

Presentation outline

- Overview of Report 803
- Research Approach
- Case Studies
- Spreadsheet Tool Demo
- Question and Answer session

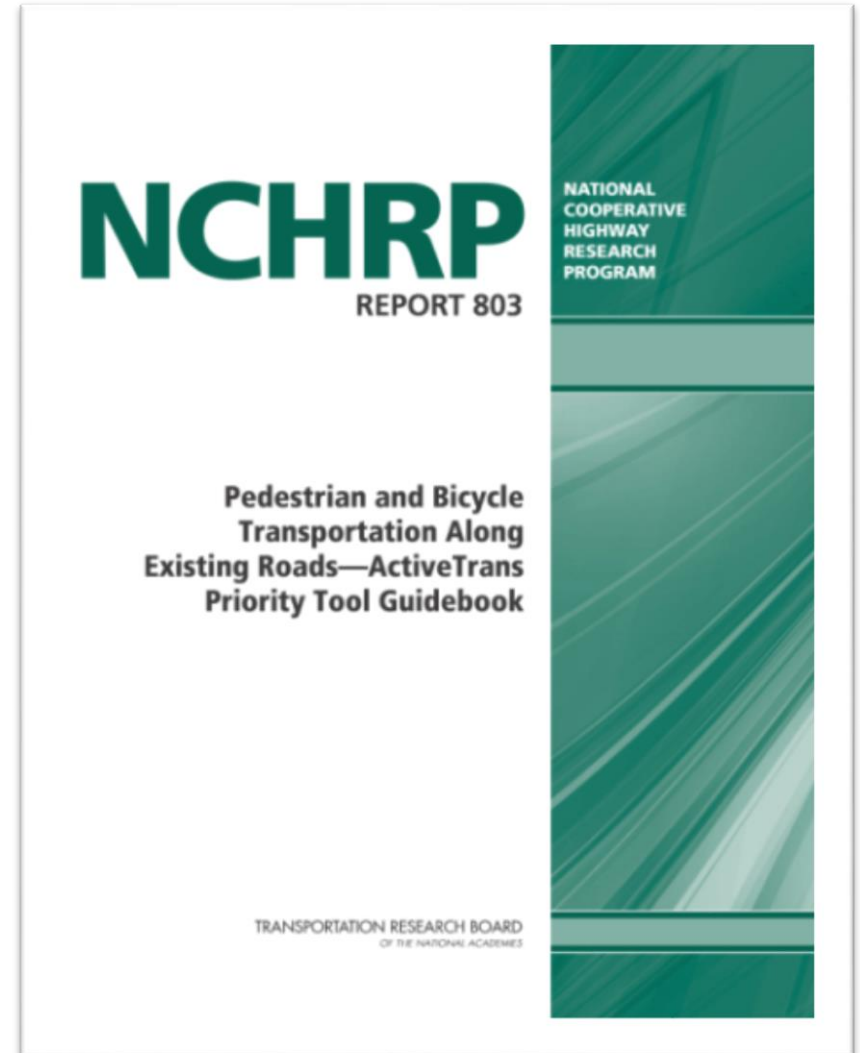


NCHRP 07-17 Overview

- NCHRP 07-17 Pedestrian and Bicycle Transportation along Existing Roads
- Project Goals:
 - Analyze **institutional approaches** for improving physical conditions for pedestrians and bicyclists
 - Evaluate **prioritization factors** including safety, accessibility, connectivity, health benefits, and economic development
 - Identify **data gaps** and research needs
 - *Develop a methodology to evaluate and prioritize pedestrian and bicycle facility improvements on existing roads*

NCHRP 803 – ActiveTrans Priority Tool Overview

- APT Guidebook
- GIS guidance
- Programmed Spreadsheet and User Guide
- Screencast
- Brochure/Poster
- NCHRP 803 Final Report with research approach and findings



Why is Prioritization Important?

- Lots of needs, but limited resources
- Need to make wise choices about how resources are used
- Need to communicate choices to others
- Need to build public/political support for action



Photo by Michael Hintze

Uses of the ActiveTrans Priority Tool

- May be applied at state, regional, and local levels.
- Can be applied at variety of geographies: segments, intersections, corridors, areas
- May be applied once or iteratively
- *Does not provide guidance for determining pedestrian and bicycle facility design solutions*



Uses of the ActiveTrans Priority Tool

- Planning Level Prioritization
- Project Prioritization
- Engage stakeholders/public in prioritization process
- Conduct funding-decision prioritization
- Prioritize list of “Complete Streets” projects to maximize benefits for walking or biking.



Photo by Toole Design Group

The APT Research Process

- Literature review
- Survey
- Interviews with transportation agencies
- Feedback from NCHRP panel
- Pilot tests

