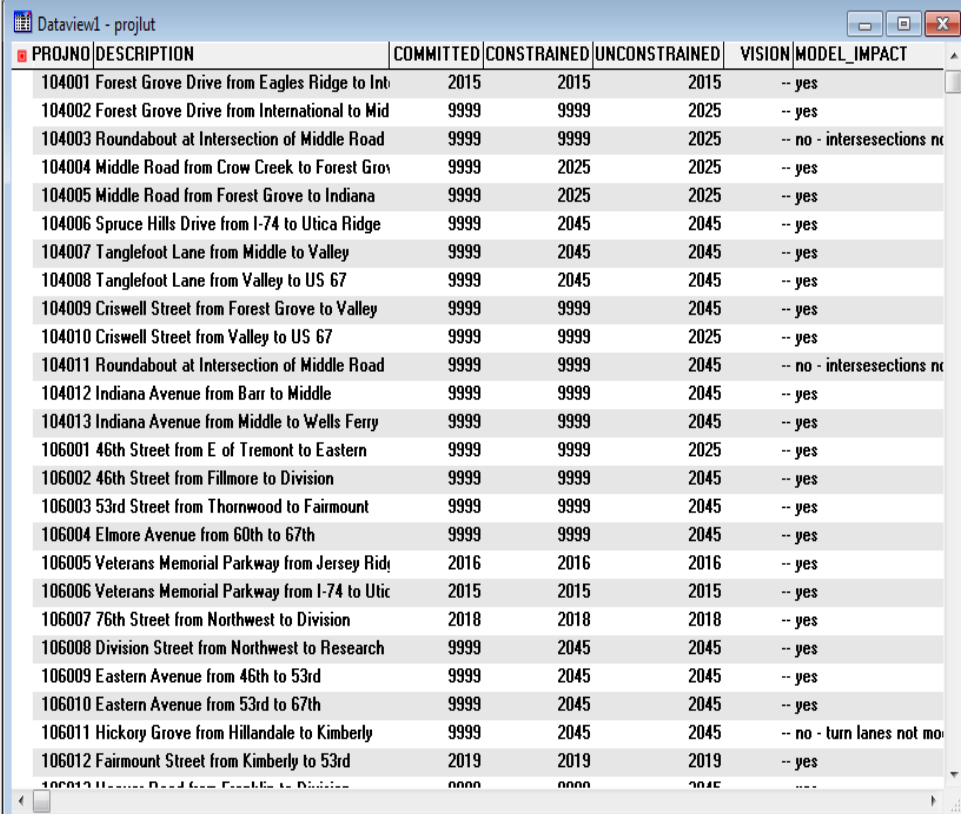
Master Network Approach

- One master network for all scenarios
- Only two sets of attributes are needed to represent almost all network improvements rather than separate sets of attributes for each scenario and/or analysis year.
- Macro reads the master network and outputs a scenario network
- Part of the initialization stage



Master Network Approach

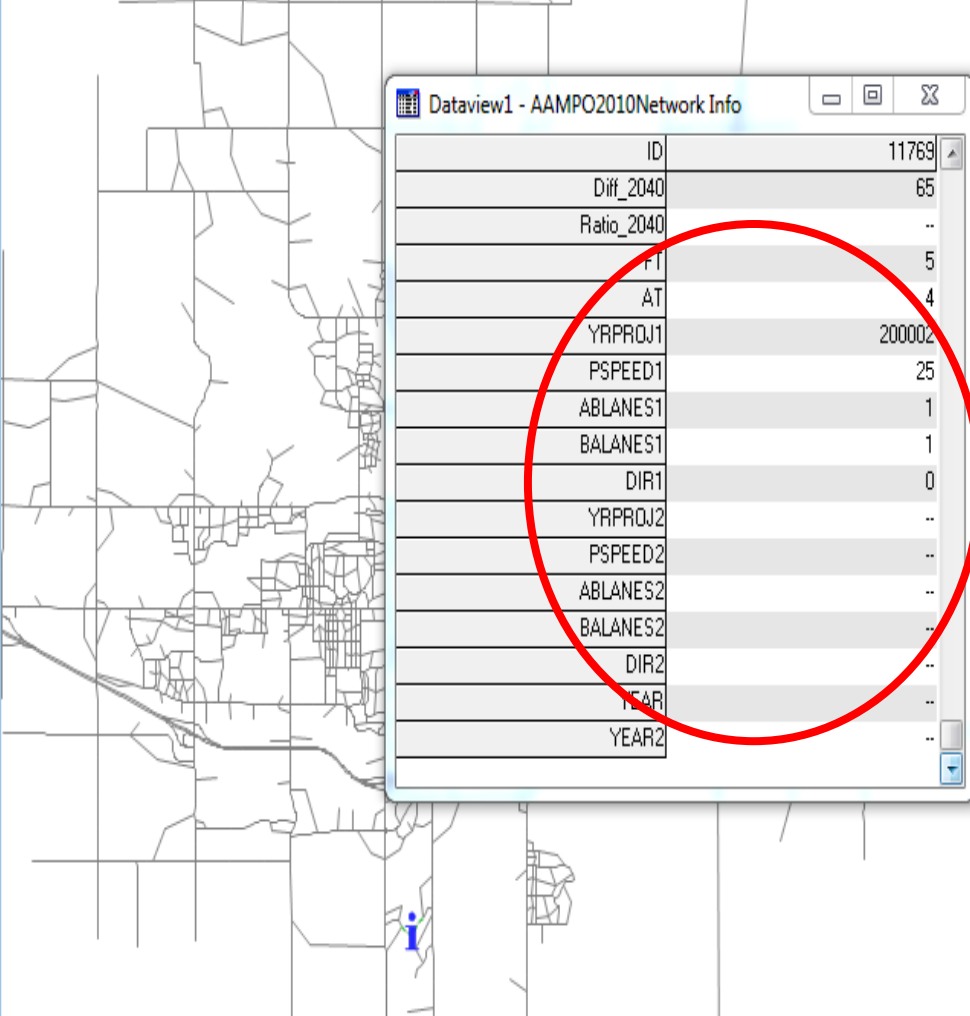
- Project Database is a table with description of the projects
- It includes a Project Number, description of the project, Road Network or Funding scenario year
- Macro joins this project database to the master network based on the "PROJNO" values



PROJNO	DESCRIPTION	COMMITTED	CONSTRAINED	UNCONSTRAINED	VISION	MODEL_IMPACT
104001	Forest Grove Drive from Eagles Ridge to Int	2015	2015	2015	--	yes
104002	Forest Grove Drive from International to Mid	9999	9999	2025	--	yes
104003	Roundabout at Intersection of Middle Road	9999	9999	2025	--	no - intersecections nc
104004	Middle Road from Crow Creek to Forest Grov	9999	2025	2025	--	yes
104005	Middle Road from Forest Grove to Indiana	9999	2025	2025	--	yes
104006	Spruce Hills Drive from I-74 to Utica Ridge	9999	2045	2045	--	yes
104007	Tanglefoot Lane from Middle to Valley	9999	2045	2045	--	yes
104008	Tanglefoot Lane from Valley to US 67	9999	2045	2045	--	yes
104009	Criswell Street from Forest Grove to Valley	9999	9999	2045	--	yes
104010	Criswell Street from Valley to US 67	9999	9999	2025	--	yes
104011	Roundabout at Intersection of Middle Road	9999	9999	2045	--	no - intersecections nc
104012	Indiana Avenue from Barr to Middle	9999	9999	2045	--	yes
104013	Indiana Avenue from Middle to Wells Ferry	9999	9999	2045	--	yes
106001	46th Street from E of Tremont to Eastern	9999	9999	2025	--	yes
106002	46th Street from Fillmore to Division	9999	9999	2045	--	yes
106003	53rd Street from Thornwood to Fairmount	9999	9999	2045	--	yes
106004	Elmore Avenue from 60th to 67th	9999	9999	2045	--	yes
106005	Veterans Memorial Parkway from Jersey Ridg	2016	2016	2016	--	yes
106006	Veterans Memorial Parkway from I-74 to Utic	2015	2015	2015	--	yes
106007	76th Street from Northwest to Division	2018	2018	2018	--	yes
106008	Division Street from Northwest to Research	9999	2045	2045	--	yes
106009	Eastern Avenue from 46th to 53rd	9999	2045	2045	--	yes
106010	Eastern Avenue from 53rd to 67th	9999	2045	2045	--	yes
106011	Hickory Grove from Hillandale to Kimberly	9999	2045	2045	--	no - turn lanes not mo
106012	Fairmount Street from Kimberly to 53rd	2019	2019	2019	--	yes
106013	Harvey Road from Forest Grove to Division	9999	9999	2045	--	yes

Master Network Approach

- Projects are coded in the Master Network DBD
- Fields ending in 1 describe opening year conditions and the YRPROJ1 field is where the opening year or project number is coded.
- Fields ending in 2 are where upgrades (if any) are coded and the YRPROJ2 field is where the upgrade year or project number is coded.
- DIR1/DIR2 fields indicate One-way/Two-way changes
- Negative PSPEED2 is used to identify links being removed
- Recommend tying the Project ID with LRTP, STIP or other documentation of project

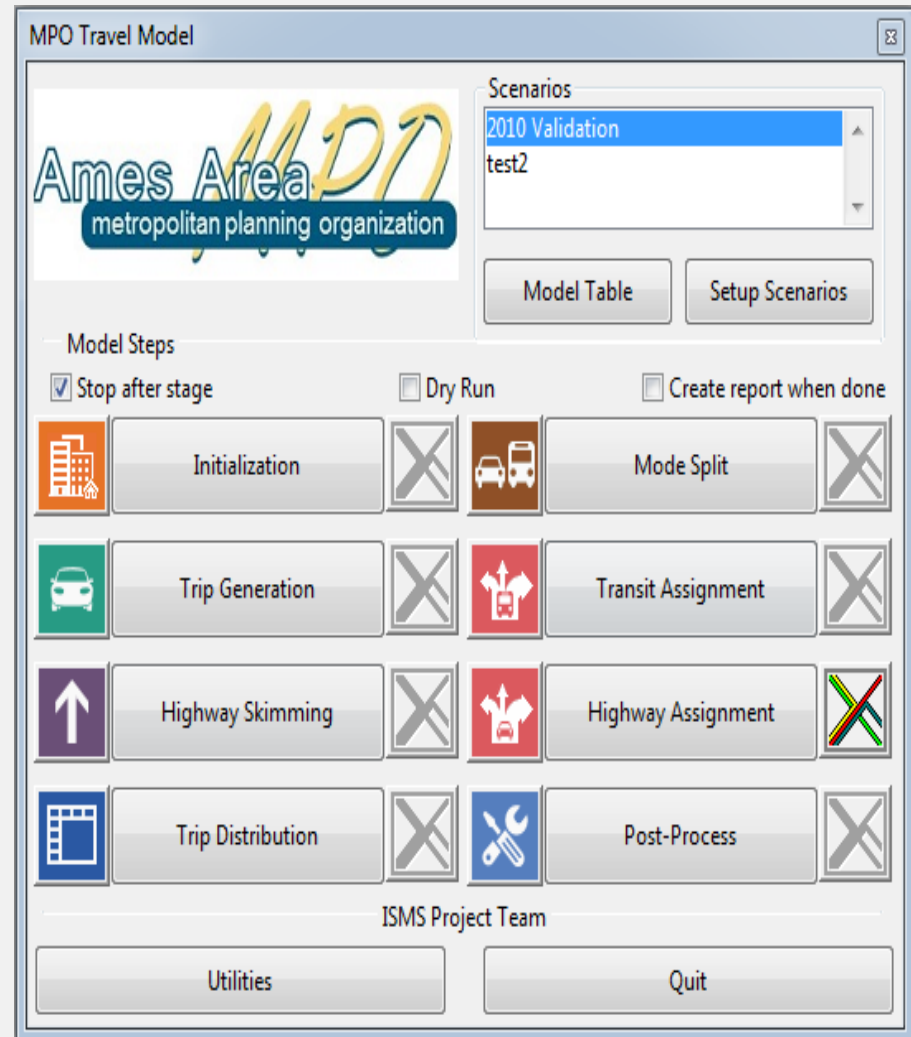


ID	11769
Diff_2040	65
Ratio_2040	--
FT1	5
AT	4
YRPROJ1	200002
PSPEED1	25
ABLANES1	1
BALANES1	1
DIR1	0
YRPROJ2	--
PSPEED2	--
ABLANES2	--
BALANES2	--
DIR2	--
YEAR1	--
YEAR2	--

