GIS Assisted Non-Motorized Transportation Planning

2011 APA Ohio Statewide Planning Conference

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10:45 AM to Noon

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The Purpose of GIS Assisted Network Planning

- Determine what is possible
  - Focus on near-term projects
- Help establish what is appropriate
  - Addressing roadway conditions and context
- Identify where are improvements needed the most
  - Bang for the buck
- Communication
- Sharing information

GIS as a decision support tool not a decision making tool

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Public Input vs. Black Box

- The purpose of inventory and analysis is to help inform decisions – not make them
- Public input is just as important an input as any other analysis
- In order for any plan to get approved, it needs to have support from the public
- Should integrate public input into the GIS system

There are too many variables to use GIS in a practical cost effective way to determine an "ideal" network

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ROW Database Conventions

- Use road centerline data for all improvements within a road ROW
- Tie to standard road referencing systems
- Use right side / left side based on line direction to record things like sidewalks
- This permits mapping sidewalks at a number of scales
- Typically use state base so we can look beyond municipal boundaries

For network planning what is important is that there is a path along side the road, the nature of the setback, the width of the path and how many driveways it crosses. The exact location of the centerline does not matter

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Independent Trail Database Conventions

- Housed in a separate layer from the roadways
- Depth of information collected depends on the budget
- Need to at least address function – is it a true shared-use path or just a local trail or walkway?
- Status is important
  - Existing
  - Under development
  - Planned
  - Proposed

Not all shared-use paths will function the same in a transportation network

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Intersection Database Conventions

- Point based
- Generally different databases for signalized vs. unsignalized intersections
- May be just as simple as identifying a crosswalk opportunity
- May want to collect some qualitative information – difficult to know where to stop in that regard
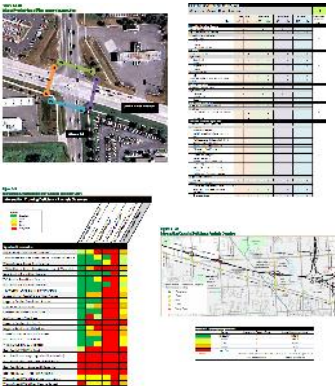
Setting up a database for an intersection can be rather complex

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Tying GIS into Other Databases

- Some items like ADA assessments for crosswalks, a different database approach is likely warranted
- May choose to have the summary assessment in a mapable format
- Needless to say, this can get very labor intensive and expensive in a hurry

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Cost Benefit

- Always ask – did we really use the data
- The inventory should be proportional to the recommendations
- Focus on those things that can be changed

Some clients / projects want a high level of analysis to help prioritize projects, others are more focused on public input
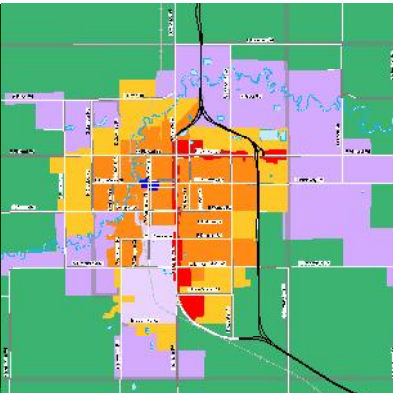
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Mapping Context

- The existing and future context will inform a transportation project's design
- For long-life projects like road reconstruction and bridges must look 25 + years ahead
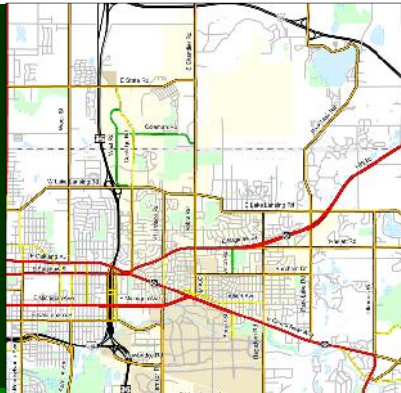
LANDSCAPE TYPES.
- Downtown
- Commercial Strip
- Campus
- General Urban
- Rural Agricultural
- Rural Residential
- Suburban
- Suburban -Range-Transitional

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National Functional Classification
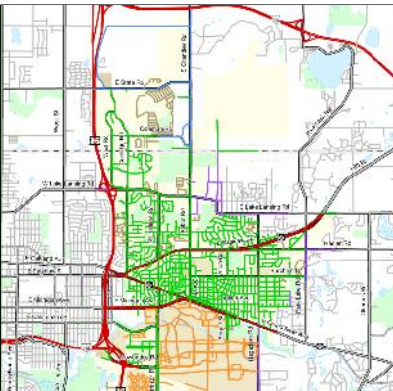
- Which roads may be more auto oriented vs .bike pedestrian oriented streets
- Typically part of state database