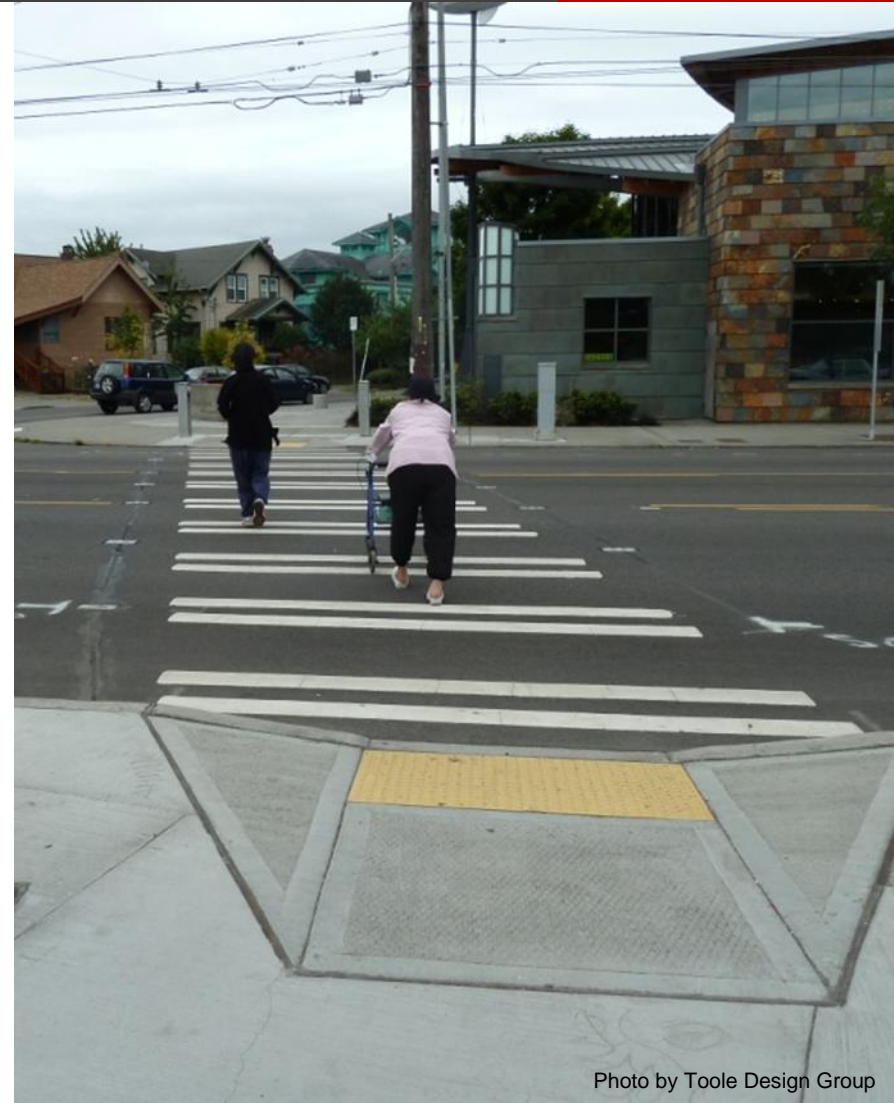


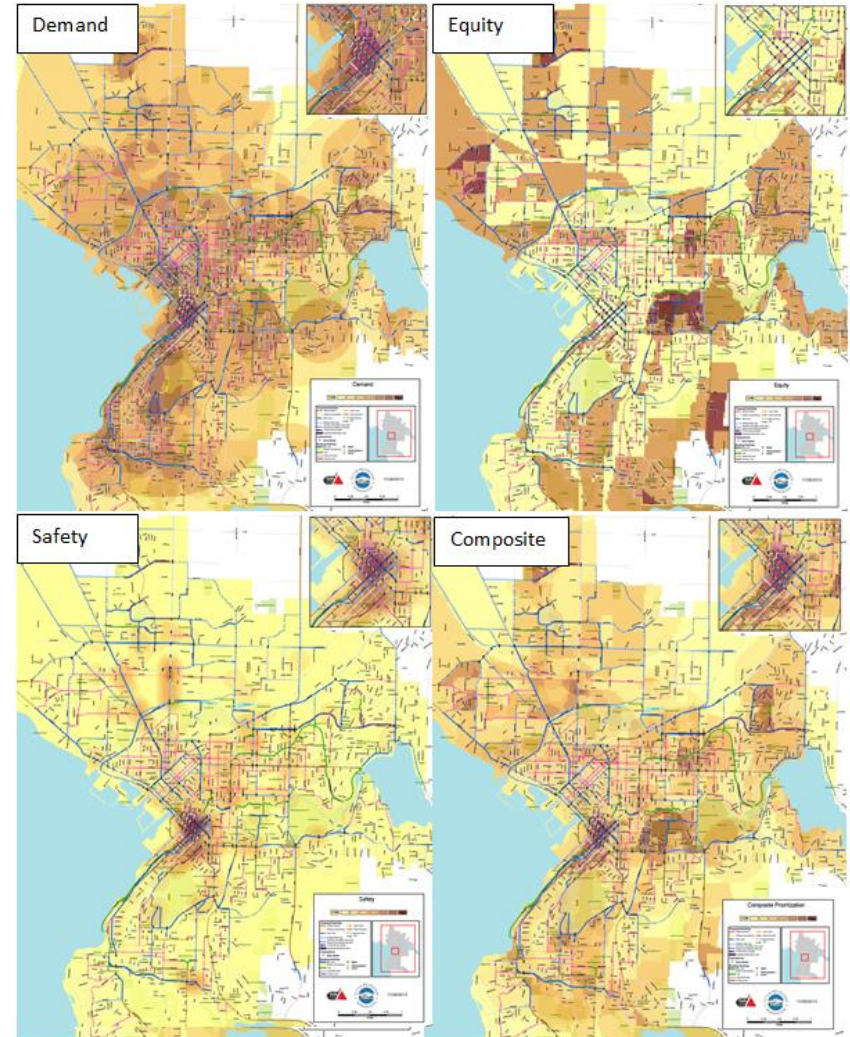
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Agency Interviews

Agency	Type	Population
Yountville, CA*†	City	3,000
Breckenridge, CO	City	4,540
Cheverly, MD*	City	6,200
Madras, OR*	City	6,250
Houghton, MI	City	7,700
Salisbury, NC†	City	34,000
Burlington, VT†	City	42,000
Carmel, IN	City	79,000
Roseville, CA	City	119,000
French Broad River MPO (Asheville, NC area)	MPO	417,000
Portland, OR†	City	584,000
Wilmington Area Planning Council (DE-MD)†	MPO	640,000
Charlotte, NC†	City	731,000
Knoxville RTPO	MPO	850,000
Delaware DOT	State	907,000
Massachusetts DOT	State	6,587,000
North Carolina DOT†	State	9,656,000
Washington State DOT†	State	6,830,000
Michigan DOT	State	9,876,000

Pilot Testing the APT

- Pilot Communities
 - Bellingham, WA
 - Bend, OR
 - Carmel, IN
 - Gastonia, NC
 - Miami, FL
 - Phoenix, AZ
 - Alameda County, CA
Transportation Commission
 - Casper Area MPO, WY
 - Humboldt County, CA
Association Of Governments
 - *New Mexico DOT*



