

Safe Routes from Schools to Parks:

South Side Milwaukee Pilot Study

EMMANUEL OKORO, ANDREW SALEH, & ROBERT HEIDEN

UNIVERSITY OF WISCONSIN-MILWAUKEE

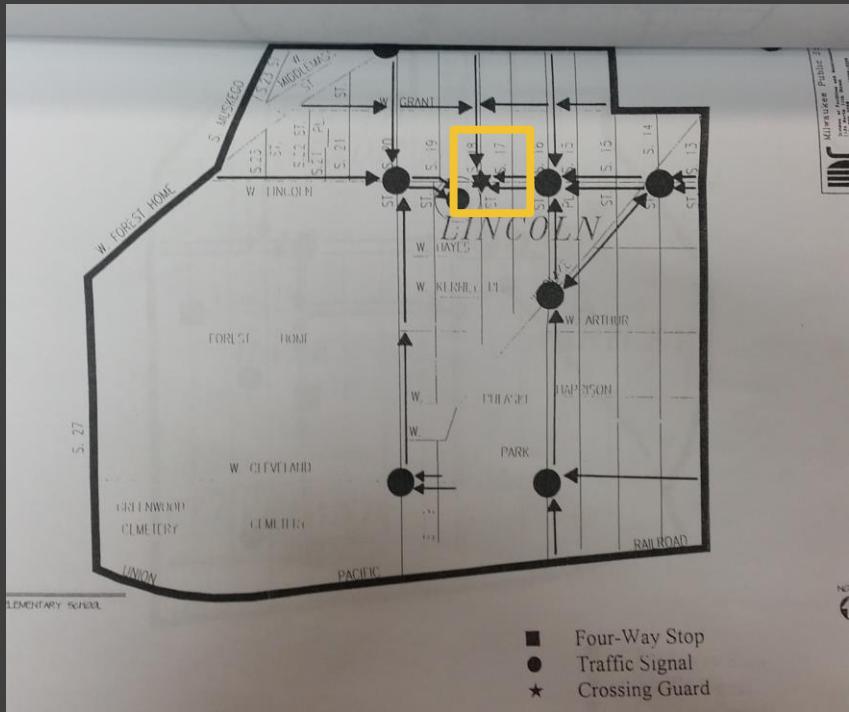
For

City of Milwaukee Department of Public Works



Introduction:

- Safe routes from schools to local parks
 - Avoid reckless behavior
- Common Sense based decision making
 - Example; Crossing guard locations
 - Need for more data driven decision making



DPW Crossing Guard Map 2018

Vision and Scope:

- Study Area (South-side Milwaukee)
 - $\frac{1}{2}$ mile radius from parks
- 2 parks
 - Pulaski Park
 - KK Sports Center
- 2 schools
 - Lincoln Avenue Elementary Public School
 - Zablocki Elementary Public School



Data	Attribute Name	Description	Purpose	Source
WI DOT crash data	Crash Weight	Point features for vehicle crashes 2012-2017	Crashes reflect reckless behavior	Wisconsin TOPS
WISLR road network	Walk time (seconds)	Line segment lengths converted to estimated walk times 2018	Safe routes still need to be reasonable lengths	WISLR
WISLR road network	Arterial Weight, Curb Weight	Line features for all roads 2018	Arterial streets are less safe	WISLR
WISLR road network	Signal Weight	Point features for signalized intersections 2018	Signalized intersections are safer locations to cross	WISLR
Milwaukee City crimes	Crime Weight	Point features for crimes 2017	Crimes reflect reckless behavior	COMPASS
Milwaukee Public Schools	School Name	Point features for MPS 2014	Cartographic/ Locational	Wisconsin Department of Public Instruction
Milwaukee County Parks	Park Name	Polygon features for MCP 2009	Cartographic/ Locational	AGSL



Network Analyst Weights Table:

Table

Study_Area_Clip_1

Feet_Lengt	WalkingTim	RightCurb_	LeftCurb_W	Arterial_W	Parking_We	Crime_Coun	Crime_Weig	Sum_Signal	Signal_Wei	Crash_Coun	TotCrash_W	Rough_Fina	Arterial_F	Signal_F	Crash_F
10.666033	3.047438	-5	-5	0	0	0	0	0	0	3	60	53.047438	3.047438	3.047438	63.047438
645.199113	184.342604	-5	-5	0	0	0	0	0	0	3	60	53.047438	3.047438	3.047438	63.047438
370.123183	105.749481	-5	-5	0	0	3	90								
598.969134	171.134038	-5	-5	0	0	0	0	0	0						
310.03728	88.58208	-5	-5	100	0	0	0	0	0						
318.651152	91.043186	-5	-5	0	0	0	0	0	0						
15.71495	4.489996	-5	-5	0	0	0	0	0	0						
27.102558	7.743588	-5	-5	0	0	0	0	0	0						
325.75878	93.07937	-5	-5	0	0	0	0	0	0						
9.933526	2.83815	-5	-5	0	0	0	0	0	0						
489.961829	139.989094	-5	-5	0	0	0	1	30							
326.669294	93.334084	-5	-5	100	0	0	0	0	0						
556.014482	158.861281	-5	-5	0	0	0	3	90							
326.538402	93.296686	-5	-5	100	0	3	90								
653.388284	186.682367	-5	-5	100	0	2	60								
327.200691	93.485912	-5	-5	0	0	1	30								
222.765901	63.6474	-5	-5	100	0	1	30								
317.655907	90.75883	-5	-5	0	0	0	0	0	0						
63.598351	18.170958	0	0	100	0	0	0	0	0						
662.104456	189.172702	-5	-5	100	0	1	30								
568.951814	162.557661	-5	-5	0	0	3	90								
645.190576	184.340164	-5	-5	0	0	0	0	0	0						
322.772566	92.220733	-5	-5	100	0	1	30								
13.922716	3.977919	-5	-5	0	0	0	0	0	0						
641.027492	183.150712	-5	-5	0	0	0	0	0	0						
9.694739	2.769926	-5	-5	0	0	0	0	0	0						
325.757212	93.073489	-5	-5	0	0	0	0	0	0						
369.550626	105.585893	-5	-5	0	0	0	0	0	0						
647.315374	184.94725	-5	-5	0	0	0	0	0	0						
752.054583	214.872738	-5	-5	0	0	5	150								
35.013846	10.003956	-5	-5	0	0	0	0	0	0						
292.760153	83.645758	-5	-5	0	0	0	0	0	0						
325.014691	92.86134	-5	-5	100	0	0	0	0	0						
41.705304	11.915801	-5	-5	100	0	1	30								
1079.567498	308.447857	-5	-5	0	0	1	30								
607.018418	173.433834	-5	-5	0	0	0	0	0	0						
367.473065	104.992304	-5	-5	0	0	2	60								
493.71487	141.061391	-5	-5	0	0	3	90								

