

# Planning Level Traffic, Certified Traffic, and the PDP

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# Planning Level Traffic, Certified Traffic and the PDP

## ► PRESENTATION OBJECTIVES

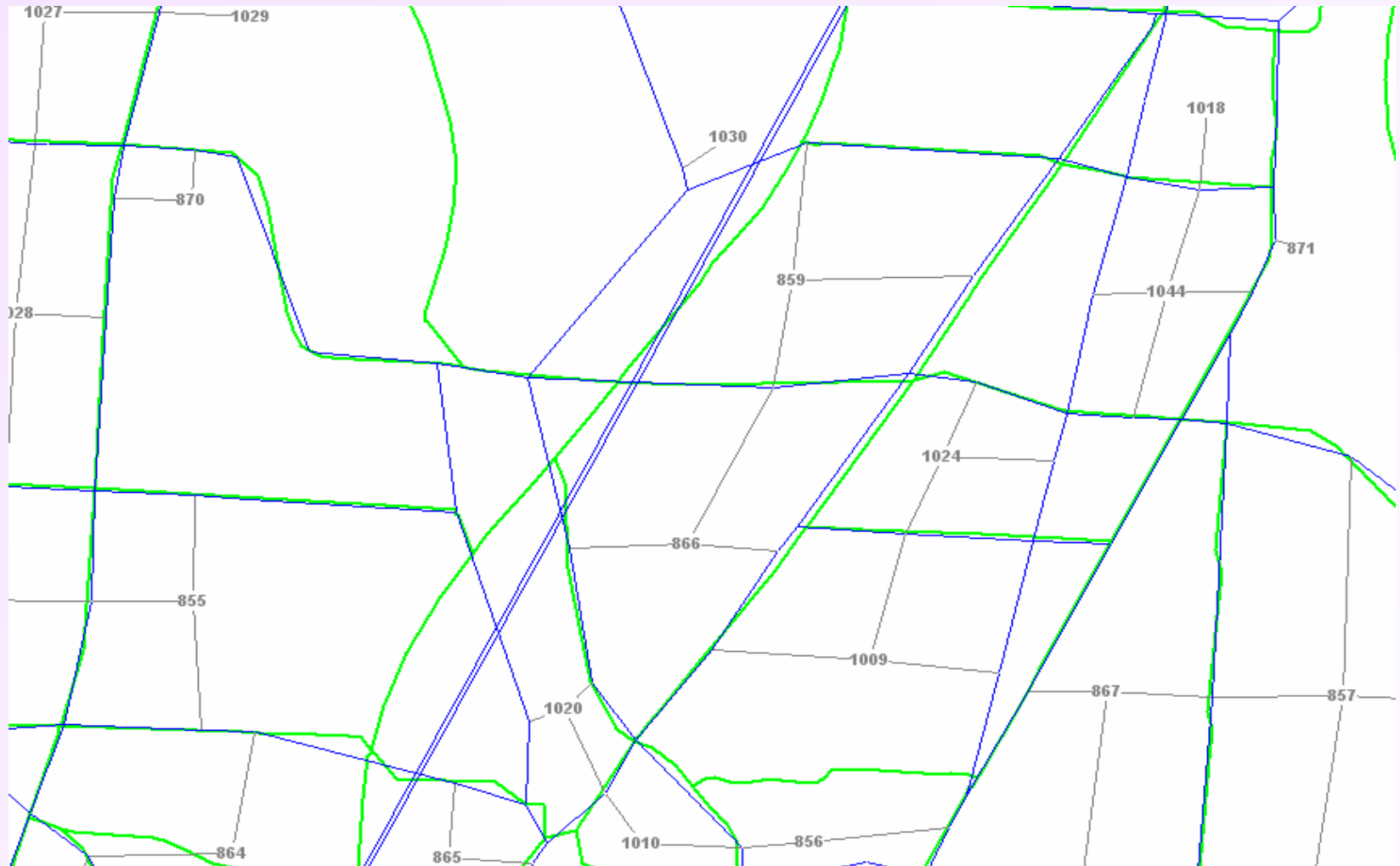
- Types of projects that require travel demand forecasting (model work)
- Different types of traffic forecasts
- PDP steps and types of traffic forecasts for Major and Minor projects

# Travel Demand Forecasting (TDF) a very abbreviated explanation

## ▶ Travel Demand Forecasting Models

- Traffic Analysis Zones (TAZs) contain land use variables (population, housing, employment, etc.)
- Land use variables are converted into trips in the trip generation step
- Trips are converted to vehicles and loaded onto the road network via centroid connectors

# MORPC Network & TAZs vicinity of IR 71 & Big Walnut





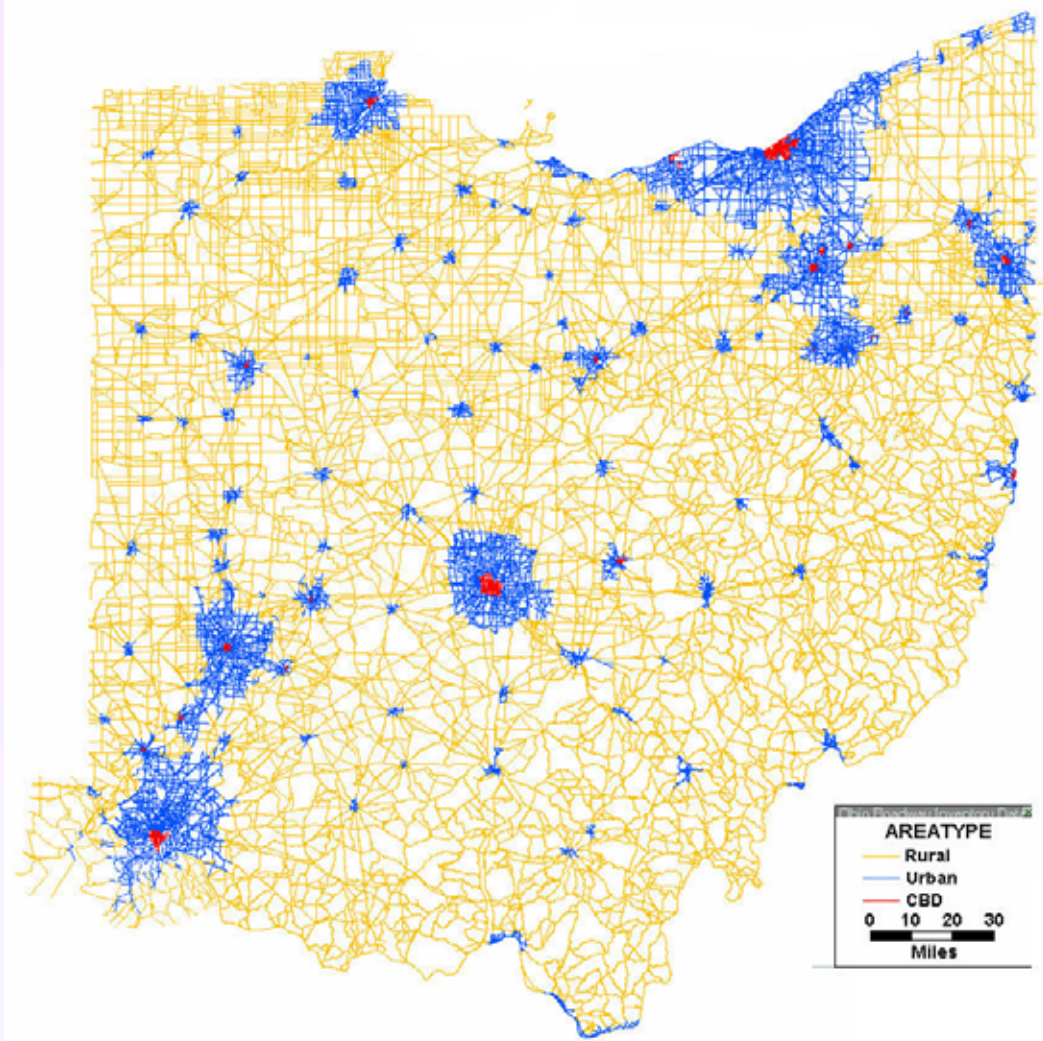
# Travel Demand Models in Ohio

- ▶ Each of Ohio's 17 MPOs has a TDM
- ▶ An Interim Statewide TDM covers all other areas