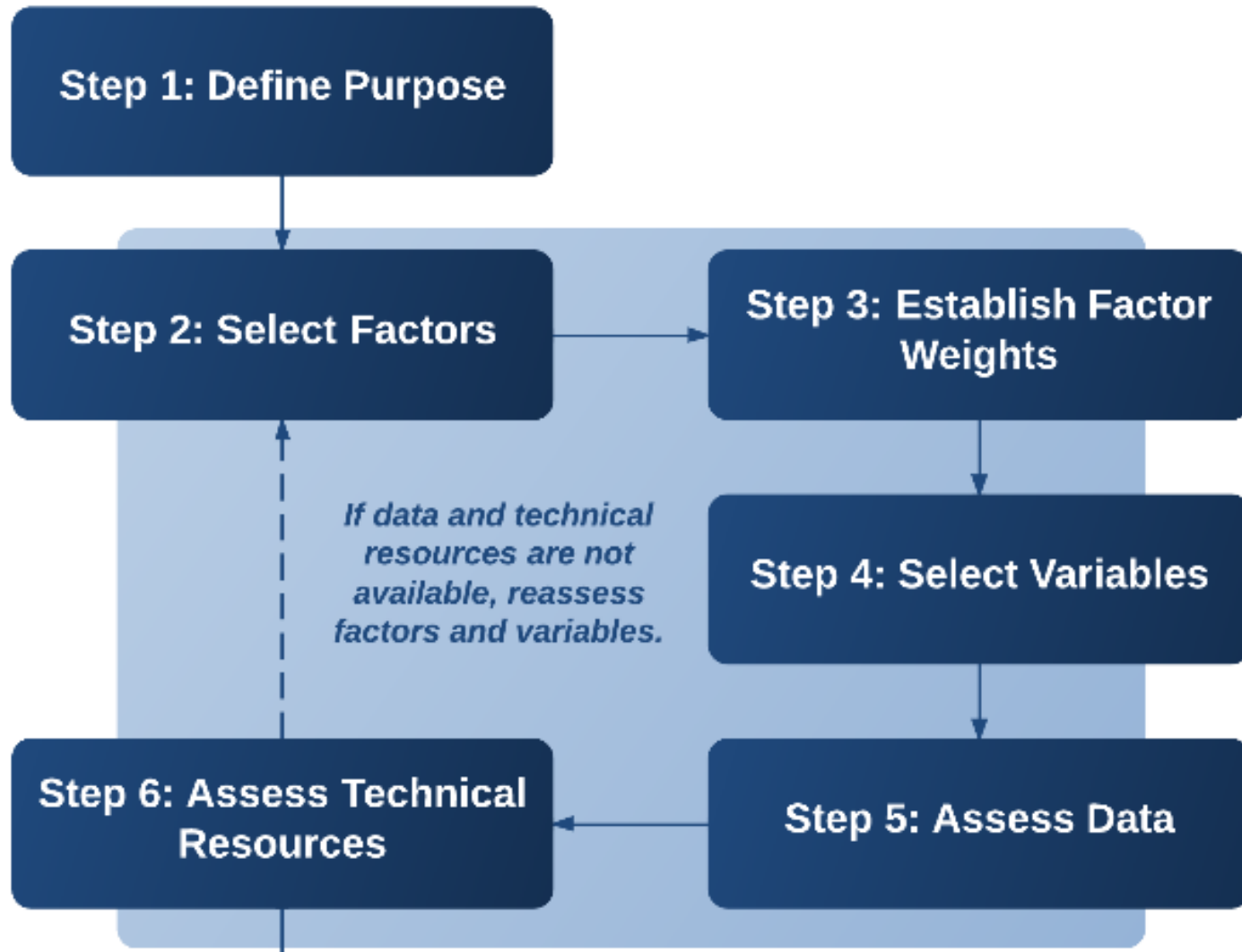
State of the Practice → APT

- No need to reinvent the wheel
- Different levels of technical capabilities, data, etc --> need to be flexible
- Open the “black box”
- Develop common language
- Offer guidance for important decision points



Photo by Robert Schneider

APT Overview—Phase I: Scoping



Step 1: Define Purpose

- Mode
- Goals
- Improvement-specific vs. general location
- Type/extent of improvement locations
- Number of improvement locations



Photo by Michael Hintze

Step 2: Select Factors

1. Stakeholder Input
2. Constraints
3. Opportunities
4. Safety
5. Existing Conditions
6. Demand
7. Connectivity
8. Equity
9. Compliance



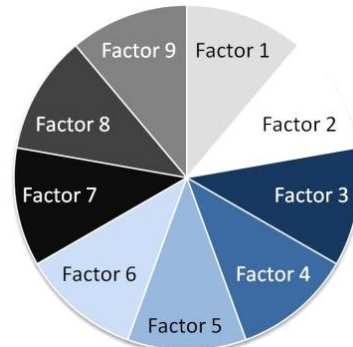
Photo by Michael Hintze

Step 2: Select Factors

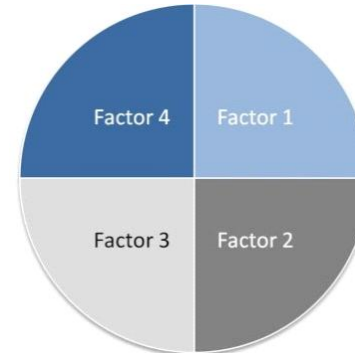
Prioritization Purpose Examples	Stakeholder Input	Constraints	Opportunities	Safety	Existing Conditions	Demand	Connectivity	Equity	Compliance
<i>Segment</i>									
Given a neighborhood where sidewalks are absent, select 30 segments to construct new sidewalks over the next three years	●	◐	◐	●	●	●	◐	●	○
<i>Intersection/Crossing</i>									
Given a regional trail with 50 unsignalized roadway crossings, identify 12 crossings for safety enhancements	●	○	◐	●	●	◐	○	◐	●

● = Very relevant; ◐ = Less relevant; ○ = Not likely relevant

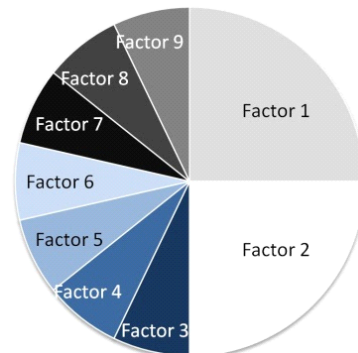
Step 3: Establish Weights



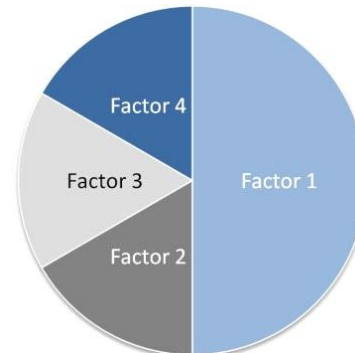
Nine Factors
Equally Weighted



Four Factors
Equally Weighted



Nine Factors
Factors 1 and 2 weighted more heavily



Four Factors
Factor 1 weighted more heavily

Relative impact of factors if weighted differently

Step 4: Select Variables

- Set of possible variables is included for each factor category
- Possible variables came from:
 - Literature review
 - Agency survey
 - Best practice guidance from organizations such as NCHRP, FHWA, AASHTO, NACTO, and ITE.
 - Professional experience of research team

APT Variable Sources: Existing Conditions

Variable	Pedestrian Level of Service (LOS) (Segment)	Pedestrian Level of Service (LOS) (Uncontrolled Crossing)	Pedestrian Level of Service (LOS) (Signalized Intersection)	FHWA Crosswalk Guidelines	Pedestrian Intersection Safety Index (ISI)	Pedestrian Crash Modification Factors
Traffic speed in the parallel direction of travel or roadway being crossed	X	X	X	X	X	
Traffic volume and composition (proportion heavy vehicles) in the parallel direction of travel or roadway being crossed	X	X		X	X	
Right-turn-on-red restricted/allowed			X			X
Signal timing (e.g., leading pedestrian interval, pedestrian clearance time, pedestrian and bicycle delay)						X
Presence/type of traffic control (e.g., traffic signal, stop sign)					X	
Presence of crosswalk warning signs or beacons (e.g., in-street crossing signs, rectangular rapid flashing beacons, pedestrian hybrid beacon)		X				X
Number of general-purpose (through) lanes in the parallel direction of travel or being crossed	X		X	X	X	