User Interface

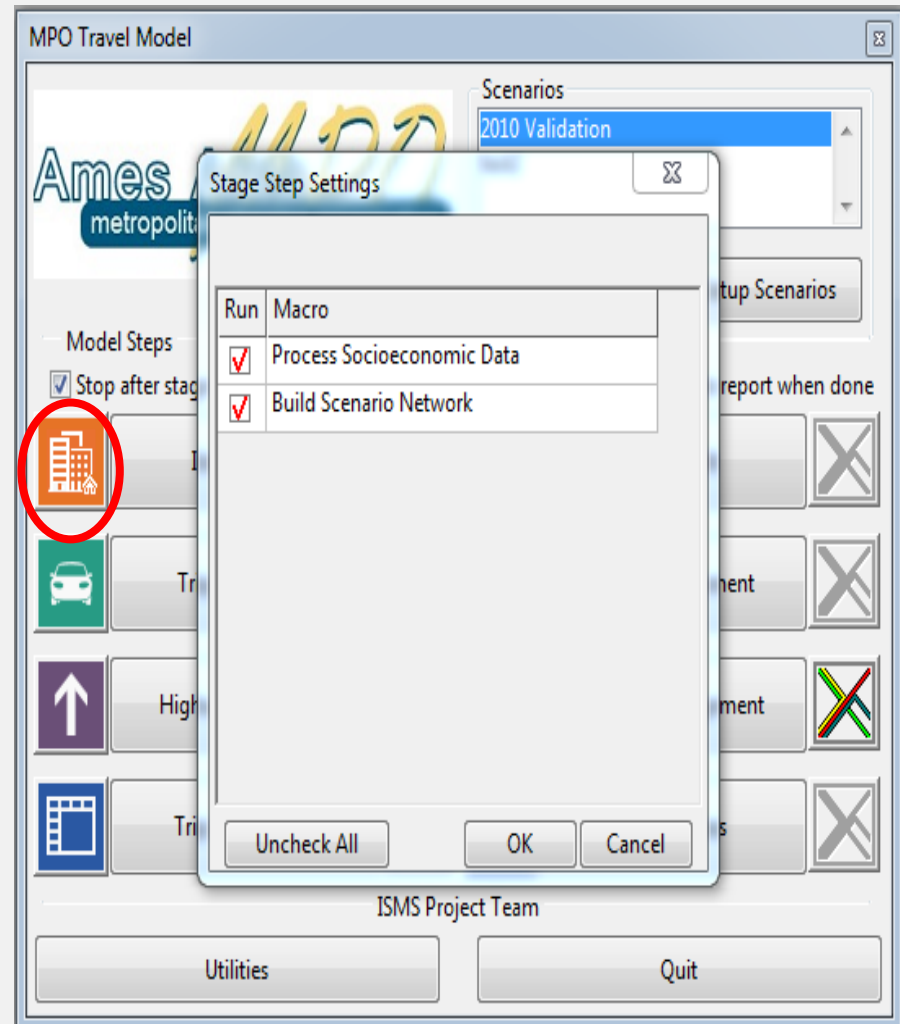
Proposed Main Interface

- Push-button architecture
- Compatible with TransCAD version 7
- Capability to execute the model in step or complete execution
- Added capability to enable/disable individual macros within each step
- Multiple scenarios can be selected and executed



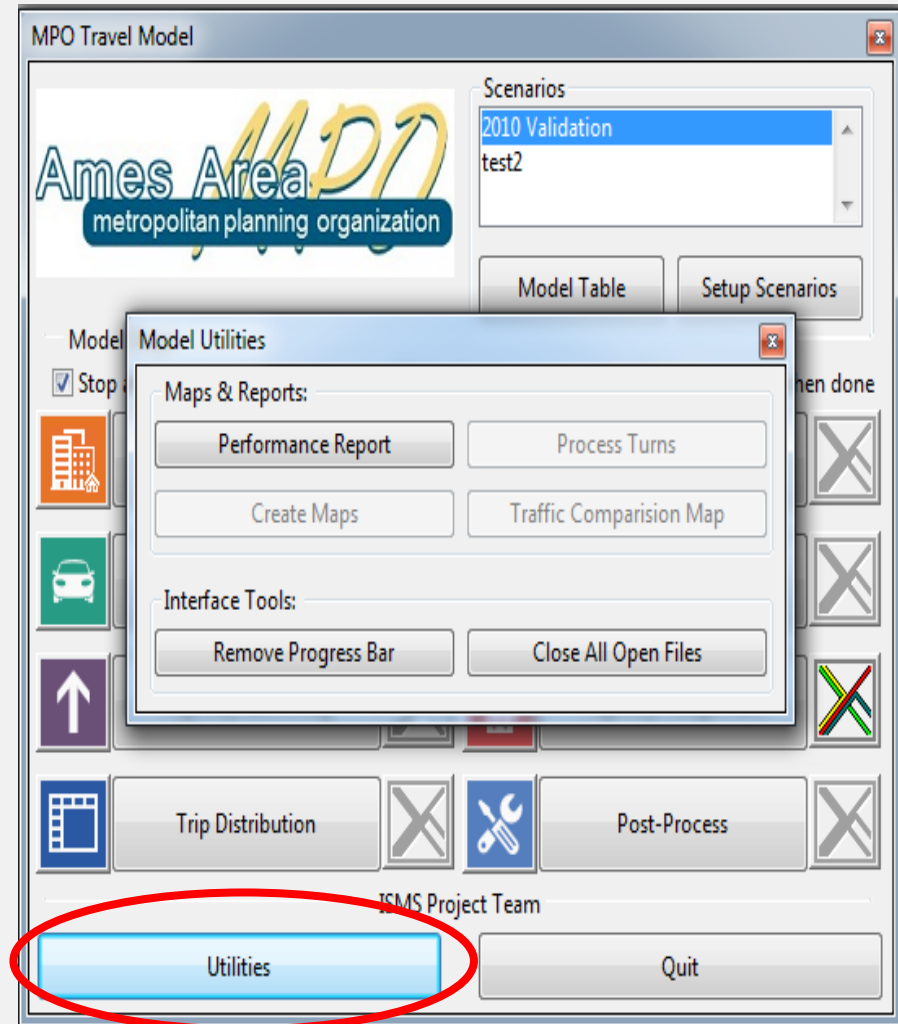
Proposed Main Interface

- Added capability to run individual macros



Proposed Main Interface

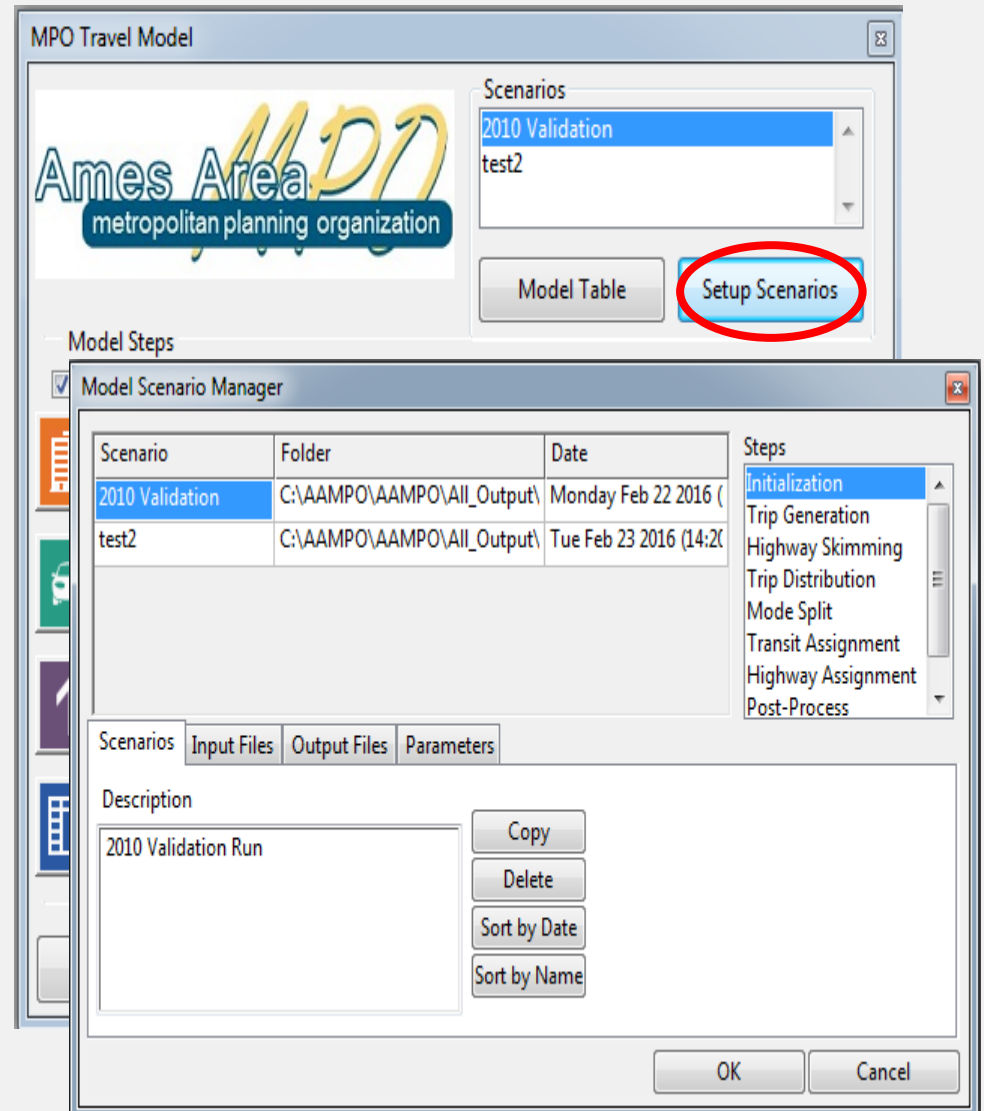
- Added Utilities button
- Performance report in HTML format (under development)
- Create Maps button to create model performance maps
- Comparison maps to compare two scenarios (volumes)
- Remove progress bar button to model progress bar if it's frozen
- Close all open files running in background from a model run