# Traffic Forecasting Tools – MPO TDM Boundaries



# Traffic Forecasting Tools – Ohio's Interim Statewide TDM



# Traffic Forecasting Tools – *Guidelines for the Use of Models for Project Traffic Forecasting*

- ▶ Developed by the Ohio Travel Demand Model Users Group in response to questions like:
  - What kind of project requires modeling work?
  - When does a project need planning level forecasts and/or when does a project need certified design traffic?
  - Who can prepare traffic forecasts?
  - Why do planning level forecasts differ from design traffic?
- ▶ [http://www.dot.state.oh.us/urban/CT/CT\\_Manual.pdf](http://www.dot.state.oh.us/urban/CT/CT_Manual.pdf) (*Appendix C*)

# Certified Design Traffic Requirements

## What? When? Where?

- ▶ The requirement for certified design traffic comes from the Pavement Design Manual and the Location & Design Manuals.
- ▶ The Project Development Process (PDP) indicates **when** to request certified traffic.
- ▶ The Office of Technical Services **provides** certified design traffic as **a service** to the District Offices.

# Types of Projects Requiring Models for Traffic Forecasts

- ▶ Minimal
  - Requires no modeling work
  
- ▶ Minor
  - Usually does not involve specific model work
  - If defined as minor per environmental impacts, but has significant traffic impacts, then treat as a Major Project for traffic analysis purposes
    - i.e. adding through lane, but no ROW purchase needed
  
- ▶ Major
  - *“significant impact to the highway’s public access, level of service, traffic flow, mobility patterns or mode shares.”*
    - ▶ Usually involves modeling work

# Types of Projects Requiring Models for Traffic Forecasts

## ▶ Examples include:

- Major new bridge
- New interchange
- Interchange changes (e.g. add ramps)
- New freeways
- One or more new miles of new (non-freeway) road
- Increase of 50% to # of through lanes

# Who Does the Modeling?

- ▶ Statewide Travel Demand Model
  - ODOT will always do the modeling
- ▶ MPO model
  - MPO and/or ODOT will *usually* perform the model runs
  - If time constraints prevent MPO and/or ODOT, then a traffic forecasting consultant may be hired
- ▶ Modeling turn around time
  - Varies; depends on type & magnitude of project, data availability & staff work flow
  - OTDMUG Guidelines has additional details (Section I. E.)

# Types of Traffic Forecasts

- ▶ Raw Model Output
- ▶ Planning Level Traffic
- ▶ Refined Alternative Level Traffic
- ▶ Certified Design Traffic

# Types of Traffic Forecasts

## ▶ Raw Model Output

- Volumes directly from the “model of record” - the model that is the basis of the current Transportation Plan
- Model volumes have not been checked/adjusted/refined (beyond the system-wide validation report)
- Used for system-wide decisions (such as long range Transportation Plan and Air Quality Conformity)
- Can be used to estimate growth rates for minimal or minor projects, with some reasonableness checking
- Raw model results should NOT be used for reporting location specific volumes

# IR 71/Big Walnut IMS No-Build Alt. Raw Model Output

IR 71 Big Walnut No-Build Alternative				
ROAD	COUNT DATA (2000 - 06)	RAW MODEL 2000	RAW MODEL 2030	RAW MODEL % growth/year
IR 71 south of Polaris/Fashion Place	121400	102600	157500	1.8%
IR 71 north of Polaris/Fashion Place	71820	54800	72000	1.0%
SR 750/Fashion Place west of IR 71	49760	30400	67700	4.1%
SR 750/Fashion Place east of IR 71	44000	32100	73100	4.3%
Big Walnut west of IR 71	6060	1900	12600	18.8%
Big Walnut west of Africa Road	8860	5900	26200	11.5%
Africa N of Big Walnut	5960	1800	7500	10.6%
Africa S of Big Walnut	6120	5600	15700	6.0%
Big Walnut east of IR 71	6060	1900	12600	18.8%
Big Walnut east of Worthington	5600	2400	15500	18.2%
Worthington N of Big Walnut	4040	8800	8200	-0.2%
Worthington S of Big Walnut	6780	9700	13400	1.3%
Ramp from IR 71 SB to US 36	4180	4500	5900	1.0%
Ramp from US 36 to IR 71 SB	12210	4300	14600	8.0%
Ramp from IR 71 NB to US 36	12050	4500	14800	7.6%
Ramp from US 36 to IR 71 NB	4540	5000	6600	1.1%
US 36 W of IR 71 SB ramps	26950	15000	35300	4.5%
US 36 E of IR 71 NB ramps	22370	13900	29500	3.7%

# Types of Traffic Forecasts

## ▶ Planning Level Traffic

- Model Volumes that have been checked/refined/adjusted
  - ▶ **Model Checking**
    - comparing the model results to base conditions
    - comparing model trends to independently estimated trends
  - ▶ **Model Refinement**
    - correcting network data and zone data
    - Adding additional detail to the model
  - ▶ **Model Adjusting**
    - Changing the model to produce better results in the project area
    - AKA “calibration”
    - Only after checks and refinements have been completed
    - Must be documented