Note: A complete list of Existing Conditions variables is included in the APT Guidebook

APT Variables: Existing Conditions

Example Variables	Relevance		Potential Location
	Ped	Bike	
<i>Note: The relevance designations in this table are meant to provide general guidance. Ultimately, variable relevance depends on the prioritization purpose. Agencies are encouraged to review each variable and consider how relevant it may be considering their purpose. Appendix C provides references for the variables listed in this table to assist practitioners in finding additional information.</i>	<ul style="list-style-type: none"> ● = Very relevant ◐ = Less relevant ○ = Not likely relevant 		S = Segment Cr = Crossing Co = Corridor A = Area
Traffic speed ¹	●	●	Cr, S, Co
Traffic volume and composition (percentage of heavy vehicles)	●	●	Cr, S, Co
Right-turning traffic volume	◐	●	Cr
Type of traffic control (e.g., traffic signal, stop sign)	●	●	Cr
Presence of crosswalk warning signage or beacons	◐	◐	Cr
Width of outside through lane	○	●	S, Co
Presence and width of buffer between sidewalk and moving traffic	●	○	S, Co

Note: A complete list of Existing Conditions variables is included in the APT Guidebook

Step 5: Assess Data

Inventory readily available data

(e.g., roadway data, land use, traffic counts)

Seek other data sources (if necessary)

(e.g., regional, state or federal agency data, open data sources)

Collect new data (if necessary)

- Generate data from GIS analysis (see Step 8)
- High-level collection (e.g., using aerials, Street View imagery)
- Field verification/assessment
- Automatic (counters, video)

Or- don't use that variable if no data is available!

Guidance on Data Sources

Example Demand Proxy Variables	Data Considerations/Sources
Population density	Population of given geography divided by its area, U.S. Census
Employment density	Employment is often compiled at the regional level and made available to local agencies by request from the Census Transportation Planning Package for traffic analysis zones. Density is calculated by dividing the number of employees by a measure of area. Longitudinal Employer-Household Dynamics (LEHD) is another U.S. Census program that can provide employer/employee data estimates.
Transit station or stop density/proximity/accessibility	Point data typically maintained by transit agency
Socioeconomic characteristics (e.g., proportion of neighborhood residents living in poverty or without access to an automobile)	U.S. Census data (block group-level data may be most appropriate for projecting demand). Note: This type of data may also be used for variables within the Equity factor.
Proximity to or number of bike share docking stations	Point data layer of bike share stations

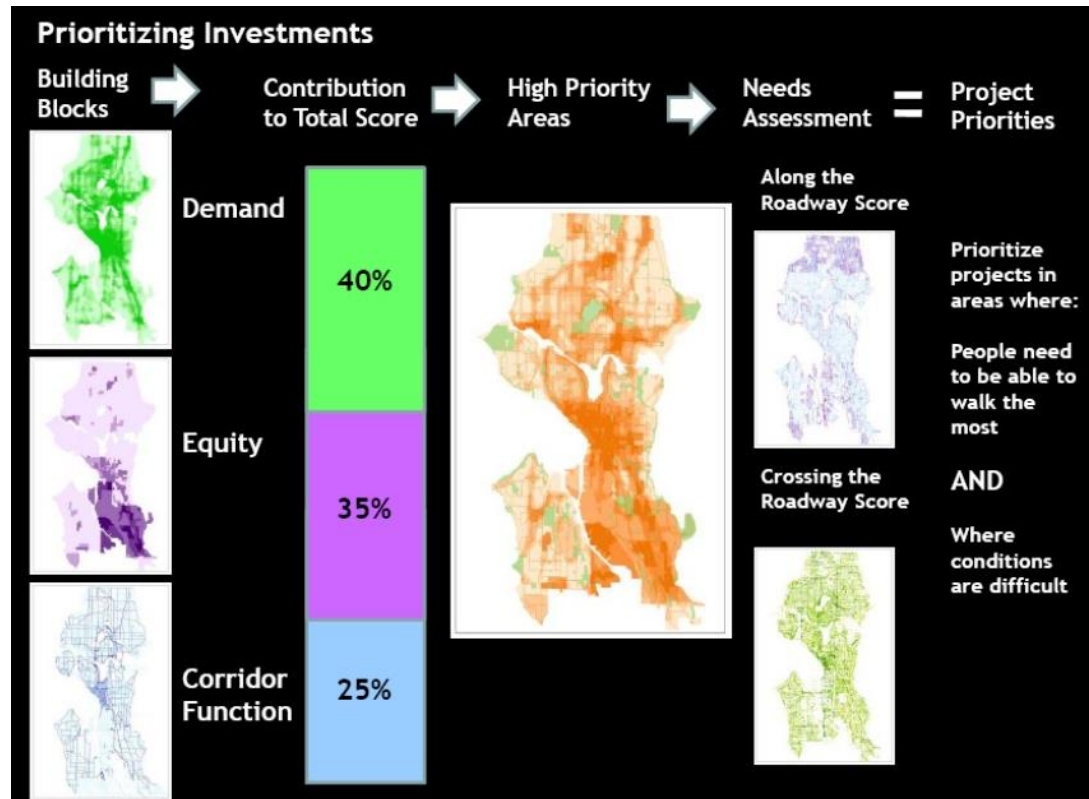
Guidance on Data Collection

Inventory Data Source/Tool	Can be used to inventory data for these variables
Aerial Imagery	<ul style="list-style-type: none">• Sidewalk and buffer presence and width• Marked crosswalk presence and type• Median island presence and width• Bicycle facility presence and width• Lane width/shoulder width• Pedestrian crossing distance
Street-Level Imagery (e.g. video log, Street View)	<ul style="list-style-type: none">• Curb ramp presence• Truncated domes presence• Pedestrian/bicycle-related signage• Major sidewalk obstructions• Pedestrian signal heads• Pedestrian push buttons
Direct Field Observation (using technological data collection tools or manual observations)	<ul style="list-style-type: none">• More precise lane width/shoulder width• Traffic volume• Traffic speed• Sidewalk condition• Crosswalk condition• Pavement condition• Curb ramp slope• On-street parking presence and occupancy