- Principal Arterials
- Arterials
- Collectors
- Significant Local Roads
- Local Roads

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Road Jurisdiction

- Who has the final say on the road
- Typically part of state database

Road Jurisdiction

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Average Daily Traffic

- Frequently regional governments are the best source for ADT data
- Sometimes this is point based and has not been distributed to segments via a model

Vehicle Traffic Volume
(vehicles per day)
- Heavy (above 15,000)
- Medium (10,000 - 15,000)
- Moderate (5,000-10,000)
- Light (under 5,000)

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Speed Limit

- Actual running speed would be ideal
- Typically use posted speed
- Sometimes use Google Streetview and crash reports to get data

Speed Limit
- 25
- 30
- 35
- 45

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Existing Road Cross Section

- Typically use air photos to get this data
- Ignore turn lanes at intersections and by-pass lanes

Number of Lanes
- 1 Lane
- 2 Lanes
- 3 Lanes
- 4 Lanes
- 5 Lanes

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Slopes

- Can be a significant issue in some places
- My have different solution on the downhill vs. the uphill side of the same street

20.0000
12.0000
8.3300
4.0000
% Grade

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Roadway Width

- Generally don't create a map
- Important to know how the measurement was taken
- Some roads can be maddening as they change width frequently
- Typically use air photos but do spot verifications with on-site measurements

Face of Curb

Edge of Metal

Curb

We have worked with many a client that has said they have this data – only to find out that it was wildly inaccurate

One foot can make the difference between something being feasible or not

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On-Street Parking

- Comes into play when determining where bike lanes could / should go vs. using Shared Lane Markings
- Ideally, know the utilization of the parking

Existing Bike Lane

On-Street Parking
- One Side of Street
- Both Sides of Street

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In-Road Bicycle Quality of Service

- General picture of the existing conditions
- Helps determine where things are needed the most

In Road Bicycling Quality
- A - Excellent
- B - Good
- C - Fair
- D - Poor
- E - Very Poor

Without Bike Lane	With Bike Lane	ADT	Speed Limit
A	A	0 - 5,000	25
B	A	5,000 - 10,000	30
C	B	10,000 - 15,000	35
D	C	15,000 - 20,000	40
E	C	20,000 - 25,000	45
E	D	Over 25,000	50

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Sidewalk Quality of Service

A – Facility with Vertical Buffer

B – Facility with Buffer

C – Facility along Curb

D – No Facility, but Passable

E – No Facility, Not Passable

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Sidewalk Quality of Service

- Can use to determine where we need to add street trees
- Also can use to see where a bike lane could help pedestrian comfort

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Crosswalk Spacing Analysis

- Needs to be contrasted with demand to be effective
- There may be places where long distance between crosswalks is OK

Rating	Distance between Crosswalks
A	0 to 1/8 Mile
B	1/8 Mile to ¼ Mile
C	¼ Mile to ½ Mile
D	Over ½ Mile

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Road Crossing Difficulty Assessment

- Begins to lead towards what type of crossing improvements may be appropriate

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Determining Relative Demand

- Research has shown that urban form influences mode choice and total miles traveled

- The most important factors are:
  – Density (Population)
  – Diversity (Land Use)
  – Design (Street Network)

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Block Size Analysis

- The "grain" of the urban fabric is key
- Our favorite analysis
- Used in a relative demand model

Rating	Block Size in Acres
A	0 to 15 Acres
B	15 to 49 Acres
C	50 to 100 Acres
D	Over 100 Acres

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Population Density

- ¼ mile grid
- Hard to choose the right population range to fit every project

Rating	Points	Number of People per Acre
A	4	Over 20
B	3	16 to 20
C	2	11 to 15
D	1	6 to 10
E	0	0 to 5

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Land Use Diversity

- ¼ Mile Grid
- Number of Land Uses:
  - Commercial / Retail
  - Office
  - Residential
  - School
  - Park
  - Mixed-Use

Rating	Points
A	4
B	3
C	2
D	1
E	0

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Activity Generators

- Beyond land use diversity
  - School
  - University
  - Downtown
  - Shopping Center
  - Local Parks
  - Regional Parks
  - Recreation Centers

Destination	Score
School	1 pt. per school
University	1 to 4 pts. based on % Coverage
Downtown/Mixed-use	1 to 4 pts. based on % Coverage
Regional Shopping Center	1 to 4 pts. based on % Coverage
Park	1 pt. per park
Activity Zone Within Park	2 pts. per each activity zone
Regional Trail	2 pts.