# Types of Traffic Forecasts

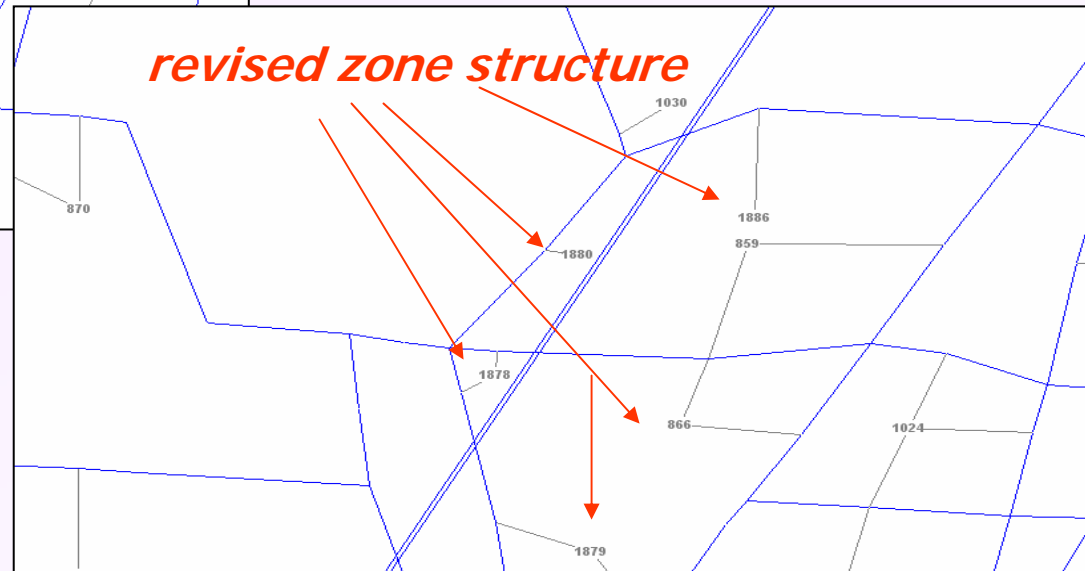
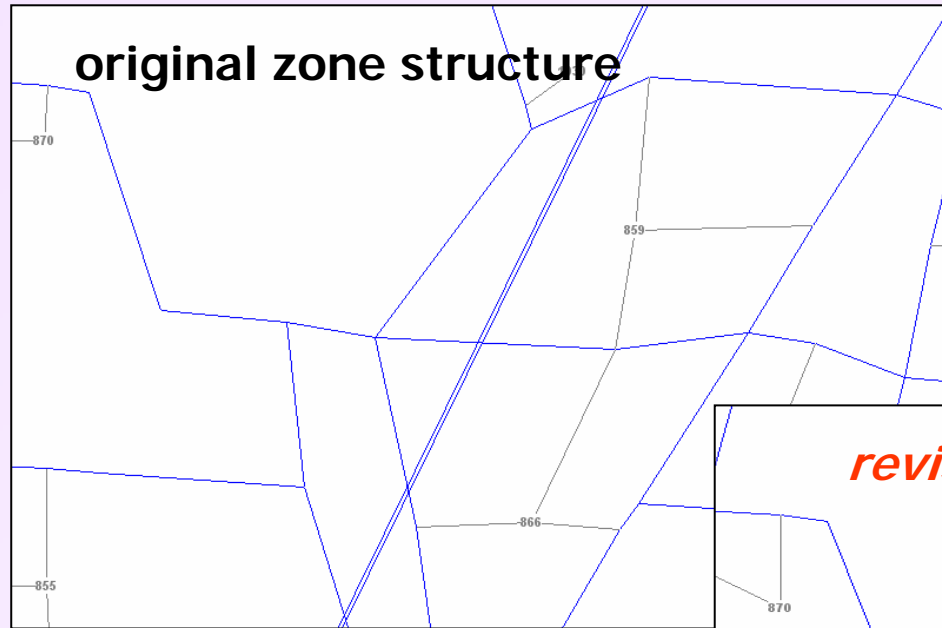
- ▶ Some Uses of Planning Level Traffic
  - ▶ Designation of 1000-2000 ft corridors
  - ▶ Interchange locations
  - ▶ Need for a general purpose lane
  - ▶ Assessing the demand for a new facility
- ▶ Planning level traffic is **not** refined enough for detailed design decisions such as location and length of turning lanes

# IR 71/Big Walnut IMS No-Build Alt. Planning Level Traffic

## ► **Model Refinement**

- correcting network data and zone data
- adding additional detail to the model
- refinements included:
  - **Refined zone structure – added 9 zones**
  - **Home Rd extension to Lewis Center Road**
  - **3 lanes on IR 71 north of US 36/SR 37**
  - **Added Polaris/Gemini interchange modifications**

# IR 71/Big Walnut IMS No-Build Alt. Planning Level Traffic – refined zone structure



# IR 71/Big Walnut IMS No-Build Alt. Planning Level Traffic

IR 71 Big Walnut No-Build Alternative						
ROAD	COUNT DATA (2000 - 06)	PLANNING LEVEL 2006	PLANNING LEVEL 2030	RAW MODEL % growth/yr	PLANNING LEVEL % growth/yr	
IR 71 south of Polaris/Fashion	121400	128688	172151	1.8%	<b>1.1%</b>	
IR 71 north of Polaris/Fashion	71820	63314	79020	1.0%	<b>0.8%</b>	
SR 750/Fashion Place west of	49760	51054	77687	4.1%	<b>1.7%</b>	
SR 750/Fashion Place east of	44900	49922	77450	4.2%	<b>1.8%</b>	
Big Walnut west of IR 71	6060	2435	15989	18.8%	<b>18.6%</b>	
Big Walnut west of Africa Road	8860	9058	32217	11.5%	<b>8.5%</b>	
Africa N of Big Walnut	5960	3659	11732	10.6%	<b>7.4%</b>	
Africa S of Big Walnut	6120	7591	17588	6.0%	<b>4.4%</b>	
Big Walnut east of IR 71	6060	2435	15989	18.8%	<b>18.6%</b>	
Big Walnut east of Worthington	5600	3657	16690	18.2%	<b>11.9%</b>	
Worthington N of Big Walnut	4040	9031	10871	-0.2%	<b>0.7%</b>	
Worthington S of Big Walnut	6780	10675	13618	1.3%	<b>0.9%</b>	
Ramp from IR 71 SB to US 36	4180	4621	8250	1.0%	<b>2.6%</b>	
Ramp from US 36 to IR 71 SB	12210	8532	18186	8.0%	<b>3.8%</b>	
Ramp from IR 71 NB to US 36	12050	8923	18824	7.6%	<b>3.7%</b>	
Ramp from US 36 to IR 71 NB	4540	5161	8446	1.1%	<b>2.1%</b>	
US 36 W of IR 71 SB ramps	26950	21899	47732	4.5%	<b>3.9%</b>	
US 36 E of IR 71 NB ramps	22370	20332	43528	3.7%	<b>3.8%</b>	