Scenario Management

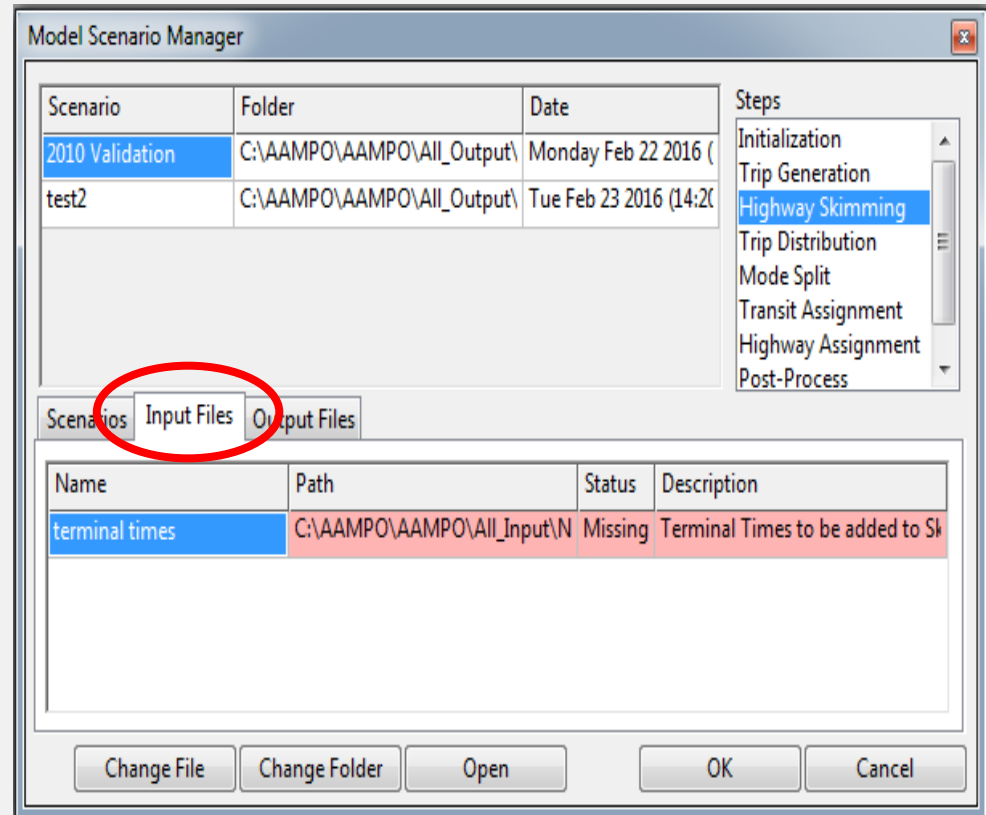
Model Scenario Manager

- Setup Scenario button opens the scenario manager dialogue box
- Multiple scenarios can be added here
- Each model step can have up to 3 tabs (Input Files, Output Files and Parameters)



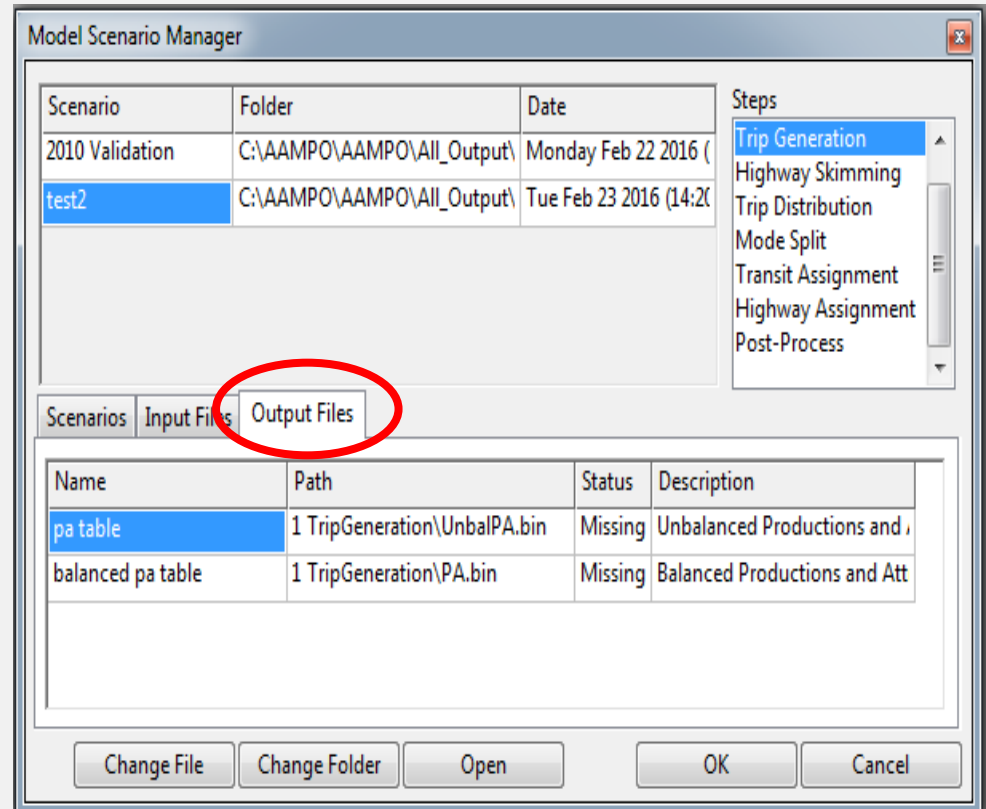
Model Scenario Manager

- Input Files shows the name and path of the files that are required for a model run
- Any missing file is highlighted by red color
- TransCAD shows a warning dialogue box before model execution and lists the missing files
- The description provides the detail about the file



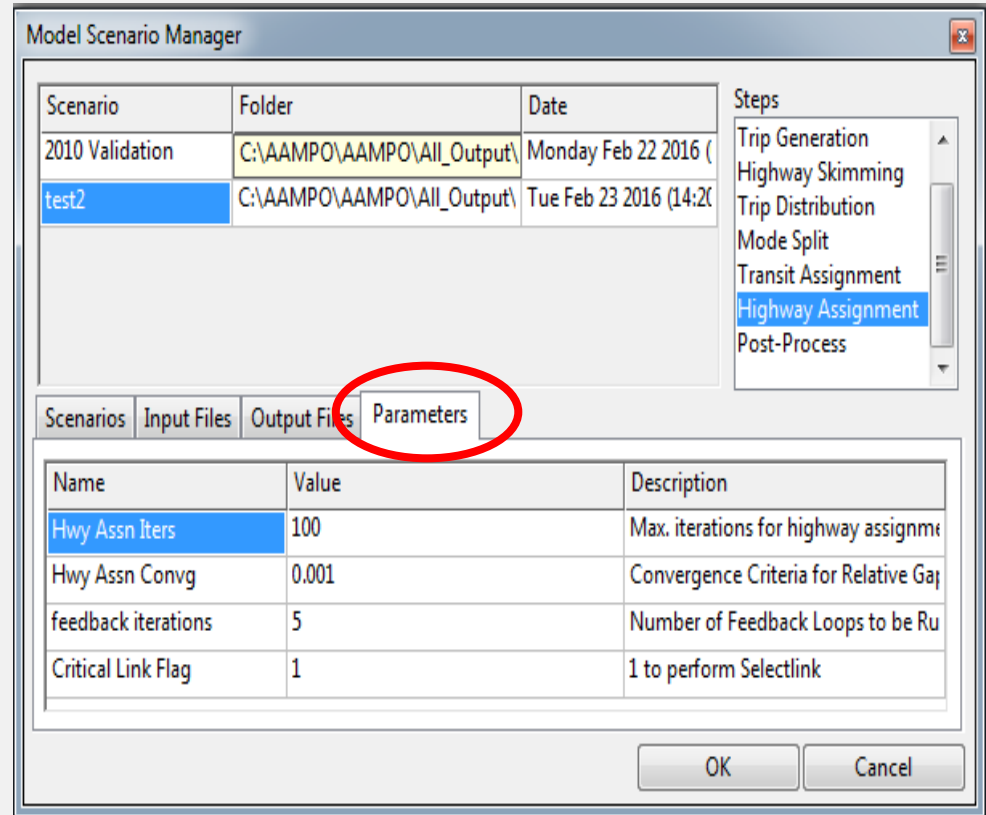
Model Scenario Manager

- Output Files shows the name and path of the output files
- TransCAD shows a warning dialogue box before model execution and lists the missing files
- The description provides the detail about the file



Model Scenario Manager

- Parameters lists the name and value of the parameters required by a model run
- The description provides the detail about the parameters
- More parameters can be added as needed for any model step

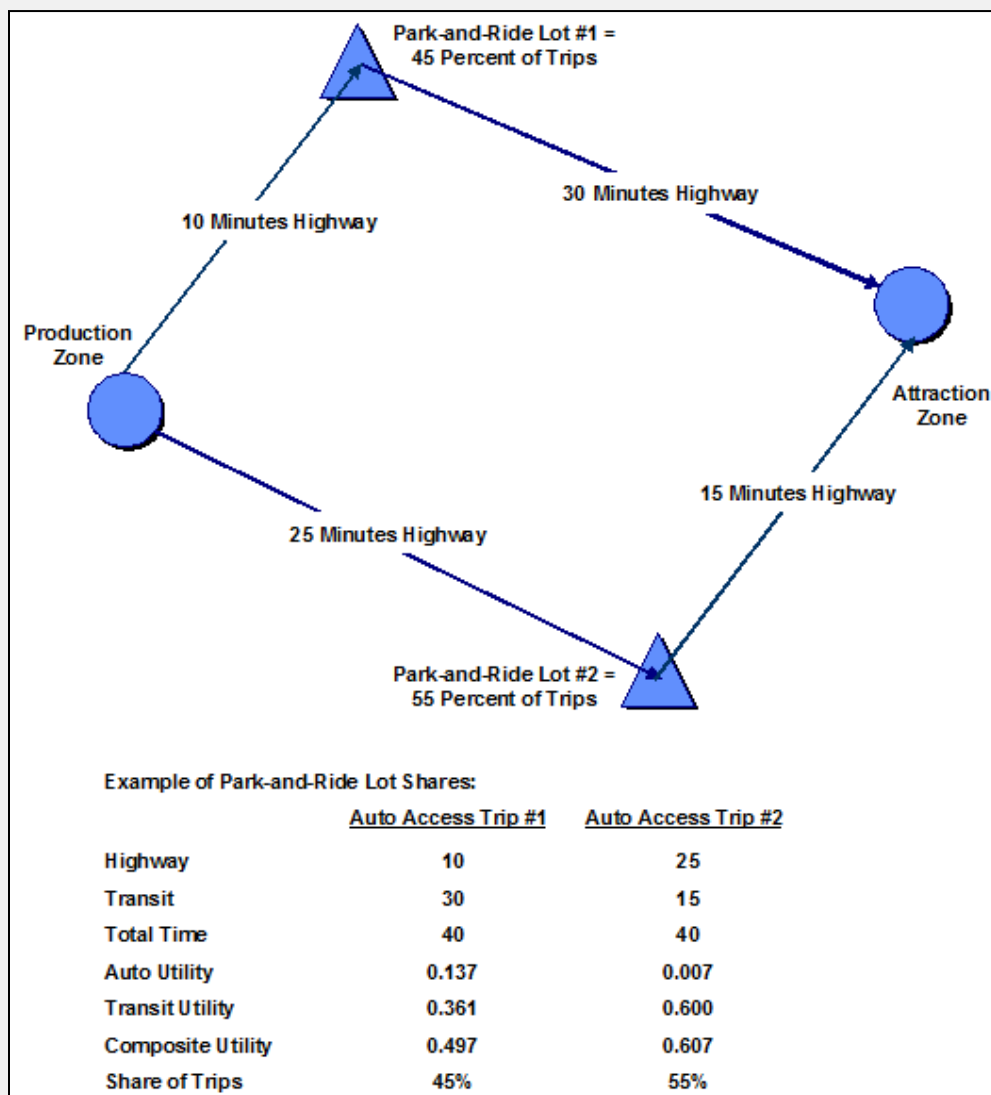


Folder and File Structure

Folder/File Structure Under Discussion

- Under the “Model” Folder...
 - Inputs Folder for Global Parameters, Network, TAZ, etc that Applies to All Years
 - Alternative or Scenario Specific Folders Containing Edited Input Files for the Alternative/Scenario Along with Outputs and Reports
- Other Considerations...
 - Easier Troubleshooting, Debugging
 - Storage, Archiving Model Runs