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Access to Transit

- Big pedestrian traffic generator
- Helps identify mid-block areas where there is cross corridor demand

Rating	Points	
A	4	Transit Station/Light Rail Station/Subway Station
B	3	Bus Route with 15 Minute or Less Headway
C	2	Bus Route with 30 to 16 Minute Headway
D	1	Bus Route with over 30 Minutes Headway
E	0	No Transit Stations or Routes

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Connectivity

- Block size analysis applied to the grid

Rating	Points	Proportional Average Block Size
A	4	0 to 15 Acres
B	3	15 to 50 Acres
C	2	50 to 100 Acres
D	1	100 to 150 Acres
E	0	Over 150 Acres

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Relative Demand Analysis

- Calculate the sum of:
  - Population density
  - Land Use Diversity
  - Activity Generators
  - Connectivity
  - Transit Routes
- Take into account surrounding cells by an inverse distance weighting calculation

Relative Demand Score
(Local Comparison)
- High Demand
- Moderate Demand
- Medium Demand
- Low Demand
- Very Low Demand

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Crash Analysis

- Two big issues:
  - Determining proportionality
  - Limited sample
- Need to compare to use as best as possible
- Use more than 3 years data
- Do lots of thematic maps and charts to tease out issues

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Sidepath Suitability Analysis

- Can be a controversial analysis
- May be better to just place dots at the conflict points

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Near-term Bike Lane via Lane Narrowing

- Provides a good perspective on the low hanging fruit
- Should cross reference with NFC, truck routes and bus routes

Rating	Lane Min Width
A - High Potential	11' + Bike Lane
B - Moderate Potential	10-11' + Bike Lane
C - Marginal Potential	10' + Bike Lane
D - Low Potential	Too Narrow

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Near-term Bike Lane via 4 to 3 Lane Conversion

- Other issues to consider are the number and nature of signalized intersections

Rating	ADT
A - High Potential	<15,000
B - Moderate Potential	15,000-17,500
C - Marginal Potential	17,500-20,000
D - Low Potential	20,000+

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Potential Roadway Conversions

- Composite map – often add this information to visioning workshop maps so people can understand what is possible
- May have other conversion options

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Neighborhood Connectors

- Local road bike routes and short connecting trails
- Reference local roads, existing and planned trails, signal, road crossing when looking at options

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Comparative Analysis

- Helping to prioritize facility improvements and routes

Improving Block Size

- Use of short trails to reduce large block size

Need for Additional Crosswalk Locations

- Compare crosswalk spacing and relative demand

Determining Appropriate Crossing Improvement

- Compare road crossing difficulty and demand

Intersection Improvements

- Contrast intersection deficiency analysis with relative demand

Public Engagement – Mapping Web Survey Input

- Can set up web surveys to collect geographic information
  - Sample area
  - Existing and Desired Destinations

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Public Engagement – Mapping Web Survey Input

- Seeing the survey results graphically can be really important in making a point

Public Engagement – Workshop Visioning Maps

- A delicate balancing act of providing information to participants but not overwhelming them
- Illustrate what is possible and provide enough context so they can show what is desirable
- Use directed exercises

Public Engagement – Documenting Input

1. Richland Ave is difficult to navigate on and across for both bikes and peds.
2. E State Street is not very bicycle or pedestrian friendly and is difficult to navigate for both bikes and peds.
3. Court Street is difficult to navigate by bicycle, heavy vehicular and pedestrian traffic, and needs bike lanes.
4. Desire to safely get to and access the parks and recreation areas by bicycle
5. Stimson Ave is difficult to navigate on and across for both bikes and peds.
6. Columbus Road is difficult to navigate by bicycle and needs bike lanes.
7. Union Street is difficult to navigate by bicycle and needs bike lanes.
8. The Intersection at the South End of Columbus Road is noted to be very dangerous making it difficult for bikes and peds to cross the street.
9. Uptown is difficult to navigate around by bicycle, there are crowded streets and limited bike parking.
10. Desire to utilize the old railroad bridges over the river to extend the bike path and create more access points between both sides of the river.

Public Engagement – Preliminary Plan Workshop Maps

- Show public input from the previous meeting informed the draft proposals
- Provide ways to both make informed comments on proposals but also to reach consensus

Documenting Plans

- At the end of the day you will need to present a compelling vision
  - Report maps
  - Summary posters
  - Websites
  - Google Earth

Most importantly, freely share your data

Questions or Comments

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