# IR 71/Big Walnut IMS No-Build Alt. Planning Level Traffic-further refinements

IR 71 Big Walnut No-Build Alternative							Automated
ROAD	COUNT DATA (2000 - 06)	PLANNING LEVEL 2006	PLANNING LEVEL 2030	RAF 2030	RAW MODEL % grw/yr	PLANNING LEVEL % grw/yr	RAF % grw/yr
IR 71 south of Polaris/Fashion	121400	128688	172151	<b>173870</b>	1.8%	1.1%	<b>1.4%</b>
IR 71 north of Polaris/Fashion F	71820	63314	79020	<b>92100</b>	1.0%	0.8%	<b>0.9%</b>
SR 750/Fashion Place west of	49760	51054	77687	<b>85400</b>	4.1%	1.7%	<b>2.4%</b>
SR 750/Fashion Place east of	44000	49923	77450	<b>91770</b>	4.3%	1.8%	<b>3.6%</b>
Big Walnut west of IR 71	6060	2435	15989	<b>19700</b>	18.8%	18.6%	<b>7.5%</b>
Big Walnut west of Africa Road	8860	9058	32217	<b>33000</b>	11.5%	8.5%	<b>9.1%</b>
Africa N of Big Walnut	5960	3659	11732	<b>17610</b>	10.6%	7.4%	<b>6.5%</b>
Africa S of Big Walnut	6120	7591	17588	<b>15640</b>	6.0%	4.4%	<b>5.2%</b>
Big Walnut east of IR 71	6060	2435	15989	<b>19700</b>	18.8%	18.6%	<b>7.5%</b>
Big Walnut east of Worthington	5600	3657	16690	<b>22980</b>	18.2%	11.9%	<b>10.3%</b>
Worthington N of Big Walnut	4040	9031	10871	<b>5400</b>	-0.2%	0.7%	<b>1.1%</b>
Worthington S of Big Walnut	6780	10675	13618	<b>9330</b>	1.3%	0.9%	<b>1.3%</b>
Ramp from IR 71 SB to US 36	4180	4621	8250	<b>7660</b>	1.0%	2.6%	<b>2.8%</b>
Ramp from US 36 to IR 71 SB	12210	8532	18186	<b>25470</b>	8.0%	3.8%	<b>3.6%</b>
Ramp from IR 71 NB to US 36	12050	8923	18824	<b>25200</b>	7.6%	3.7%	<b>3.6%</b>
Ramp from US 36 to IR 71 NB	4540	5161	8446	<b>7660</b>	1.1%	2.1%	<b>2.3%</b>
US 36 W of IR 71 SB ramps	26950	21899	47732	<b>57960</b>	4.5%	3.9%	<b>3.8%</b>
US 36 E of IR 71 NB ramps	22370	20332	43528	<b>48600</b>	3.7%	3.8%	<b>3.9%</b>

# Types of Traffic Forecasts

## ▶ Refined Alternative Level Traffic

- refine model to more precisely match count data
- i.e. matrix estimation techniques
- results can be used in operational models
- very labor-intensive
- requires all checking/refining/adjusting from “Planning Level” traffic to be completed first
- usually only for “mega” projects, or projects with very complex traffic operations
- bridges the gap between planning level and design traffic

# Types of Traffic Forecasts

## ▶ Design traffic

- Final Traffic Forecasts and related info
- additional information provided
  - ▶ 30<sup>th</sup> highest hour, direction factors, turn volumes, truck factors, etc.
- very labor-intensive
  - ▶ Post-process model volumes (link-by-link) using NCHRP 255 procedures including screenline adjustments to account for over-capacity assignments
  - ▶ determining turning movements using the iterative proportional method from NCHRP 255
  - ▶ Smoothing volumes between intersections where appropriate (i.e. bridges)
  - ▶ Comparing results to historical trend line analyses, other project forecasts with overlapping areas, etc.

# IR 71/Big Walnut IMS No-Build Alt. (Certified) Design Traffic

## ► Model Post-Processing

- Semi-Automated “Raf” (NCHRP 255), is further refined via screenline adjustments
  - Screenlines were drawn east & west of IR 71 and north & south of Big Walnut
- Turn movements are determined via the iterative proportional method (NCHRP 255)
- Volumes are “hand-adjusted” as necessary based on comparisons to overlapping projects and trendline analysis of existing traffic
  - (i.e. IR 71 north of US 36/SR 37 was not getting enough growth via the model – this was corrected for by adding in traffic “by hand” (outside the model)

# IR 71/Big Walnut IMS No-Build Alt. (Certified) Design Traffic

IR 71 Big Walnut No-Build Alternative						
ROAD	RAF 2030	CERTIFIED DESIGN 2030	RAW MODEL % grw/yr	PLANNING LEVEL % grw/yr	Semi- Automate d RAF % grw/yr	CERTIFIED DESIGN % grw/yr
IR 71 south of Polaris/Fashion	173870	<b>170400</b>	1.8%	1.1%	1.4%	<b>1.3%</b>
IR 71 north of Polaris/Fashion	92100	<b>100000</b>	1.0%	0.8%	0.9%	<b>1.3%</b>
SR 750/Fashion Place west of	85400	<b>84650</b>	4.1%	1.7%	2.4%	<b>2.3%</b>
SR 750/Fashion Place east of	91770	<b>85830</b>	4.3%	1.8%	3.6%	<b>3.2%</b>
Big Walnut west of IR 71	19700	<b>18280</b>	18.8%	18.6%	7.5%	<b>6.7%</b>
Big Walnut west of Africa Road	33000	<b>32580</b>	11.5%	8.5%	9.1%	<b>8.9%</b>
Africa N of Big Walnut	17610	<b>13400</b>	10.6%	7.4%	6.5%	<b>4.2%</b>
Africa S of Big Walnut	15640	<b>14960</b>	6.0%	4.4%	5.2%	<b>4.8%</b>
Big Walnut east of IR 71	19700	<b>18280</b>	18.8%	18.6%	7.5%	<b>6.7%</b>
Big Walnut east of Worthington	22980	<b>22720</b>	18.2%	11.9%	10.3%	<b>10.2%</b>
Worthington N of Big Walnut	5400	<b>11620</b>	-0.2%	0.7%	1.1%	<b>6.3%</b>
Worthington S of Big Walnut	9330	<b>15480</b>	1.3%	0.9%	1.3%	<b>4.3%</b>
Ramp from IR 71 SB to US 36	7660	<b>10410</b>	1.0%	2.6%	2.8%	<b>5.0%</b>
Ramp from US 36 to IR 71 SB	25470	<b>21930</b>	8.0%	3.8%	3.6%	<b>2.7%</b>
Ramp from IR 71 NB to US 36	25200	<b>22070</b>	7.6%	3.7%	3.6%	<b>2.8%</b>
Ramp from US 36 to IR 71 NB	7660	<b>10550</b>	1.1%	2.1%	2.3%	<b>4.4%</b>
US 36 W of IR 71 SB ramps	57960	<b>69820</b>	4.5%	3.9%	3.8%	<b>5.3%</b>
US 36 E of IR 71 NB ramps	48600	<b>51000</b>	3.7%	3.8%	3.9%	<b>4.3%</b>