Step 6: Assess Technical Resources

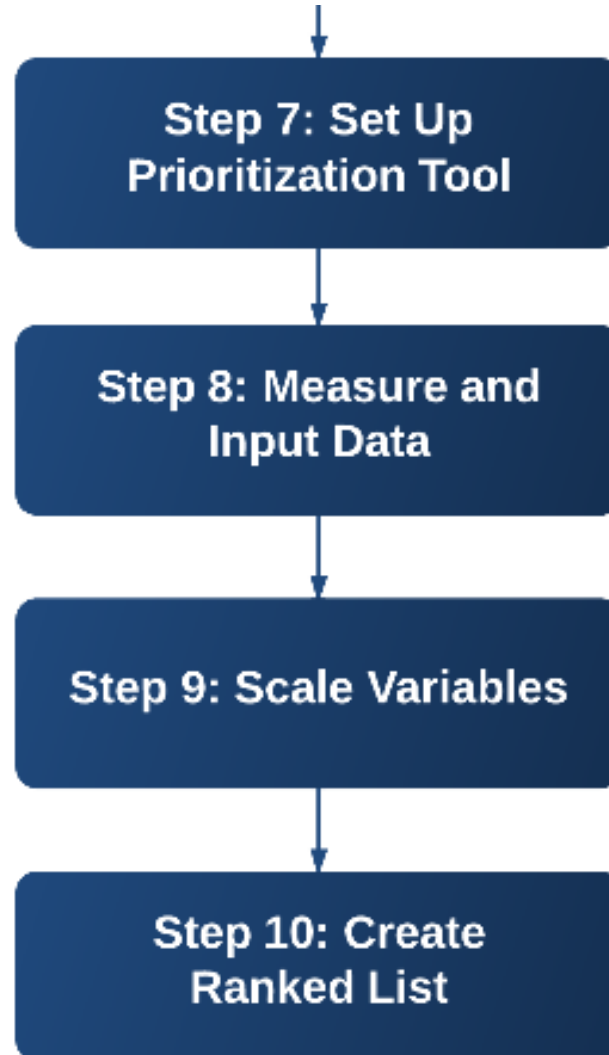
Step 10A: Calculate Priority Score						
ID	LOCATION	Safety SCORE	Safety WEIGHTED SCORE	Demand SCORE	Demand WEIGHTED SCORE	Prioritization Score
1	Pine St	0.0	0.0	2.5	25.0	25.0
2	Marion St	10.0	100.0	3.0	30.0	130.0
3	Hinds St	0.0	0.0	5.0	50.0	50.0
4	Lander St	7.0	70.0	9.5	95.0	165.0

APT is intended to work for a range of technological capabilities

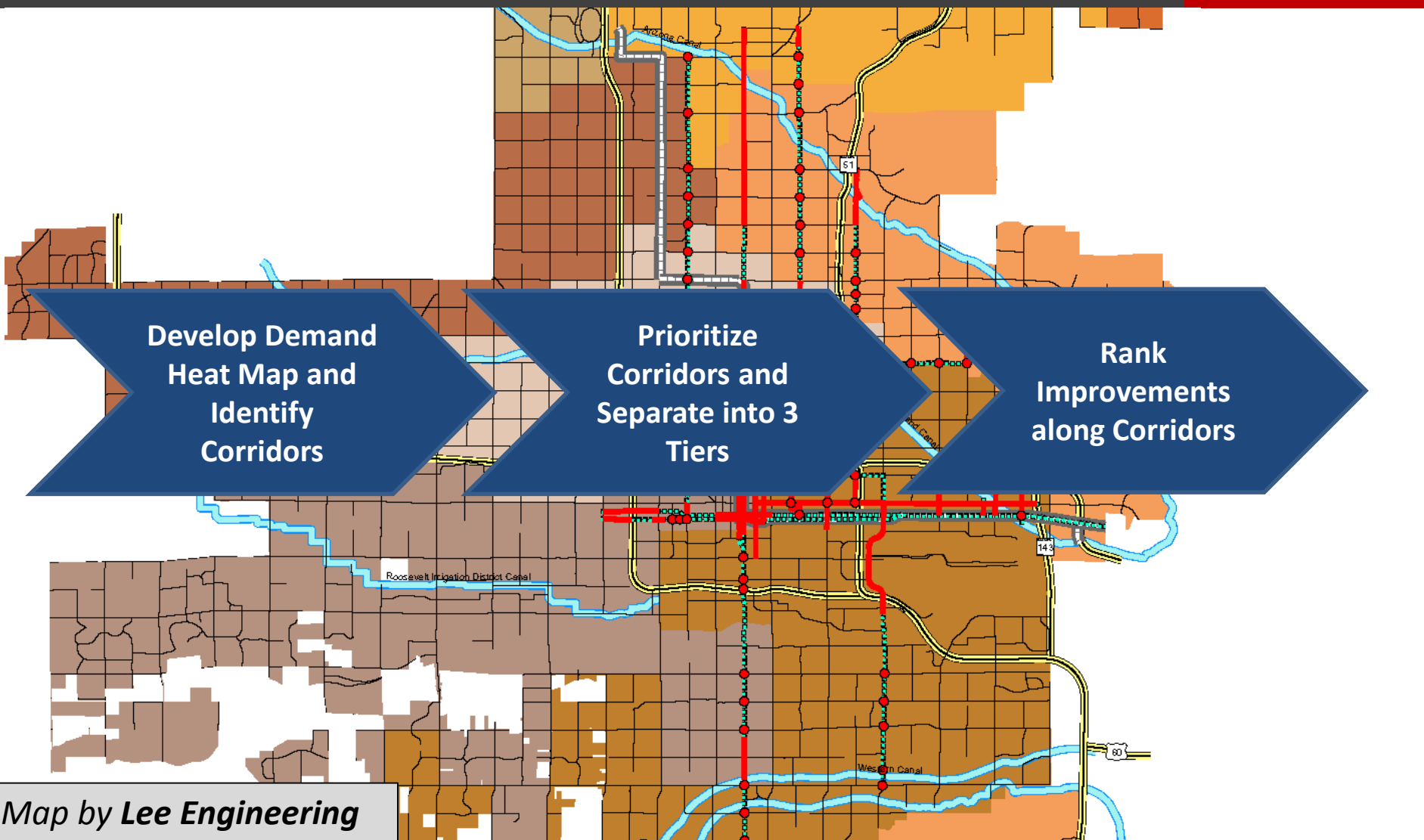


GIS Example Source: Seattle Pedestrian Master Plan, 2009

APT Overview—Phase II



The APT in Action--Phoenix



The background map shows a portion of Phoenix, Arizona, with various colored zones in shades of brown and orange. Blue lines represent canals, including the 'Roosevelt Irrigation District Canal' and 'Weston Canal'. Red lines with circular markers indicate prioritized corridors for water infrastructure improvements. Highway shields for SR 51, SR 143, and SR 80 are visible. Three large blue arrows point from left to right across the map, representing the sequential steps of the APT process.