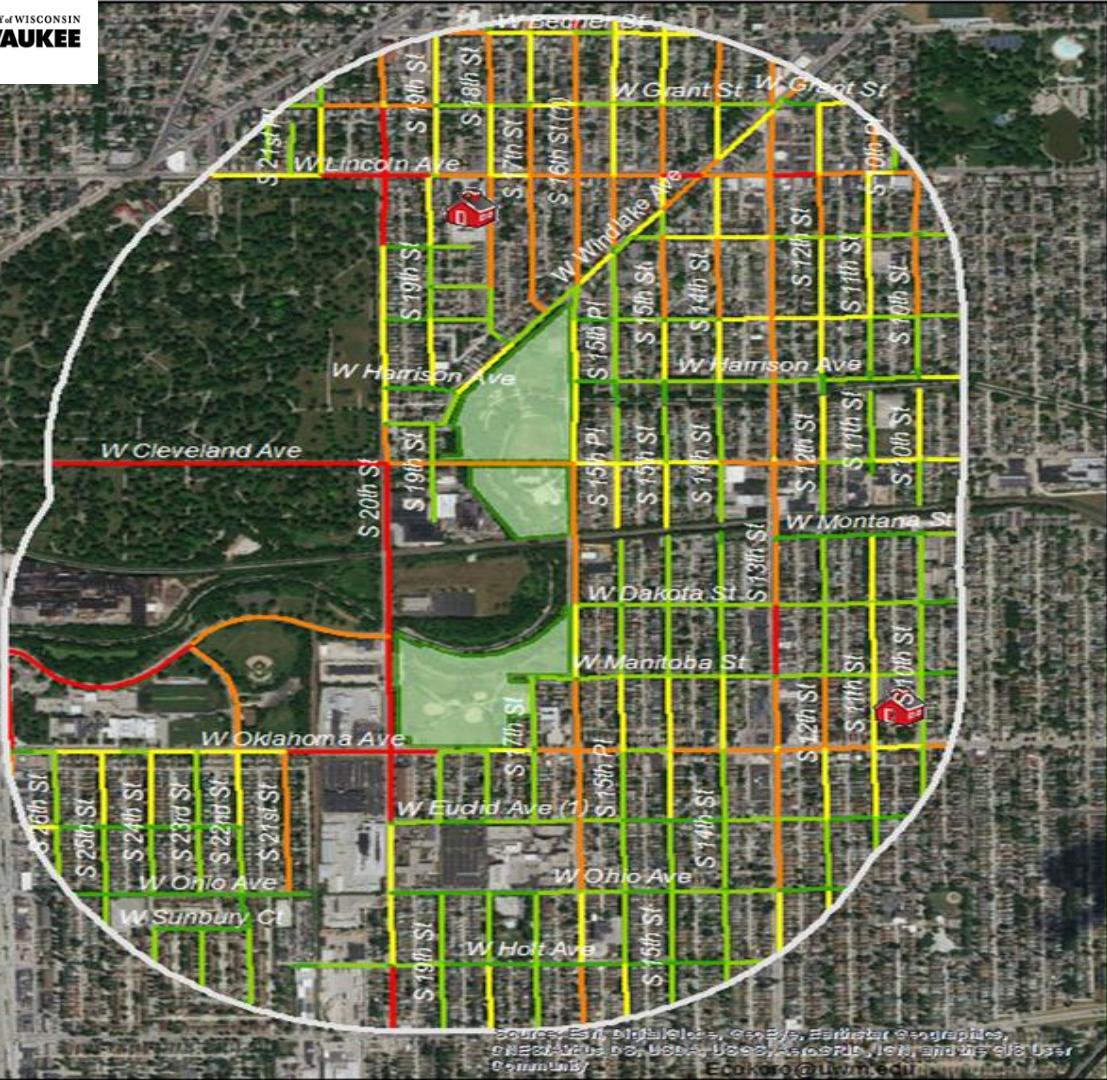
(0 out of 498 Selected)

Study_Area_Clip_1

Final Route Math:

Walking time in seconds
(feet of WISLR segment/3.5) + Left curb weight (0,1, or 2 * (-5)) + Right curb weight (0,1, or 2 * (-5)) + Arterial weight (0 or 1 * 100) + Crime weight (crime # per segment * 30) + Signal weight (signal # per segment * (-30)) + Crash weight (crash # per segment * 20) = Final Route

Weighted walk-time, seconds = Impedance factor



SAFE ROUTES FROM M.P.S. TO PARKS (HEAT MAP)

1,000 500 0 1,000 2,000
Feet



Study Area - 1/2 Mile Radius of Parks



Lincoln Avenue Elementary School
Zablocki Public Elementary School

Streets Weight Level

- 8.58 - 138.00
- 138.01 - 304.42
- 304.43 - 517.98
- 517.99 - 911.55
- 911.56 - 1654.07

Pulaski Park & KK Sports Center

Sources for all maps = Data Model

CLIENT

City of Milwaukee Department of Public Works

James Hannig, AICP
Pedestrian & Bicycle Coordinator
Marissa Meyer
Associate Transportation Planner