Parking Allocation Model



Transit On-Board Surveys

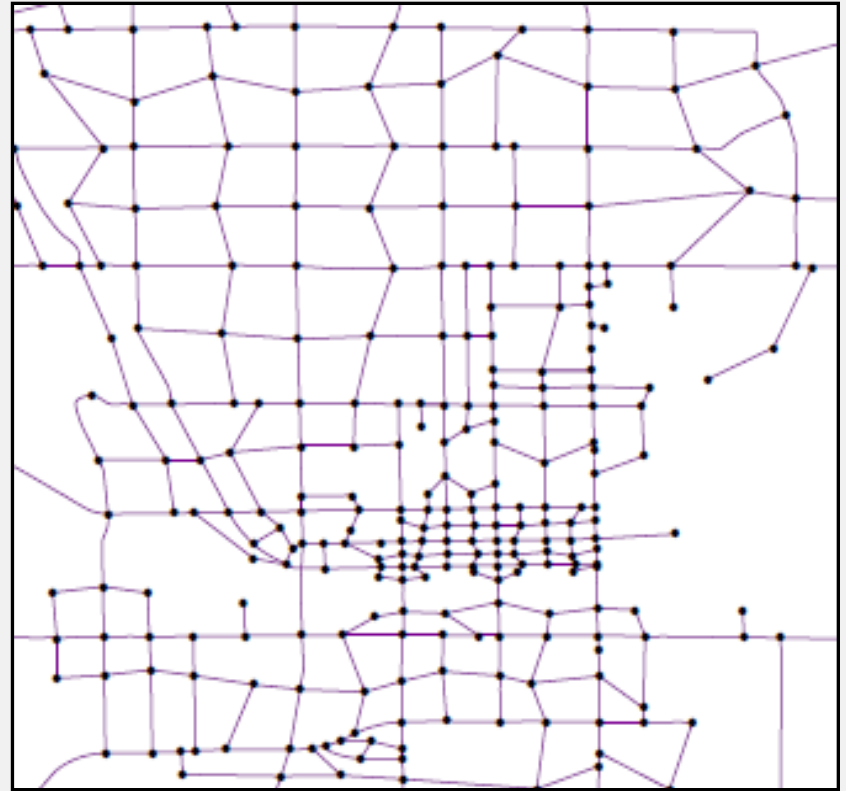
- MPOJC Asked for Guidance on Conducting an In-House Transit On-Board Survey
- Key Elements of Guidance Include:
 - Basic Questions
 - Survey Timing
 - Issues with Surveying Transit Riders
 - Survey Response Collection Methods
 - Paper vs Tablet (Advantages/Disadvantages)
 - Weighting and Expanding Survey Results
 - Sampling Plan

Intersection Delay

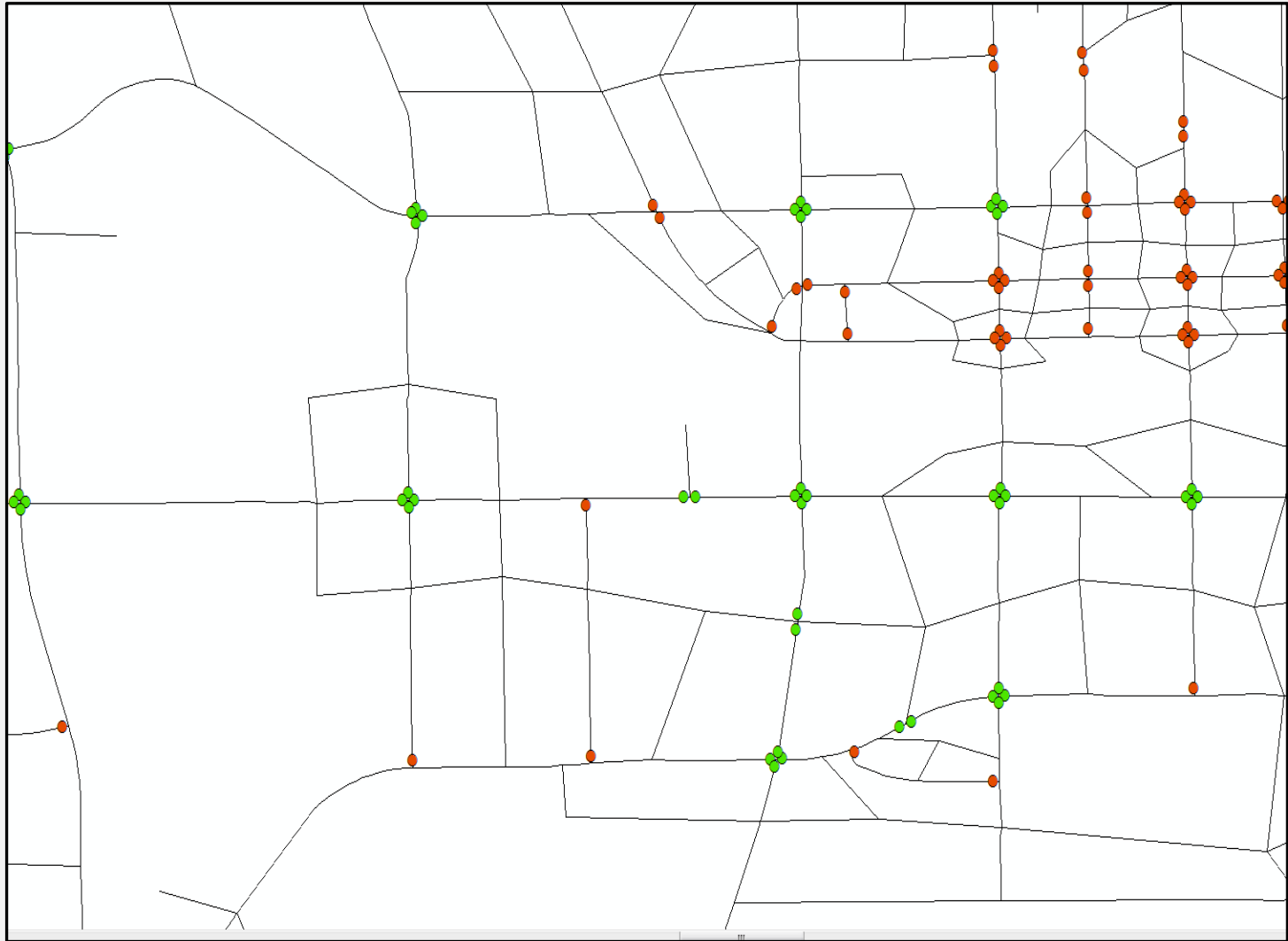
Objectives

- Improve Model Representation of Arterial Capacity and Intersection Delay
- Evaluate Alternative Options Available in TransCAD
- Use Ames Testbed to Develop Parameters and Evaluate Results

Remove Nodes



Code Intersection Approaches



TransCAD Signal Delay Function

$$d_i(v) = \frac{(C - g)^2}{2C \left(1 - \frac{v}{s}\right)} + K_1 \left(\frac{v}{\left(\frac{g}{C}\right)s} \right)^{K_2} + K_3$$

Where:

$d_i(v)$ =

v =

s =

g =

C =

K_1, K_2, K_3 =

Average delay at intersection, in seconds.

Traffic volume on entering link, in vehicles (passenger car equivalents) per hour.

Exiting rate of traffic volume at saturation flow stage, in vehicles (passenger car equivalents) per hour.

Total green time of the approach phase, in seconds.

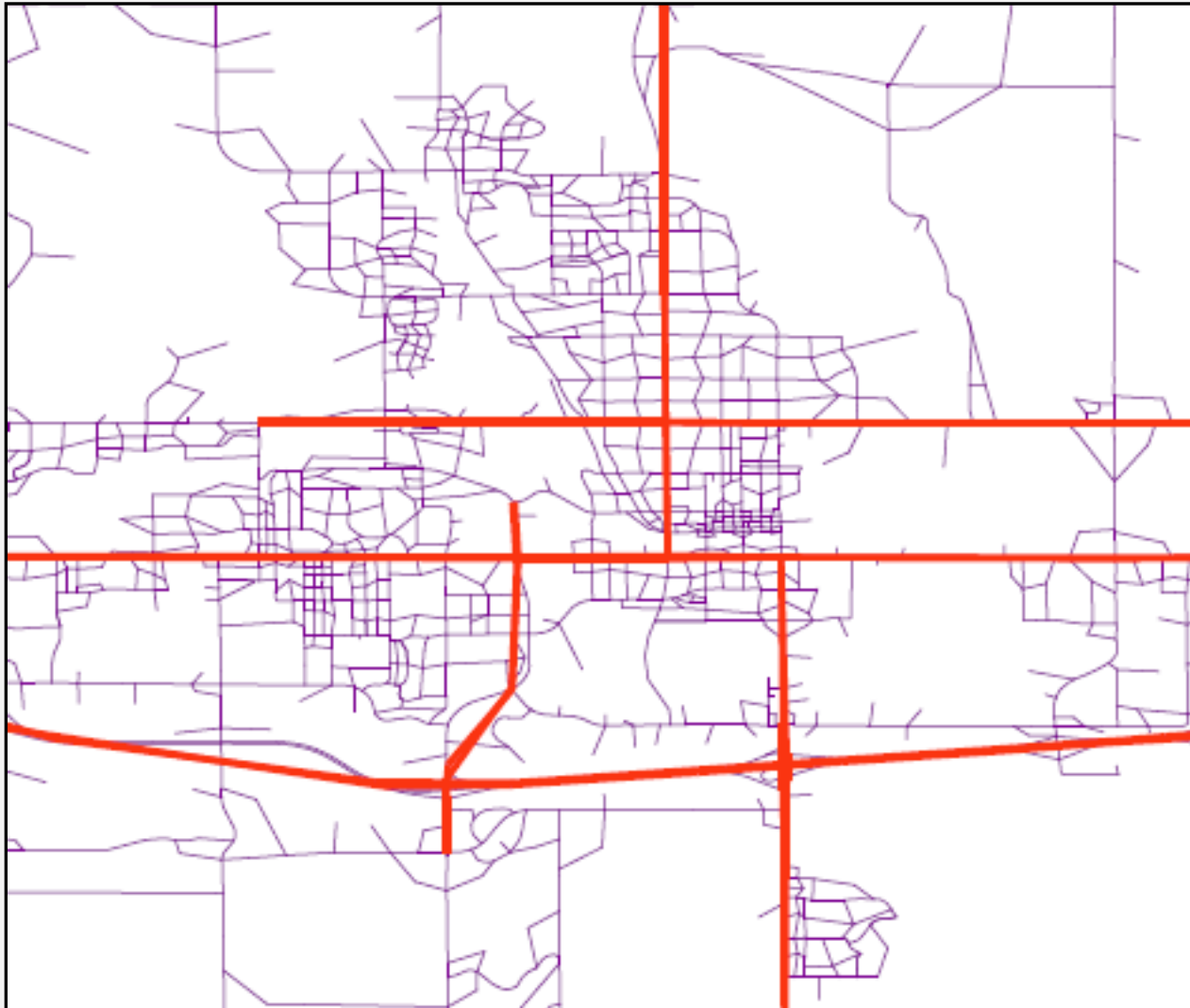
Cycle length of the traffic signal, in seconds.