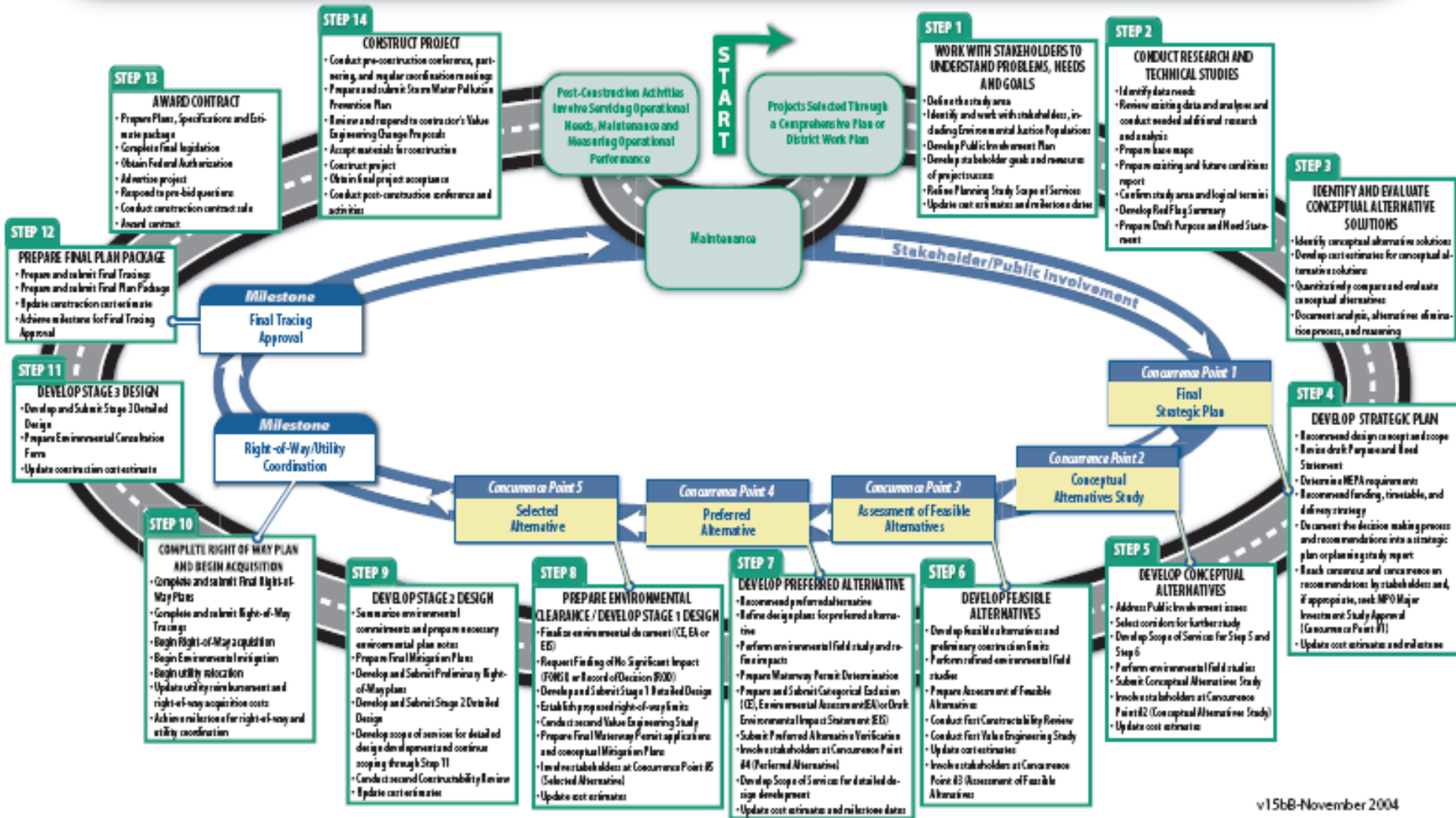
# Types of Traffic Forecasts

## ▶ Certified Design Traffic

- From FHWA letter dated August 28, 1973
  - ▶ “. . .all traffic forecasts, that are included in any submissions to our office, will require the endorsement of the Bureau of Transportation Technical Services.”
  - ▶ “certified” indicates endorsement of the Office of Technical Services
- If not developed or approved by the Office of Technical Services, then it’s just a forecast



# Ohio Department of Transportation Project Development Process (PDP) for Major Projects



v15b-November 2004



## STEP 2

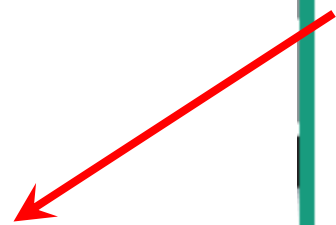
### CONDUCT RESEARCH AND TECHNICAL STUDIES

- Identify data needs
- Review existing data and analyses and conduct needed additional research and analysis
- Prepare base maps
- Prepare existing and future conditions report
- Confirm study area and logical termini
- Develop Red Flag Summary
- Prepare Draft Purpose and Need Statement

### 202.2 Existing Data, Research, and Analysis

To avoid unnecessary study costs and save time, prior to collecting new data, should be collected and reviewed. This may include prior studies, secondary reports. This review should include a thorough evaluation of existing aerial photo analysis, travel patterns, system performance, crash data, and transportation analyzed and proposed for the area in the past. This review should also identify available data is insufficient to define or analyze the problem. Only then should Some existing resources for use in technical analysis include:

- Existing ODOT and MPO planning studies
- Transportation and land use plans
- Population figures and projections
- Economic indicators
- Traffic counts and planning level traffic projections
- Origin and destination surveys
- Speed and delay studies
- Geographic Information Systems (GIS) analyses including databases such as ODNR, OEPA, geological and cultural resource maps.



Assess environmental impacts and coordinate with regulatory agencies

Design

Conduct second Value Engineering Study

Conduct final Feasibility Study

Conduct First Constructability Review

Perform environmental field studies

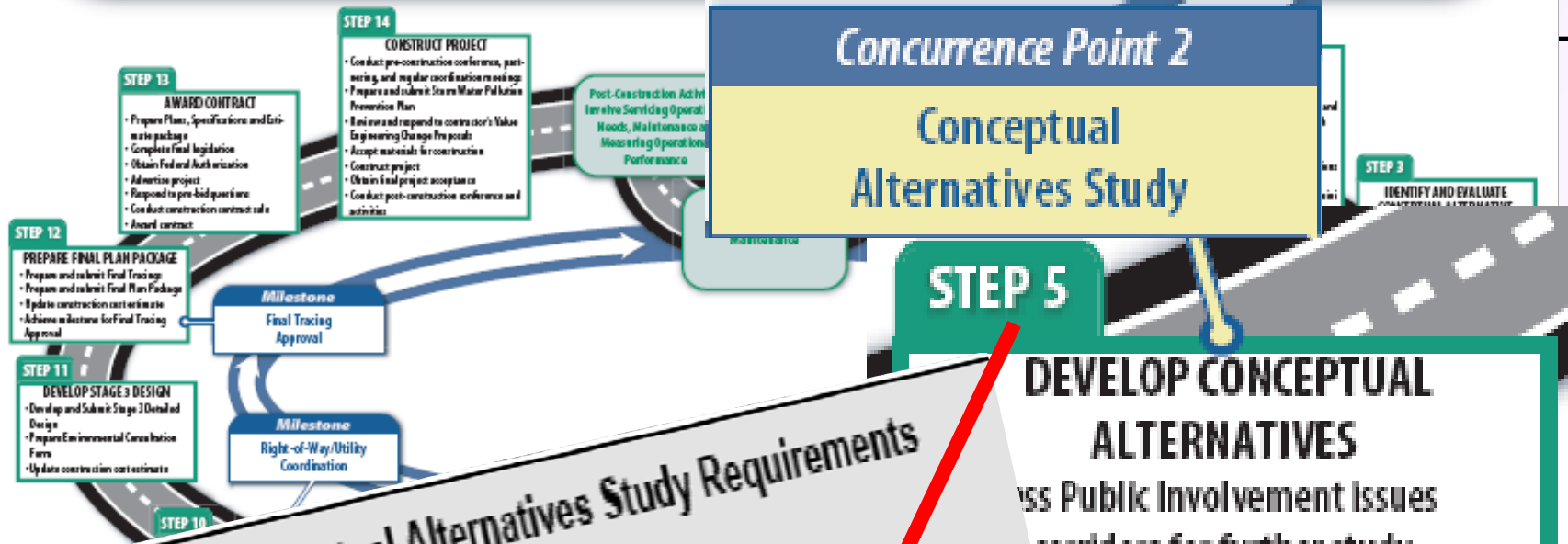
# Major Project (14 steps)

## ▶ PDP Step 2

- Existing & Future Conditions – Planning Level Traffic
  - ▶ Project Manager
    - contact M&F staff to serve on project team
  - ▶ M&F Staff will:
    - Determine which (if any) model to use
    - Coordinate with MPO regarding model
    - If using consultant for modeling work, assist with scoping details in the contract
- Confirm study area and logical termini
  - ▶ Travel Demand Models can be used for determining the study area based on traffic impacts of proposed alternatives.