**Develop Demand
Heat Map and
Identify
Corridors**

**Prioritize
Corridors and
Separate into 3
Tiers**

**Rank
Improvements
along Corridors**

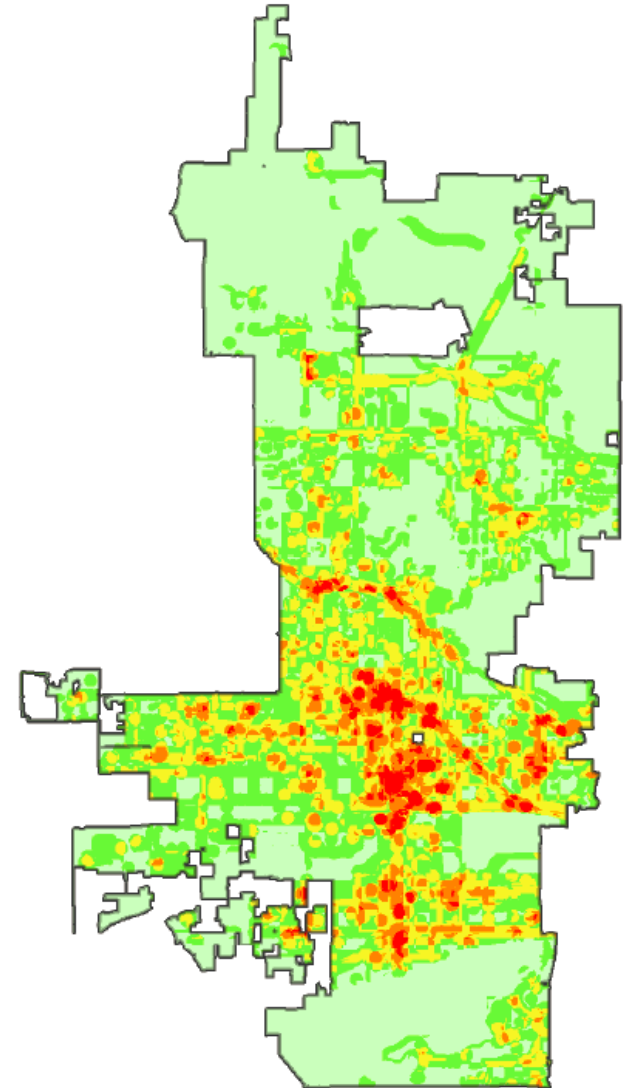
Map by Lee Engineering

Phoenix – Iteration 1

Identify High Demand Areas

Calculating DEMAND

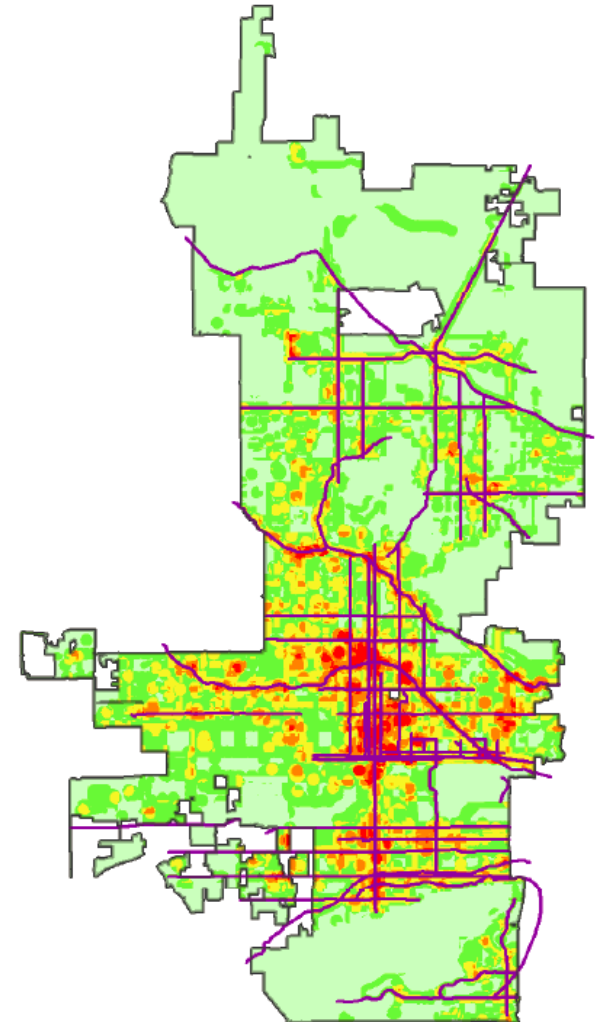
Variable	Source
Schools	City of Phoenix
Bus Stops	City of Phoenix
City Facilities (e.g. libraries, municipal offices, etc.)	City of Phoenix
Community Centers	City of Phoenix
Light Rail Stops	Valley Metro
Park and Rides	Valley Metro
Parks	City of Phoenix
Existing Bikeways	City of Phoenix
Wikimap Routes	Wikimap
Wikimap Destinations	Wikimap
% of Households in Poverty	U.S. Census
% of Population under 18	U.S. Census
% Households with No Vehicle	U.S. Census
Population Density	City of Phoenix



Phoenix – Iteration 2

Identify Priority Corridors

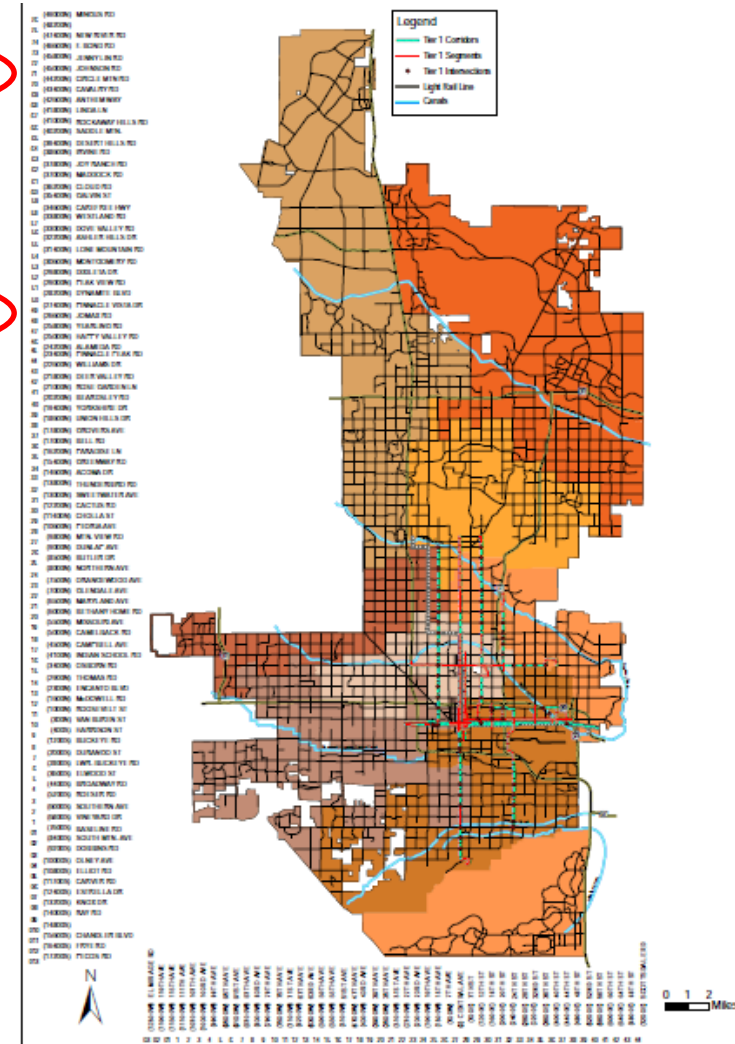
Factor	Weight	Variable	Source
Connectivity	10	Number of times corridor intersects other corridors	N/A
		Number times corridor intersects bicycle facilities	N/A
		Presence of existing bicycle facilities	City of Phoenix
Demand	7	Primary attractors (light rail stops, colleges/universities) within 1 mile of the corridor	Valley Metro Google Maps
		Secondary attractors (schools, city facilities, community centers, park and rides, parks) within ¼ mile of the corridor. Also includes bus stops directly on the corridor	City of Phoenix Valley Metro
		Land Use (commercial and high-density housing)	City of Phoenix
		Population Density	City of Phoenix
		% Households in Poverty	U.S. Census
		% Households with No Vehicle	U.S. Census
		% of Population under 18	U.S. Census
		Bicycle Trip Origin and Destination Zip Codes from the Maricopa County Trip Reduction Survey	MAG
Stakeholder Input	3	Wikimap Destinations (included public meeting input and transit center surveys)	Wikimap
		Wikimap Routes (included public meeting input)	Wikimap
		Ad Hoc Task Force input	Task Force
		Technical Advisory Committee input	TAC