Parameters, defaulting to 43, 4, and 3, respectively.

Incorporate Intersection Attributes

- Cycle Length
- Intersection Approach Saturation Flow Rate
- Intersection Approach Green Time
- Free-Flow Intersection Delay Time
- Turn penalties (?)

Evaluate Results



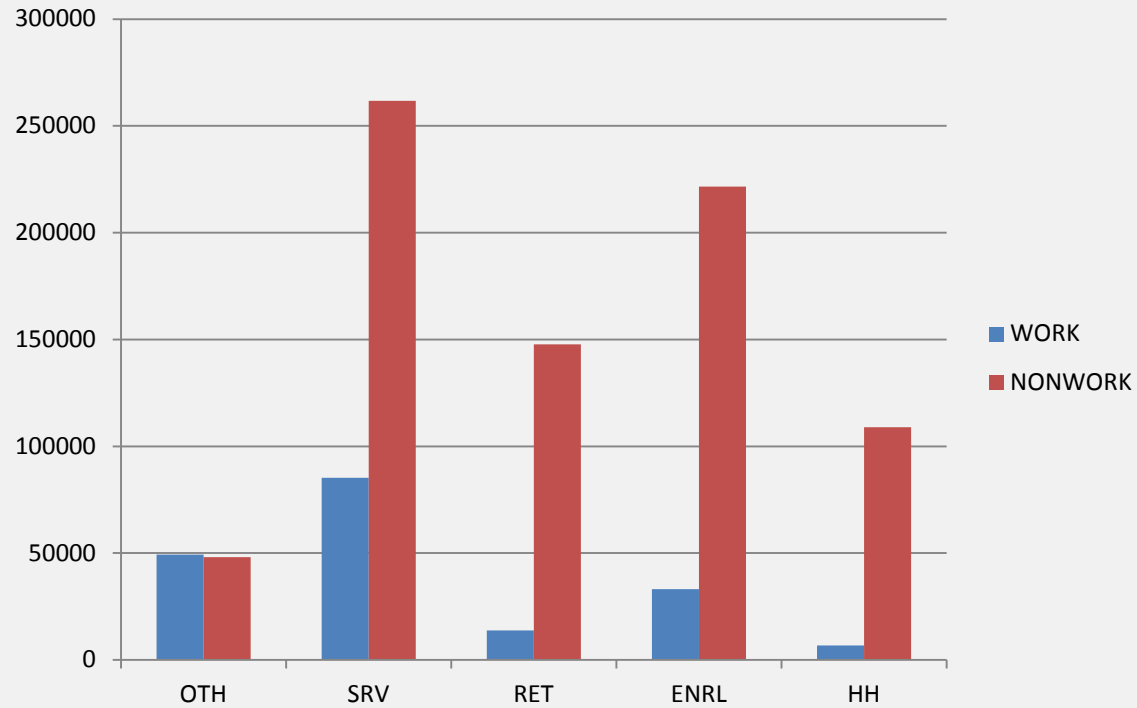
Travel Time Validation Data

- DOT Conducted Floating Travel Time Study for Duff Corridor in Ames
- INRIX Data Processed for Ames Case Study
- Synchro Model Being Developed to Evaluate Sensitivity of Congestion to Travel Time
- Goal is to Develop Parameters to Represent Delay at Intersections Based on Congestion Levels

Questions?

Improving Employment and Trip Attraction Estimates

Person Trip Attractions



Common Model Accuracy Issues

- Overall Travel is Underestimated
- Proportion of Travel on Freeways/Expressways is Overestimated
- Volumes on Streets in Commercial Areas are Underestimated
- Intra-zonal Percentages are Overestimated
- Model Accuracy on Arterials is Less than Desired

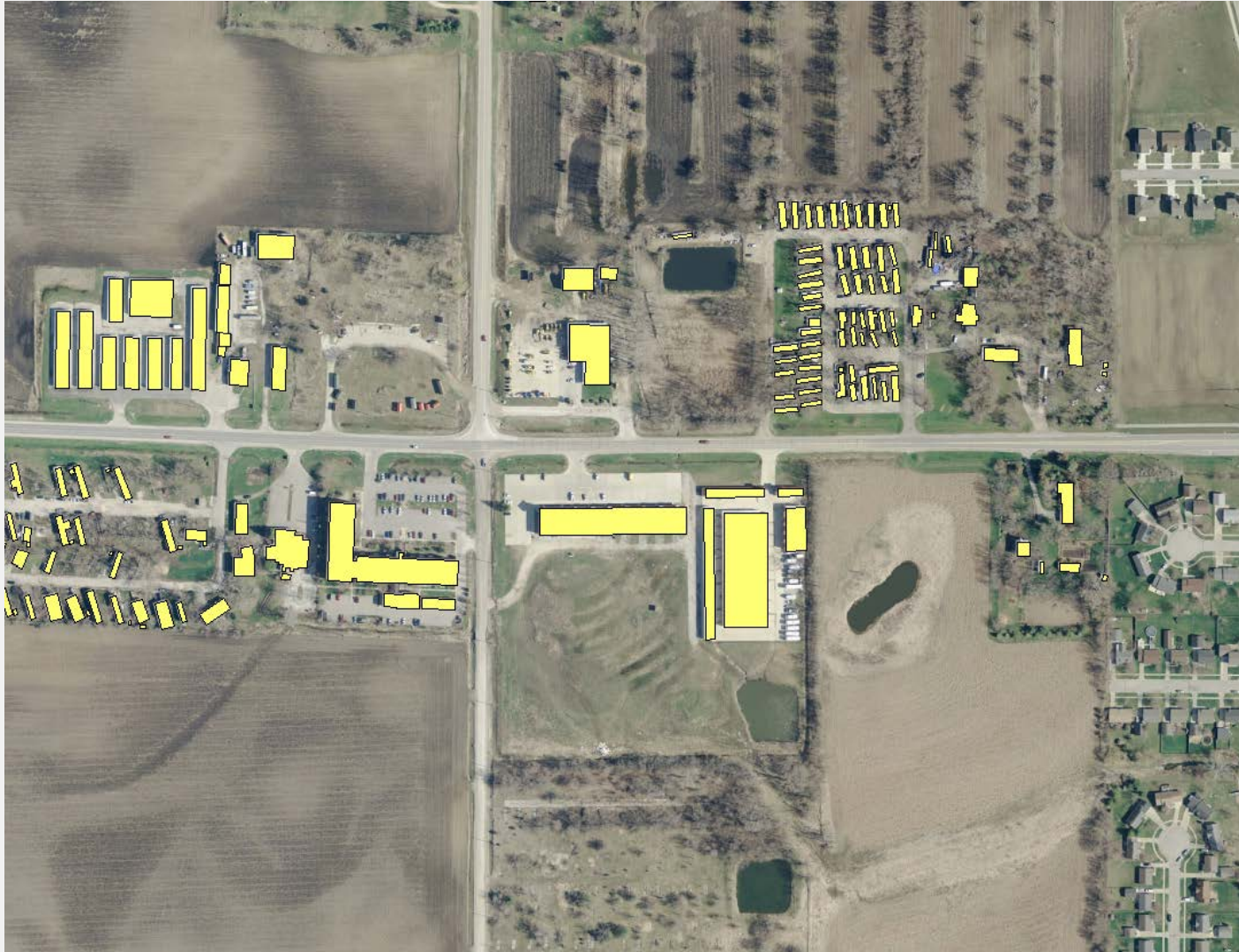
Project Objectives

- Evaluate Alternative Sources for Employment Data
- Recommend Standardized Procedures for Editing and Assembling Data
- Recommend Standardized Procedures for Maintaining and Updating Data Over Time

Employment Data Sources

- Infogroup
 - Commercial Vendor that Collects Employment Data at the Site Level through Phone Contacts
- Iowa Workforce Development (IWD)/ES-202
 - State Agency Processes Unemployment Insurance Forms to Obtain Site Level Employment
- Parcel/Property Tax Assessor Records
 - Local Tax Assessor Agencies Collect Commercial Building Area

Other Resources



Ames Comparison of Sources

	INFO	IWD	Parcel
Locational Accuracy			
Employment Accuracy			
Use Characterization			
Geographic Coverage			
Ease of Use (W/O QC)			
Ease of Use (With QC)			

Parcel Data Structure

- Parcel Shapefiles Have Polygons for Each Parcel
 - Multiple Stacked Polygons for Condominiums
 - Each Parcel may Have 70+ Data Fields
 - Key Fields:
 - Parcel ID Number
 - Property Class (A, C, E, I, R)
 - Owner Name
 - Site Address
 - Dwelling Unit Count
 - Latitude/Longitude
- Commercial Building Files Have Records for Each Building
 - May Have 30+ Fields
 - Key Fields
 - Parcel ID Number
 - Building Address
 - Year Built
 - Use (Occupancy) Code
 - Building Area
 - Number of Apartment and Hotel/Motel units
 - Linked to Polygon File though Parcel ID Number

Parcel Description

- Annual updates to parcel shape files and related property tax files
- Building area can be aggregated to obtain total parcel area
- Detailed building use codes can be summarized to obtain generalized parcel land use code
- Ratios of employees per square foot by land use code can be applied to obtain parcel level employment estimates
- Year built codes can be used to track changes over time