# Ohio Department of Transportation Project Development Process (PDP) for Major Projects



## Conceptual Alternatives Study Requirements

- Design and legal speeds
- Functional classification
- Projected traffic volumes for opening year and design year
- Conceptual typical sections identifying the number of lanes, lane width, sidewalk, buffer, graded shoulder width, and type of grading

- Address Public Involvement Issues
- Identify and delineate study corridors for further study
- Determine Scope of Services for Step 5 and
- Conduct environmental field studies
- Conduct Conceptual Alternatives Study
- Involve stakeholders at Concurrence Point #2 (Conceptual Alternatives Study)
- Update cost estimates

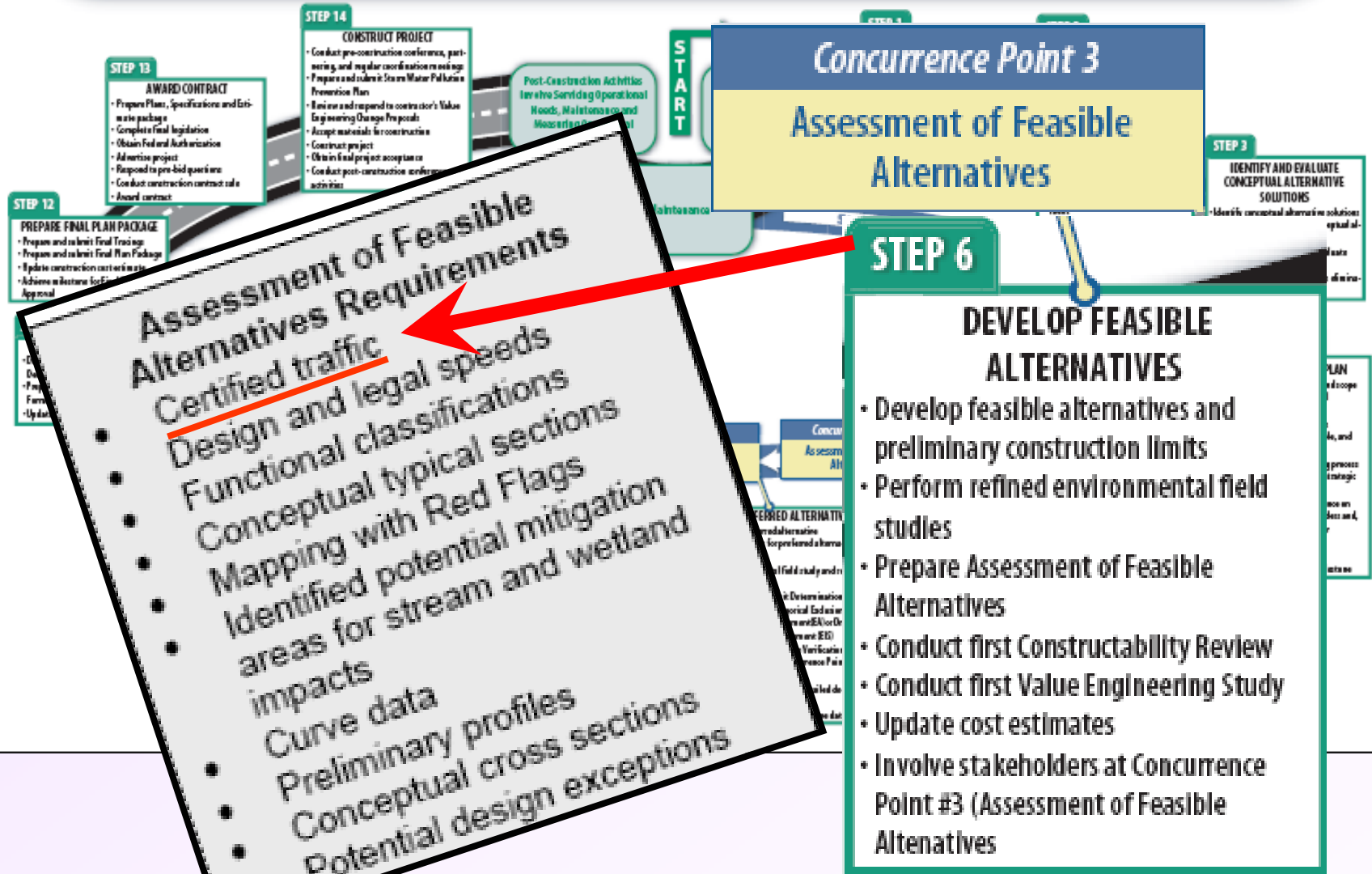
# Major Project (14 steps)

## ▶ PDP Steps 3-5

- Uses Planning Level Traffic from Step 2
- If moving elements\* of Step 6 into Step 5, then obtain certified design traffic for Step 5
  - ▶ \*Example of Step 6 elements that may be moved forward to Step 5:
    - Interchange Justification issues (access points)
    - Completion of pavement design
    - For complete list see **L&D Manual Volume 3, Section 1403.3.4 Conceptual Alternatives Studies for Projects with Constrained Study Areas**