Phoenix – Iteration 3

Identify Priority Projects

Factor	Variable	Source
Connectivity	Bicycling Barriers	Wikimap
	Existing Bikeways	City of Phoenix
Safety	Bicycle Crashes	MAG
	% of Population under 18	U.S. Census
Existing Conditions	Posted Speed Limit	City of Phoenix
	Street Classification	City of Phoenix
Constraints	Order of Magnitude Cost	Lee Engineering
	Available Rights of Way	City of Phoenix
Demand	Tier 1 Attractors (light rail stops, colleges/universities, schools)	Valley Metro
		Google Maps
	Tier II Attractors (bus stops, bikeshare stations, city facilities, community centers, park-and-rides, parks)	City of Phoenix Valley Metro
	Population Density	City of Phoenix
	Land Use (commercial and high-density housing)	Maricopa County
Equity	% Households in Poverty	U.S. Census
	% Households with No Vehicle	U.S. Census



The APT in Action--Tulsa

- Good example of regional pedestrian and bicycle facility prioritization
- Project steering committee and INCOG Bicycle and Pedestrian Advisory Committee provided input on factors and factor weights
- City of Tulsa staff requested inclusion of additional variables for City projects—had more data that could be used for prioritization

City of Tulsa Bike Prioritization Weighting Factors and Variables

Factor	Variables	Weight
Stakeholder Input		10%
	# WikiMap comments on corridor	
	Presence on project retreat prioritization list	
Opportunities		20%
	% of corridor included on Improve Our Tulsa ¹	
	% of corridor with project identified in prior plan ²	
	Lower project cost (planning-level cost per mile)	
Safety		20%
	# of bike and pedestrian crashes per mile	
	# of fatal or severe bike and pedestrian crashes per mile	
	Change in Level of Traffic Stress based on recommended bike facility	
Demand		20%
	Average demand score for length of project	
	% of project coincident with existing transit line	
	Population density	
Equity		10%
	# of areas served with low automobile ownership	
	# of areas served a high % of low-income population	
	# of areas served with high % of population under 18	
Connectivity		20%
	# of connections to an existing in-street bike facility	
	# of connections to an existing trail	
	# of connections to a planned on-street bike facility	
	# of connections to planned off-street bike facility	

¹ Tulsa-only variable

² Tulsa-only variable. Included multimodal corridors from PLANiTULSA and small area plans provided by the City of Tulsa Planning Department.

The APT in Action--Tulsa

- Prioritization lists included in plan appendix.
- INCOG and communities advised to use lists as guide