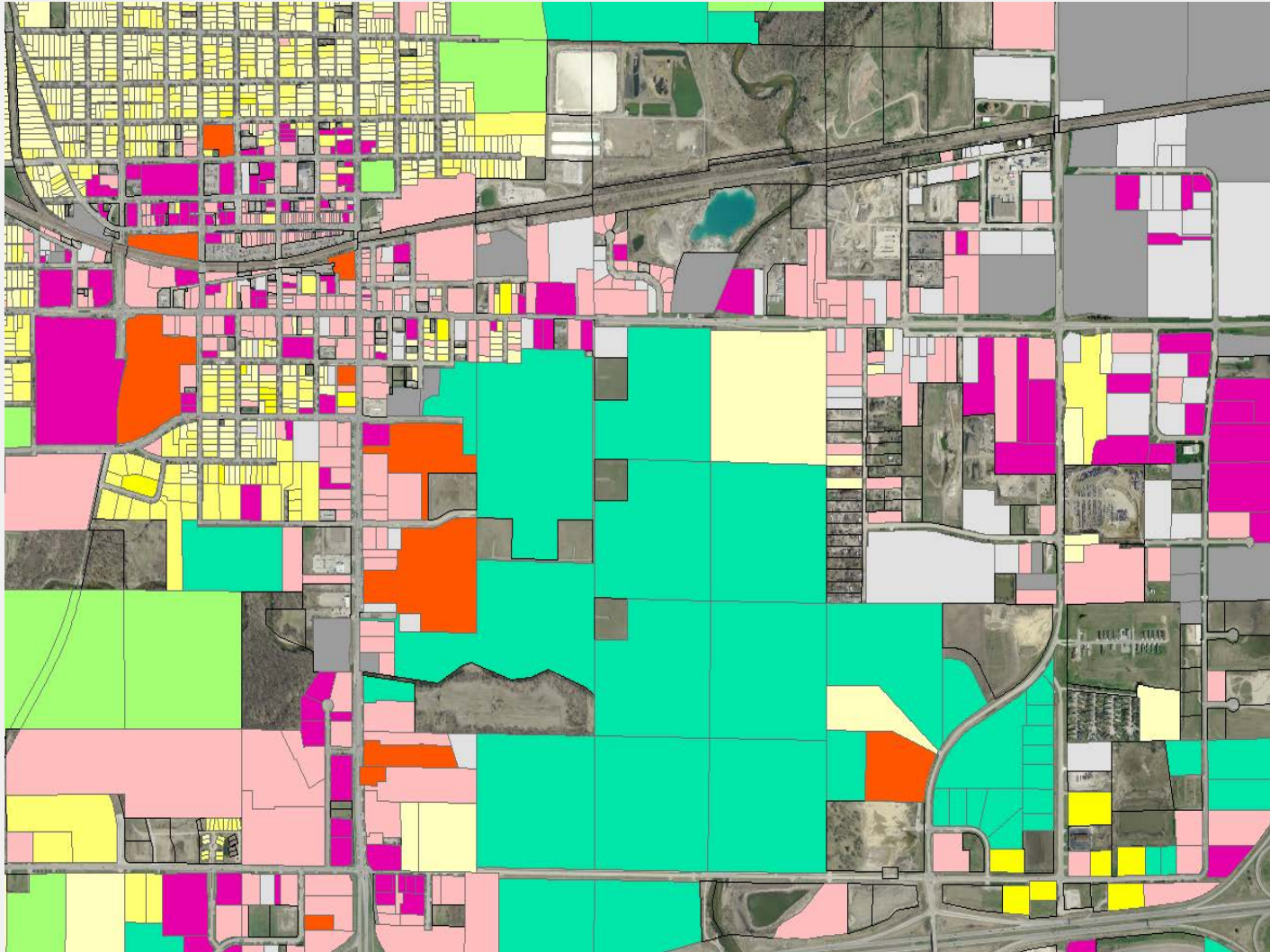
Ames Use Codes (314)

Cafeteria
Car Wash Auto
Casino
Church
Cinema Theater
City Club
Classrooms - College
Cold Stg, Farm
Country Club
Clubhouse
Computer Ctr
Cold Stg Facility
College - Entire
Commercial Garage
Commercial Greenhouse
Community Ctr
Commons K-12
Commons/Student Ctr
Comm Shopping Ctr Shell
Community Shop Ctr Shell
Complete Auto Dealership
Commodity Stg Shed,Farm
Community Shopping Ctr
Commodity Stg Flathouse
Convention Ctr
Convalescent Hospital
Convenience Market
Corn Crib Bldg
Creamery
Cotton Gin
Car Wash Canopy
Car Wash, Drive-Thru
Car Wash, Self-Serve

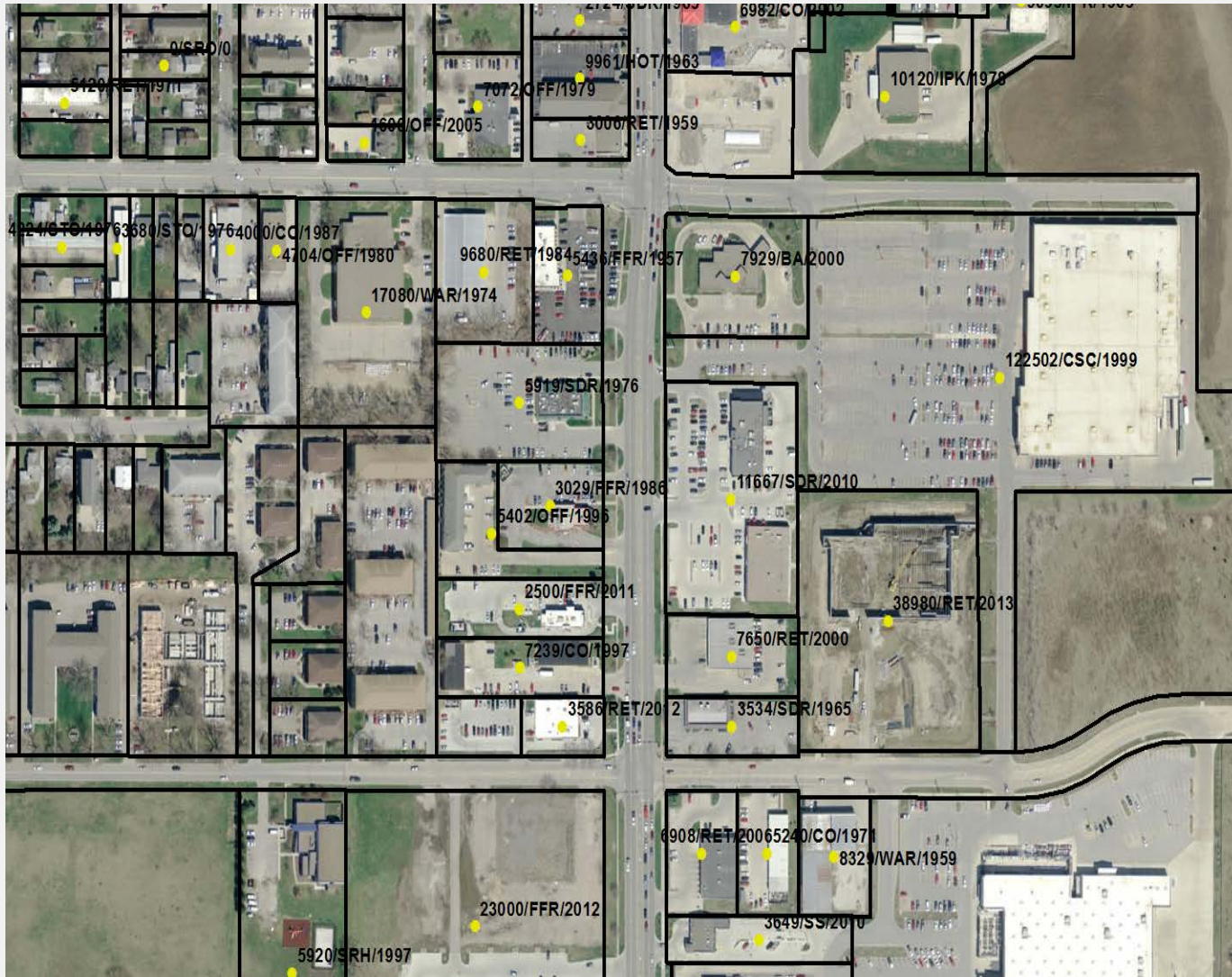
Non-Residential Land Use Codes

Code Name	Code Name
25 Assisted Living/Hospice/SNF	64 Post Office
26 Hotel/Motel	65 Bank
30 Manufacturing	66 Fire/Police Station
31 Industrial Park/Light Industry	67 Cemetery
32 Warehousing	68 Religious Facility
33 Truck Terminal	69 Other Public Service
34 Public Storage	70 Hospital
35 Extractive Industry	71 Other Health Care
36 Junkyard/Dump/Landfill	73 Recreational Use
40 Commercial Airport	74 Cultural Facility
41 General Aviation Airport	75 Convention Center
42 Right-of-way	76 Public Assembly
43 Communication/Utility	77 Military
44 Parking	78 Prisons/Jails
45 Passenger Terminal	80 Day Care/Preschool
50 Street Front Commercial	81 Elementary School
51 Neighborhood Shopping Center	82 Junior High/Middle School
52 Community Shopping Center/Big Box	83 Senior High
53 Regional Shopping Center	84 Post-Secondary
55 Auto Dealership	89 Other School
56 Service Station	90 Golf Course
57 Fast Food	91 Casino
58 Restaurant	92 Stadium/Arena
59 Other Commercial	93 Active Park
60 General Office	94 Passive Park
61 Government Office	95 Intensive Agriculture
62 Government Service Office	96 Farming
63 Library	98 Water
	99 Inactive Use