# Ohio Department of Transportation Project Development Process (PDP) for Major Projects



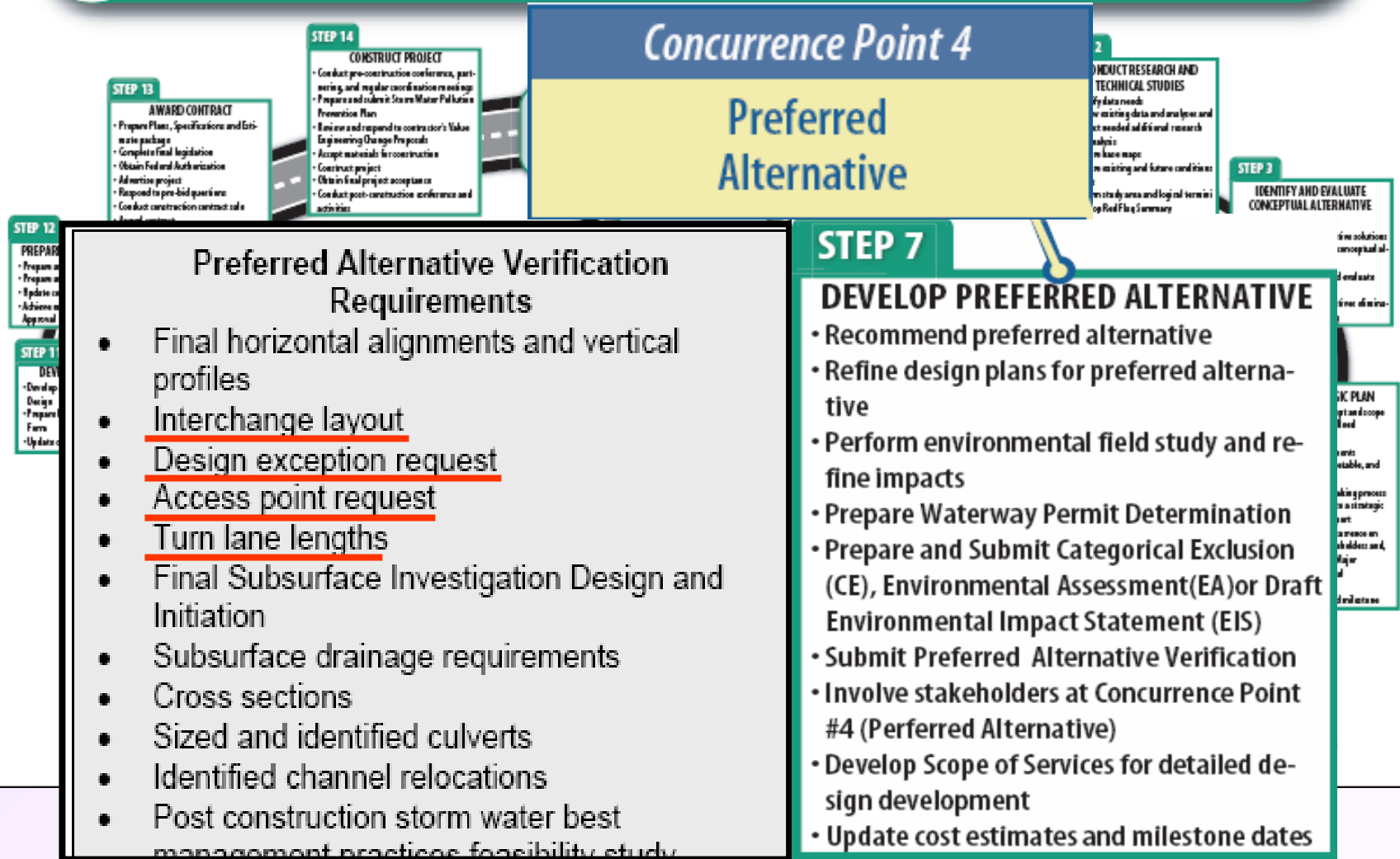
# Major Project (14 steps)

## ▶ PDP Step 6

- Obtain Certified Design Traffic for the Assessment of Feasible Alternatives
- Typically no more than 2-3 alternatives from Step 5 (*Conceptual Alternatives Study*) should move on for further development in Step 6 (*Assessment of Feasible Alternatives*)



# Ohio Department of Transportation Project Development Process (PDP) for Major Projects



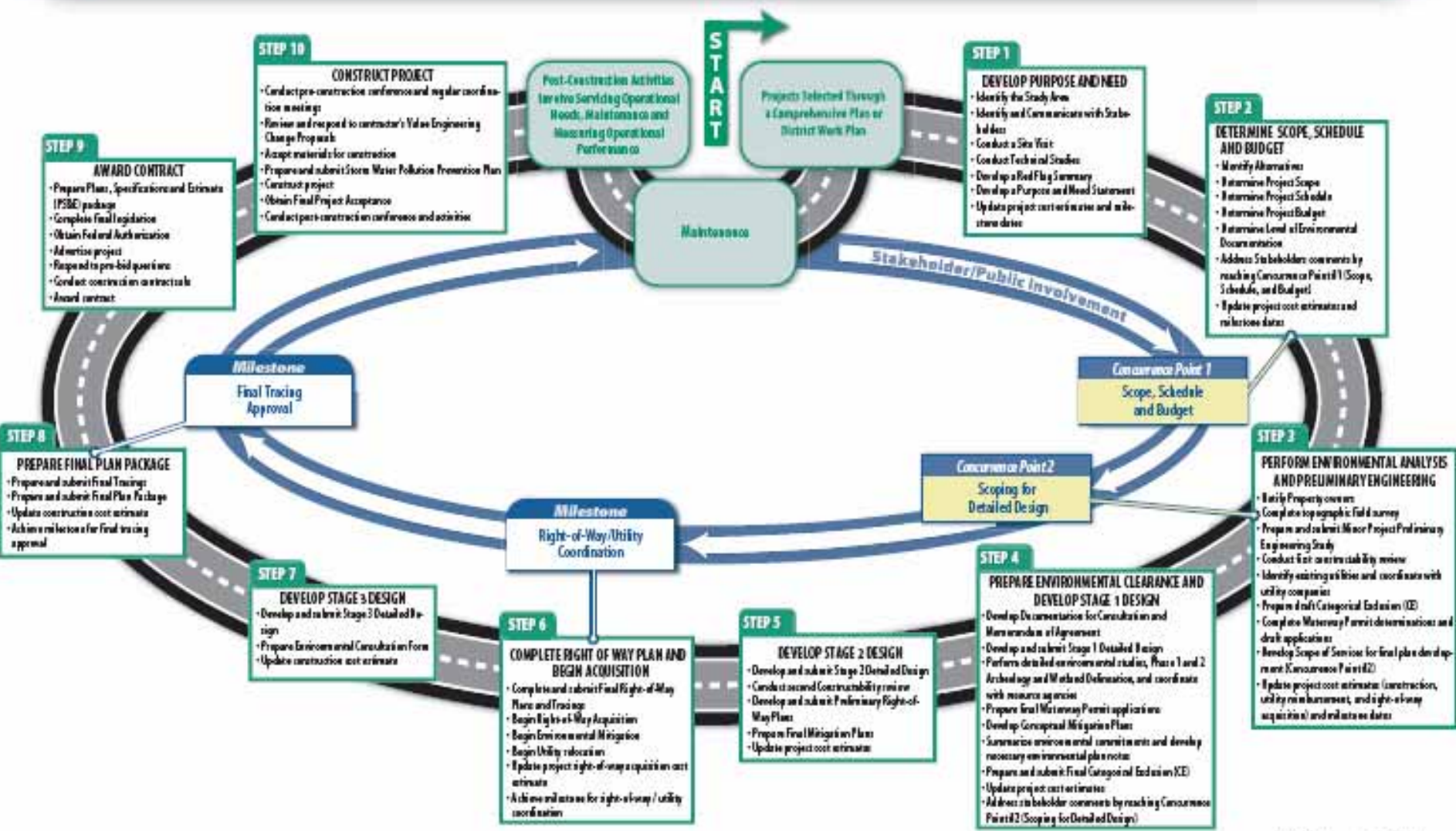
# Major Project (14 steps)

## ▶ PDP Step 7

- Develop Preferred Alternative
- Specific design decisions are made regarding turn lane lengths, access points, interchange designs, etc.
- Certified Design Traffic is the basis of these decisions and should be immediately requested, if not previously obtained in Step 6.



# Ohio Department of Transportation Project Development Process (PDP) for Minor Projects



v10aB-November 2004

# Minor Project (10 steps)



## Ohio Department of Transportation Project Development Process (PDP)

### STEP 1

#### DEVELOP PURPOSE AND NEED

- Identify the Study Area
- Identify and Communicate with Stakeholders
- Conduct a Site Visit
- Conduct Technical Studies
- Develop a Red Flag Summary
- Develop a Purpose and Need Statement
- Update project cost estimates and milestone dates

### 301.10 Products

- Identify study area
- Identify stakeholders through the Public Involvement
- Conduct site visit
- Conduct technical studies
- Develop Red Flag summary
- Develop a Purpose and Need statement
- Update project cost estimates and milestone dates

### 301.5 Technical Studies

Step 1 includes investigation of a wide range of issues, problems, needs, and alternatives to determine the best way to solve the transportation problem. For example, technical studies may include: conducting or reviewing traffic counts, Level of Service, and traffic projections.