Table 1: Bixby Prioritized Bike Projects

Project	Facility	Length	Cost	Street	From	To	Score	Citywide Prioritization Rank	Regional Rank
BX-002	Bike Lane	1.49	\$72,287	RIVERVIEW DR	DIXBY TRAIL	E 161 ST S	25.767	1	40
BX-001	Bike Lane	1.00	\$36,168	E 151 ST S	S MEMORIAL DR	S MINGO RD	23.124	2	60
BX-003	Shared Lane Marking	0.65	\$21,754	E 131 ST S	FRY CREEK TRAIL	S MEMORIAL DR	18.594	3	128
BX-020	Trail	1.20	\$1,066,933	FRY CREEK TRAIL	E 111 ST S	FRY CREEK TRAIL	16.216	4	181
BX-030	Trail	1.48	\$1,314,661	S MINGO RD	DIXBY TRAIL	RP DIXBY/DA TRAIL	16.203	5	183
BX-032	Trail	1.01	\$898,603	PROPOSED TRAIL	FRY CREEK TRAIL	E 131 ST S	14.351	6	253
BX-017	Trail	3.01	\$2,677,253	FRY CREEK TRAIL	E 151ST ST S.	DIXBY RIVER TRAIL	14.114	7	267
BX-005	Shared Lane Marking	1.15	\$38,220	E 141 ST S	MISSOURI PACIFIC TRAIL	S MEMORIAL DR	13.944	8	275
BX-006	Shared Lane Marking	0.51	\$17,011	S YALE AVE	S KIMBERLY-CLARK PL	E 141 ST S	13.643	9	294
BX-008	Shared Lane Marking	1.64	\$22,050	PROPOSED TRAIL	N RIVERVIEW DR	E 161 ST S	13.355	10	309
BX-015	Sidpath	2.98	\$2,140,991	E 121 ST S	S SHERIDAN RD	HAIKEY CREEK	13.353	11	310
BX-007	Shared Lane Marking	0.50	\$16,659	DAWES AVE	N RIVERVIEW DR	S MEMORIAL DR	13.262	12	317
BX-024	Sidpath	2.14	\$1,540,426	S MEMORIAL DR	E 146TH ST S	E HWY64 EXPY	13.148	13	324
BX-021	Trail	2.40	\$2,131,821	FRY CREEK TRAIL	E 121 ST S	FRY CREEK TRAIL	12.788	14	348
BX-014	Sidpath	1.99	\$1,434,258	E 111 ST S	S MEMORIAL DR	S GARNETT RD	12.449	15	376
BX-013	Shared Lane Marking	1.02	\$810	S HARVARD AVE	E 141 ST S	E 151 ST S	12.047	16	404
BX-019	Trail	0.45	\$402,911	FRY CREEK TRAIL	E 131 ST S	FRY CREEK TRAIL	12.025	17	406
BX-011	Shared Lane Marking	0.20	\$3,053	S 90 E AVE	S 91 E AVE	E 111 ST S	11.690	18	438
BX-025	Signed Route	1.37	\$1,085	S MEMORIAL DR	E HWY64 EXPY	E 101 ST S	11.401	19	460
BX-012	Signed Route	0.74	\$587	S HARVARD AVE	E 161 ST S	S HARVARD AVE	11.260	20	476
BX-004	Shared Lane Marking	1.10	\$36,726	E 141 ST S	S YALE AVE	MISSOURI PACIFIC TRAIL	11.036	21	495
BX-016	Sidpath	3.51	\$2,622,966	E 151 ST S	S. COLUMBIA AVE E.	S MEMORIAL DR	10.957	22	500
BX-009	Signed Route	3.00	\$2,379	S SHERIDAN RD	E 151 ST S	E 101 ST S	10.896	23	505
BX-018	Trail	0.72	\$637,715	DIXBY RIVER TRAIL	E 151ST ST S.	N. RIVERVIEW DRIVE	10.852	24	510
BX-026	Trail	1.70	\$1,509,312	MISSOURI PACIFIC TRAIL	MISSOURI PACIFIC TRAIL	DIXBY TRAIL	10.852	25	511
BX-022	Trail	0.95	\$840,318	FRY CREEK TRAIL	E 121 ST S	E 113 ST S	10.605	26	521
BX-028	Trail	0.23	\$207,022	E 131 ST S	S SHERIDAN RD	FRY CREEK TRAIL	10.339	27	532
BX-027	Trail	2.39	\$2,121,209	RP DIXBY/DA TRAIL	RP DIXBY/DA TRAIL	DIXBY TRAIL	10.301	28	533
BX-034	Trail	0.48	\$430,559	E EAGLE DR	FRY CREEK TRAIL	111TH STREET S.	9.163	29	562
BX-033	Trail	0.71	\$627,453	PROPOSED TRAIL	E 111 ST S	HAIKEY CREEK PARK TRAIL	7.487	30	623
BX-029	Trail	2.62	\$2,329,927	POSEY CREEK PROPOSED TRAIL	S LEWIS AVE	S KIMBERLY-CLARK PL	7.396	31	634
BX-023	Trail	2.18	\$1,931,855	HAIKEY CREEK TRAIL	S GARNETT RD	HAIKEY CREEK TRAIL	7.200	32	643
BX-031	Trail	0.33	\$294,018	PROPOSED TRAIL	HAIKEY CREEK TRAIL	PROPOSED TRAIL	6.776	33	656
BX-010	Signed Route	1.04	\$926,275	S KIMBERLY-CLARK PL	E 151 ST S	PROPOSED TC TRAIL	3.406	34	662

Table 12: Broken Arrow Prioritized Sidewalk Gaps

Project number	Street	Prioritization Rank	Prioritization Score	Length (Feet)	Estimated Project Cost
BA-140	S Elm Pl	1	26755	1,025	\$51,250
BA-141	S Elm Pl	2	26753	228	\$11,400
BA-86	N Aspen Ave	3	23895	791	\$39,550
BA-85	N Aspen Ave	4	23894	1,327	\$66,350
BA-1	W Kenosha St	5	23025	191	\$9,550
BA-87	N Elm Pl	6	21981	203	\$10,150
BA-88	N Elm Pl	7	21981	139	\$6,950
BA-90	N Elm Pl	9	21401	2,200	\$110,000
BA-89	N Elm Pl	10	21398	341	\$17,050
BA-45	W Kenosha St	11	20954	391	\$19,550
BA-47	W Washington St	12	20029	173	\$8,650
BA-21	E Kenosha St	13	19293	3,504	\$175,200
BA-34	N Aspen Ave	14	18824	4,752	\$237,600
BA-46	W Kenosha St	15	18028	1,160	\$58,000
BA-134	N 9th St	16	17799	197	\$9,850
BA-135	N 9th St	17	17797	1,655	\$82,750
BA-91	W Houston St	18	17561	526	\$26,300
BA-92	W Houston St	19	17561	614	\$30,700
BA-80	E Kenosha St	20	17171	2,120	\$106,000
BA-125	E Kenosha St	21	17070	571	\$28,550
BA-126	E Kenosha St	22	17070	2,149	\$107,450
BA-73	N 23rd St	23	15916	1,022	\$51,100
BA-144	W New Orleans St	24	15703	421	\$21,050
BA-145	W New Orleans St	25	15702	1,068	\$53,400
BA-146	W New Orleans St	26	15701	266	\$13,300
BA-7	S Elm Pl	27	15621	495	\$24,750
BA-82	N Aspen Ave	29	14732	30	\$1,500
BA-114	E Kenosha St	30	14309	751	\$37,550
BA-115	E Kenosha St	31	14309	3,200	\$160,000
BA-116	E Kenosha St	32	14309	131	\$6,550
BA-6	W Washington St	33	14046	427	\$21,350
BA-170	N 23rd St	34	13898	1,383	\$69,150
BA-169	N 23rd St	35	13897	2,487	\$124,350
BA-61	E 101st St S	36	13053	12	\$600
BA-83	N Olive St	37	12845	1,538	\$76,900
BA-84	N Olive St	38	12845	1,130	\$56,500
BA-74	N 23rd St	39	12419	2,024	\$101,200
BA-40	N 9th St	40	12163	1,333	\$66,650
BA-10	W New Orleans St	41	11487	240	\$12,000
BA-153	S Mingo Rd	43	11001	407	\$20,350
BA-154	S Mingo Rd	44	11001	446	\$22,300
BA-155	S Mingo Rd	45	11000	565	\$28,250
BA-129	W Omaha St	51	10608	426	\$21,300
BA-130	W Omaha St	52	10605	198	\$9,900
BA-131	W Omaha St	53	10605	461	\$23,050
BA-132	W Omaha St	54	10605	271	\$13,550
BA-133	W Omaha St	55	10605	1,076	\$53,800

Other Agencies that Have Used the APT

- Alexandria, VA
- Arvada, CO
- Bellingham, WA
- Boston Region MPO
- Casper, WY
- Charlottesville, VA
- Metropolitan Council (Twin Cities)
- Colorado Springs, CO
- Durham, NC
- Jacksonville, FL
- MassDOT
- Oregon DOT
- Wheat Ridge, CO

Why prioritize with the APT?

- Transparent
 - Flexible
 - Responsive
 - Supported by research
-
- **Save time and effort (\$\$\$) versus creating a prioritization method from scratch**



APT Resources

- APT Guidebook
- Programmed Spreadsheet and User Guide and screencast
- GIS guidance
- Brochure
- NCHRP 803 Final Report with research approach and findings

www.pedbikeinfo.org/apt



Questions & Discussion



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