Parcel File



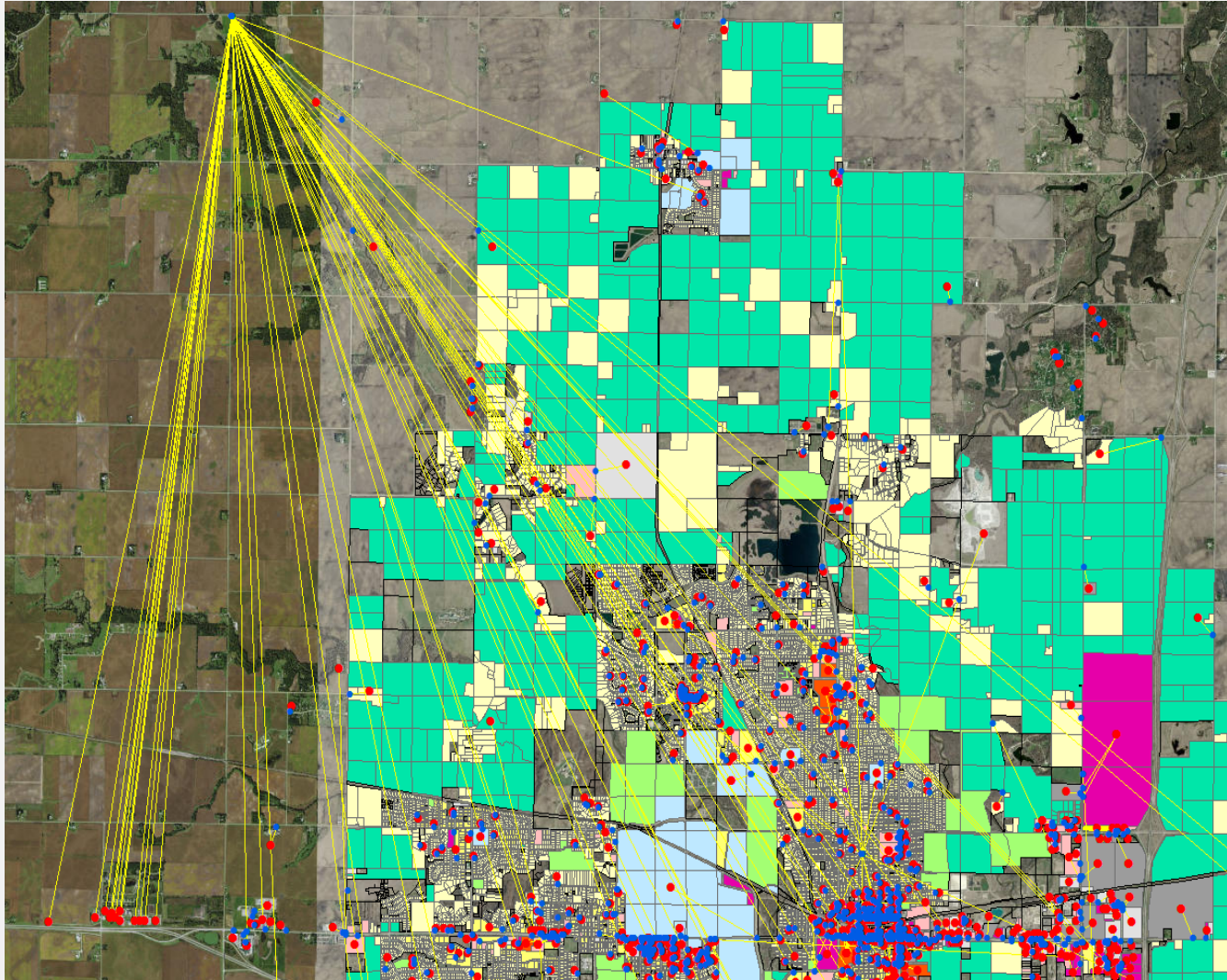
Parcel File



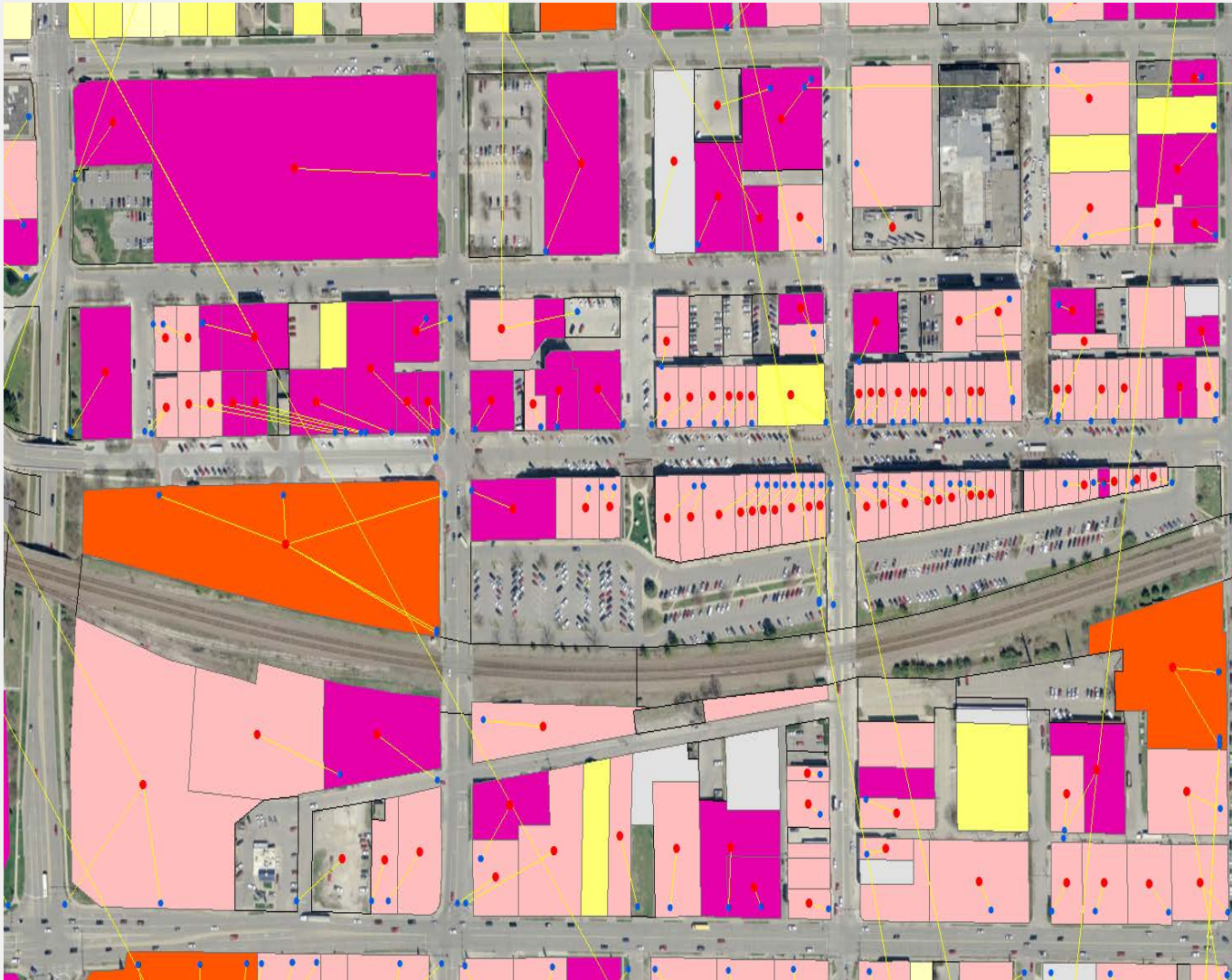
IWD Description

- Employers Required to Submit Monthly Employment Estimates
- Almost All Public/Private Employers Covered
- Key Fields:
 - Employer Name
 - Address
 - Latitude/Longitude
 - NAICS Code
 - Monthly Employment
 - UI/Key ID
- Geocoding Done at the Federal Level
- Employment Collected by Sites for Chains and Multi-site Employers with More than 9 Employees
- Strict Confidentiality Issues