# PDP Minor Project (10 steps)

## ▶ PDP Step 1

- Conduct Technical Studies – Planning Level Traffic
  - ▶ Project Manager
    - contact M&F staff to serve on project team
  - ▶ M&F Staff will:
    - Determine which (if any) model to use
    - Coordinate with MPO
    - If using consultant for modeling work, assist with scoping details in the contract
- Identify Study Area
  - ▶ Travel Demand Models can be a tool for determining the study area based on traffic impacts of proposed alternatives.

# Minor Project (10 steps)

Ohio Department of Transportation

## Project Development Process (PDP) for Minor Projects

### STEP 2

#### DETERMINE SCOPE, SCHEDULE AND BUDGET

- Identify Alternatives
- Determine Project Scope
- Determine Project Schedule

#### 302.1 Alternative Identification and Evaluation

The initial set of alternatives should be broad enough to allow for a wide range of possible solutions while at the same time account for the project's relative size and scope. The alternatives identified and examined at this level should be considered conceptual solutions to the transportation problem. The

***For Minor Projects, the study alternatives can be more design-specific in nature than alternatives for Major Projects.***

differ in the level of detail required to accomplish planning activities



STEP 1  
PREPARE  
- Prepare and submit Final Conceptual Estimation (CE)  
- Update project cost estimates  
- Address stakeholder comments by reaching Consensus on Point #1 (Scoping for Detailed Design)

ANALYSIS  
SEEKING  
and primary  
of state with  
(CE)  
institutions and  
development  
instructions,  
map

# PDP Minor Project (10 steps)

## ▶ PDP Step 2

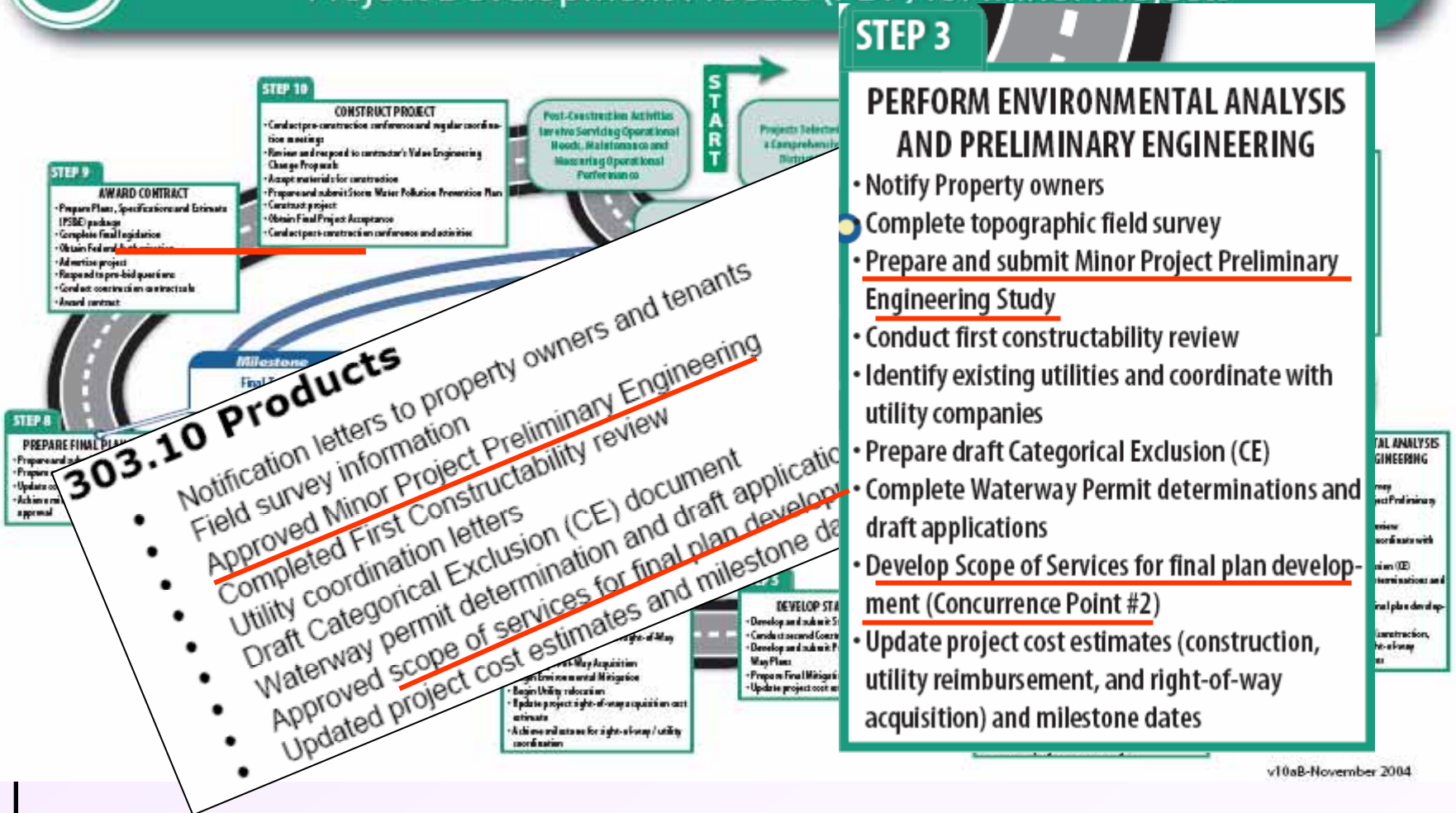
### ■ Identify and Evaluate Alternatives

- ▶ *Depending on the project and the alternatives, **planning level traffic may be adequate** for Step 2.*
- ▶ *Because alternatives may be more “design-specific”, it may be necessary to have **certified design traffic** in order to evaluate the alternatives.*
  - *What questions are we trying to answer in step 2?*
    - ▶ *If design specific (i.e. length of turning lanes), then certified design traffic is needed*

# Minor Project (10 steps)

Ohio Department of Transportation

## Project Development Process (PDP) for Minor Projects



# PDP Minor Project (10 steps)

- ▶ PDP Step 3 – Preliminary Engineering
  - Specific design decisions are made regarding turn lane lengths, access points, interchange layouts, etc.
  - Certified Design Traffic is the basis of these decisions and should be immediately requested, if not previously obtained in Step 2.

# Certified Design Traffic Requirements

## What? When? Where?

- ▶ The requirement for certified design traffic comes from the Pavement Design Manual and the Location & Design Manuals.
- ▶ The Project Development Process (PDP) indicates **when** to request certified traffic.
- ▶ The Office of Technical Services **provides** certified design traffic as **a service** to the District Offices.

# Final Thought

- ▶ Q: “Do we need certified design traffic at this step or will planning level traffic be sufficient?”
- ▶ A: What decisions are going to be made with the traffic forecasts? More detailed decisions require more refined forecasts. . .

# Contact Information

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