IWD Geocoding



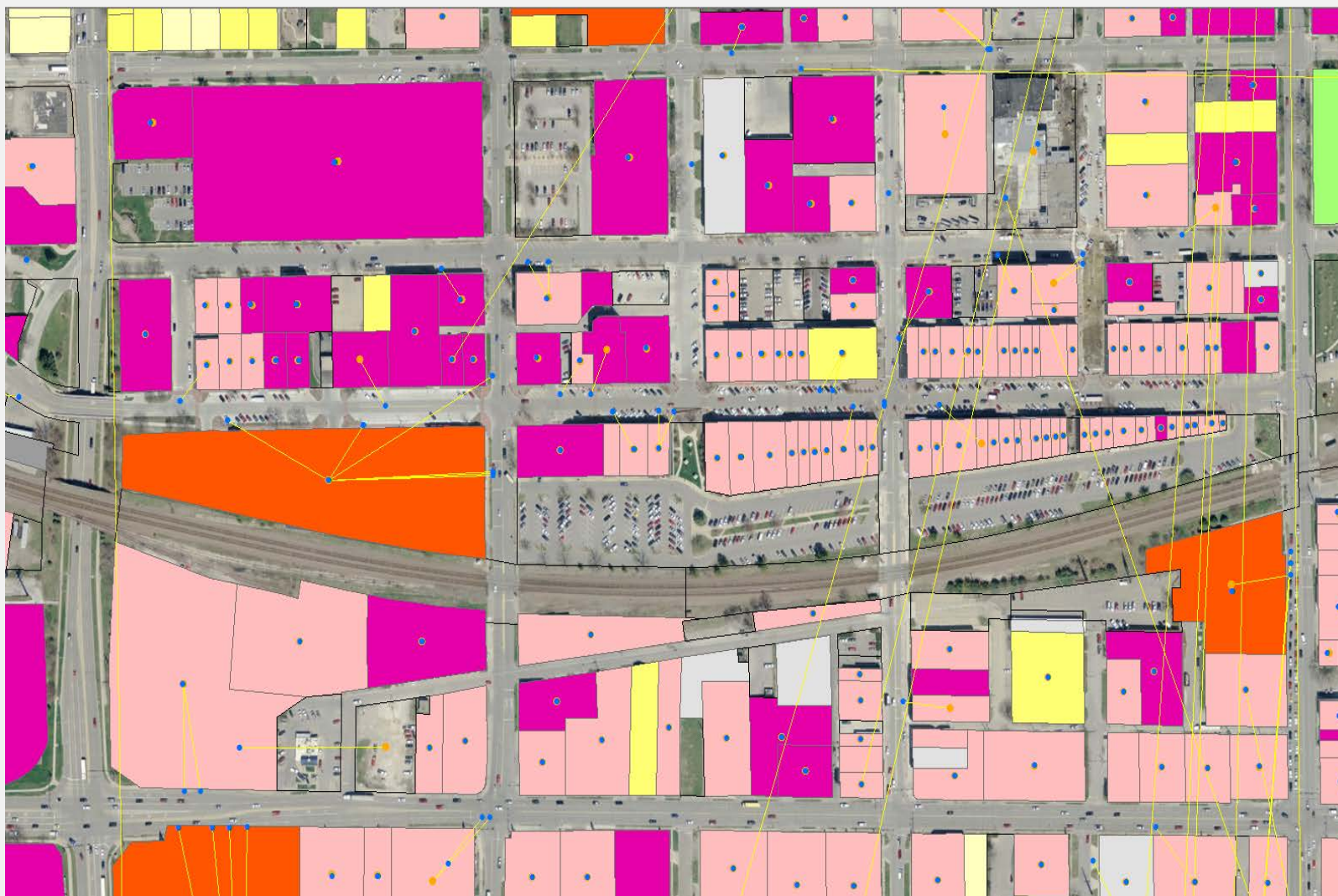
IWD Geocoding



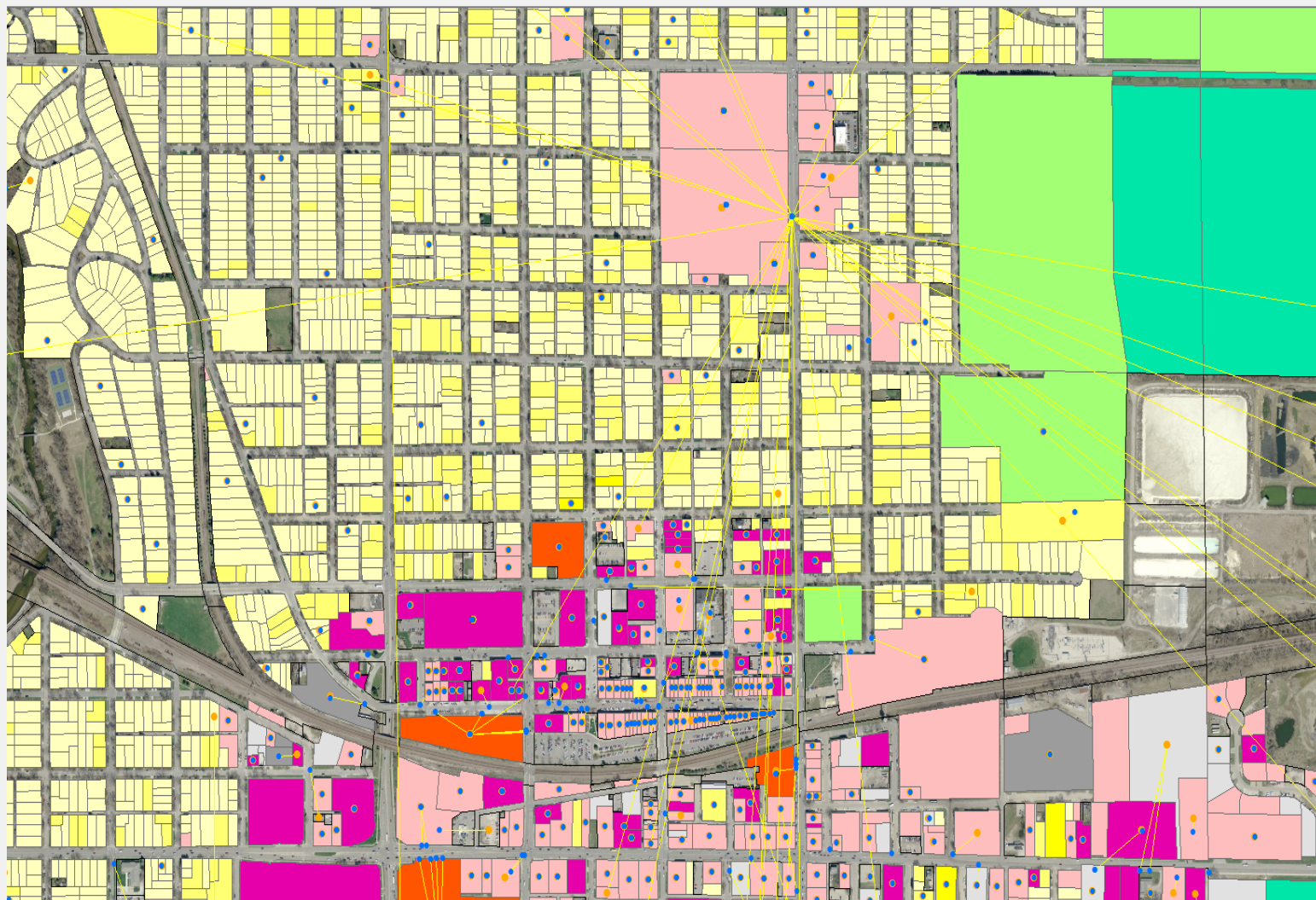
Infogroup Description

- Each Employer Record has 150+ Fields of Data
- Key Fields
 - Employer Name
 - Primary/Secondary Address
 - Latitude/Longitude
 - Match Level
 - NAICS Code
 - Actual Location
 - Infousa ID
- All Employers Included
- Employment Allocated to Sites for Chains and Multi-site Employers

Infogroup Geocoding



Infogroup Geocoding



Summary of Parcel Findings

- Most Buildings on “Exempt” Parcels are Missing
- Very Accurate Building Data on Non-exempt Parcels
- New Buildings are Well Tracked
- Vacant or Low Occupancy Buildings not Identified
- Data Processing is Somewhat Messy because Methodologies Differ by Agency
- Parcel Data Appears to be Available Throughout Iowa but Unclear for Adjacent States

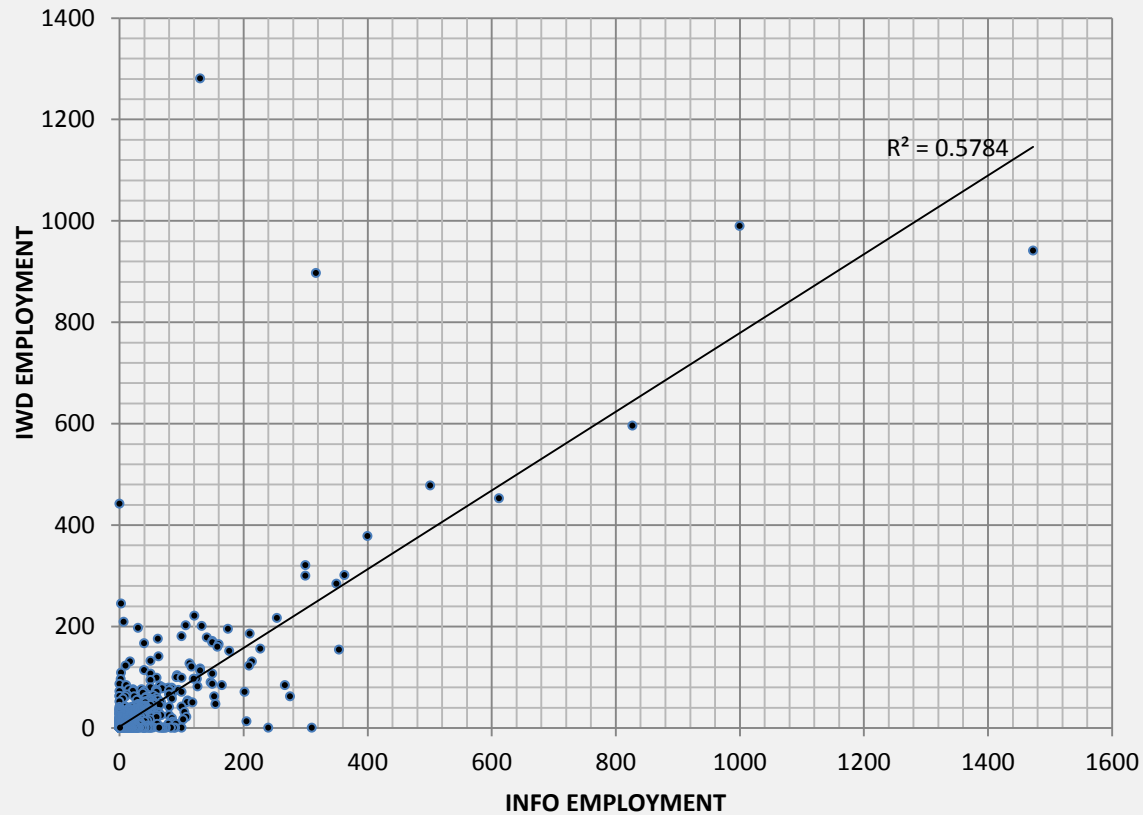
Summary of IWD Findings

- Very Good Enumeration of Employers
- Very Good NAICS Code Assignment
- New/Closed Firms Well Tracked
- Monthly Site Level Employment Variations Appear to be Accurate
- Employment at Residential Locations Can be Overstated
- Employment Overstated at Employers Without a Fixed Place of Work
- Significant Geocoding Errors
- Availability for Other States May be an Issue

Summary of Infogroup Findings

- Some Missing Employers
- Many Duplicate Employers (12%/3%)
- Info/IWD Site Level Employment Estimates Vary Widely
- Some Incorrect NAICS Codes
- New/Closed Firms Not Well Tracked
- Most Site Level Employment Estimates Remain Constant Over Time
- Employment at Residential Locations Overstated (6%)
- Employment Overstated at Employers Without a Fixed Place of Work
- Some Geocoding Errors

IWD/Infogroup Comparison



Recommended Approach

- Initial Process
- Update Process
- Modify Trip Generation Process

Initial Process

- One Time Reconciliation of Data Sources
- Produce Parcel GIS File with:
 - Land Use Code
 - Year Built
 - Residential Units
 - Commercial Building Area
 - Occupancy Factor
- Compute Employment Densities by Land Use from Aggregated Employment and Building Area
- Estimate Parcel Employment by Applying Employment Densities
- Feedback with IWD and Assessor's Offices

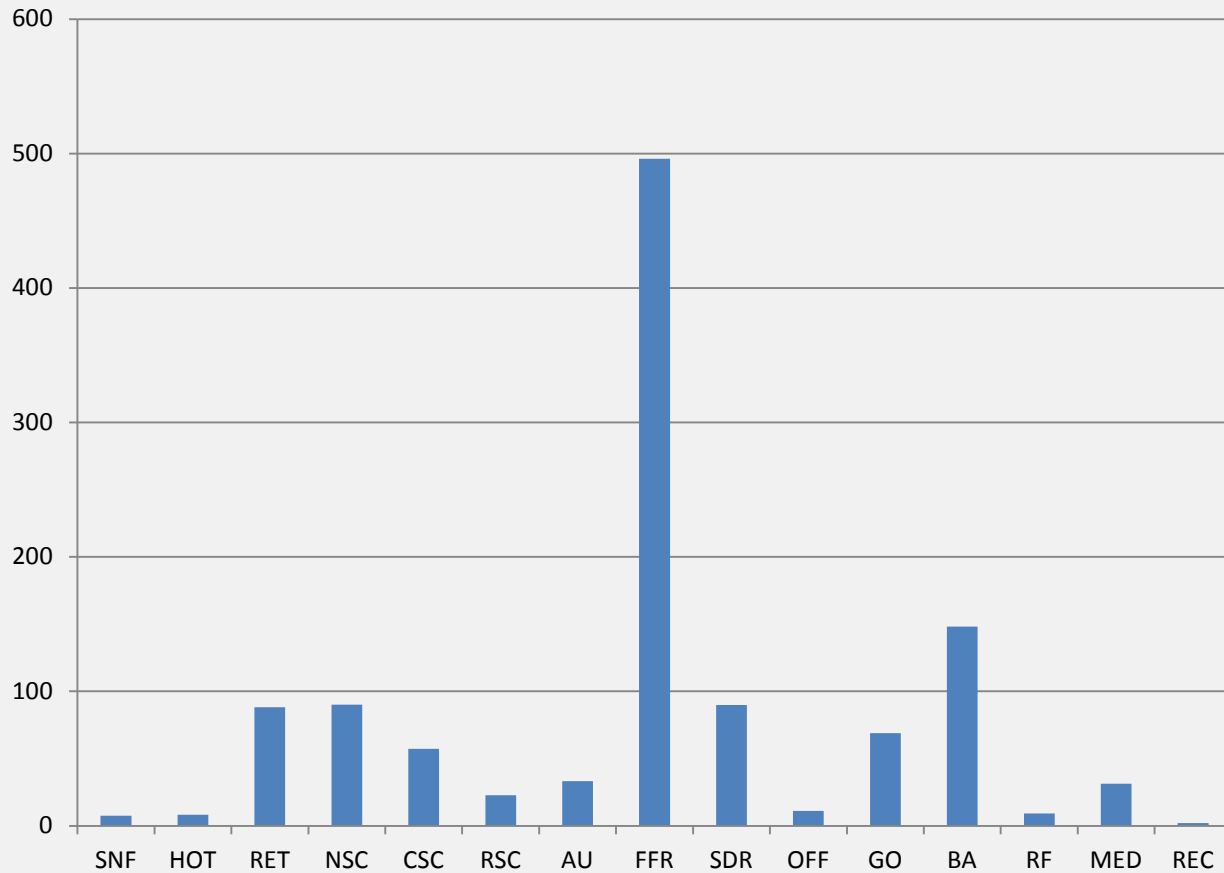
Employment Densities

Code Name	SQFT	Employment	Employment Density
60 General Office	1,735,585	5,491	316
50 Street Front Commercial	652,446	1,696	385
30 Manufacturing	907,463	1,689	537
58 Restaurant	218,274	1,589	137
51 Neighborhood Shopping Center	438,182	1,402	313
31 Industrial Park/Light Industry	877,772	1,369	641
59 Other Commercial	832,306	1,235	674
71 Other Health Care	307,713	1,196	257
61 Government Office	115,430	1,155	100
52 Community Shopping Center/Big Box	697,508	947	737
57 Fast Food	87,330	849	103
32 Warehousing	982,038	786	1,249
53 Regional Shopping Center	376,325	678	555
25 Assisted Living/Hospice/SNF	156,960	581	270
26 Hotel/Motel	656,409	560	1,172
65 Bank	154,428	390	396
55 Auto Dealership	151,617	317	478

Update Process

- Identify New IWD Records and Records with Address Changes (25%?)
- Geocode New/Changed IWD Records
- Identify New Parcel Commercial Building Records
- Reconcile IWD/Parcel Changes
- Edit Parcel File to Incorporate Updates
- Estimate Updated Parcel Employment
 - Apply Employment Densities to New Sites
 - Adjust to IWD Regional Totals
- Annual Process?

Modify Trip Generation



Questions?