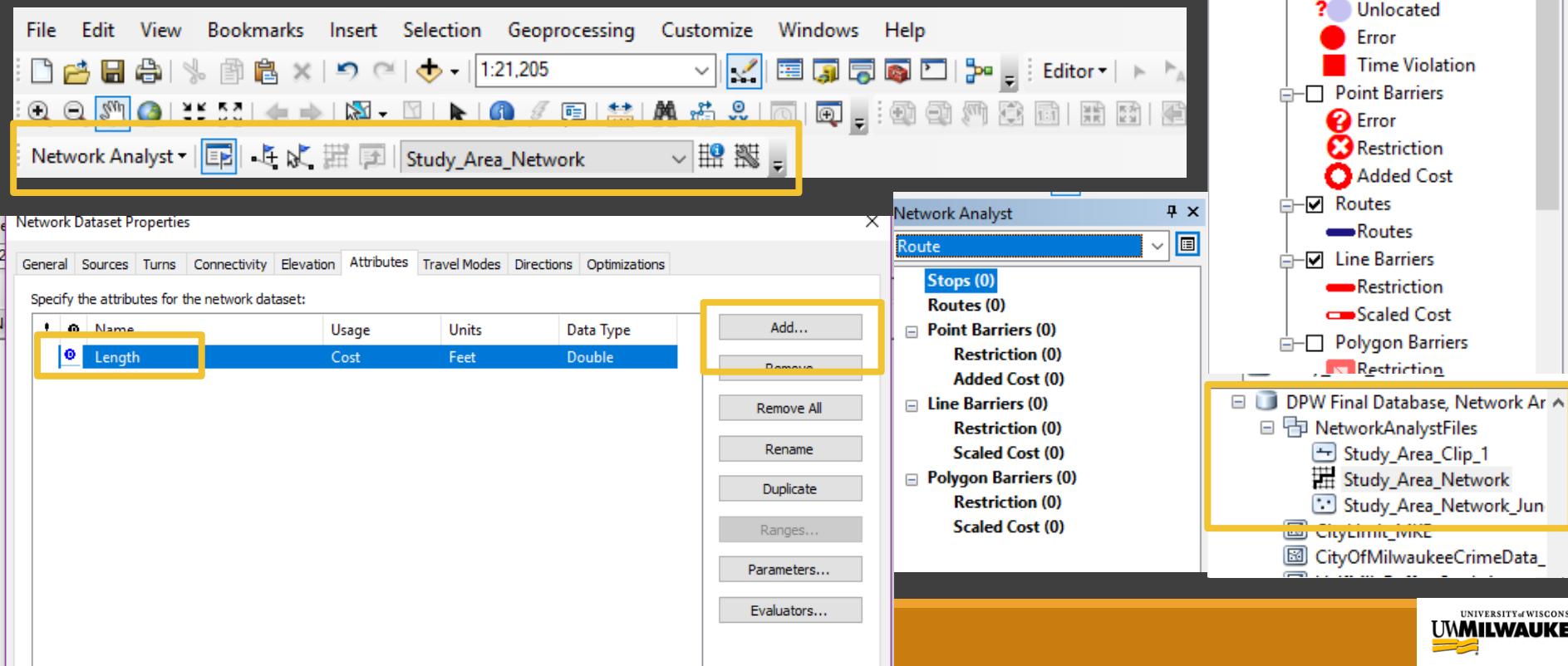
DESIGNED BY

Andrew Saleh
Emmanuel Okoro
Robert Vander Heiden

PROJECT SUPERVISOR

Dr. Robert Schneider
URBPLAN 793

Network Analyst Summary:



The screenshot displays the ArcGIS interface with the Network Analyst ribbon tab selected. The Network Analyst ribbon tab has a yellow border. The Network Dataset Properties dialog is open, showing the Attributes tab with a table of attributes. The 'Length' attribute is highlighted with a yellow box. The Network Analyst toolbar and its dropdown menu are also highlighted with yellow boxes. The Table of Contents shows various network layers and barriers, with several items highlighted with yellow boxes.

Network Analyst | Study_Area_Network

Network Dataset Properties

General Sources Turns Connectivity Elevation Attributes Travel Modes Directions Optimizations

Name: Length Usage: Cost Units: Feet Data Type: Double

Add... Remove Remove All Rename Duplicate Ranges... Parameters... Evaluators...

Route

Stops (0)

Routes (0)

Point Barriers (0)

Line Barriers (0)

Polygon Barriers (0)

Restriction (0)

Added Cost (0)

Scaled Cost (0)

DPW Final Database, Network Ar

NetworkAnalystFiles

Study_Area_Clip_1

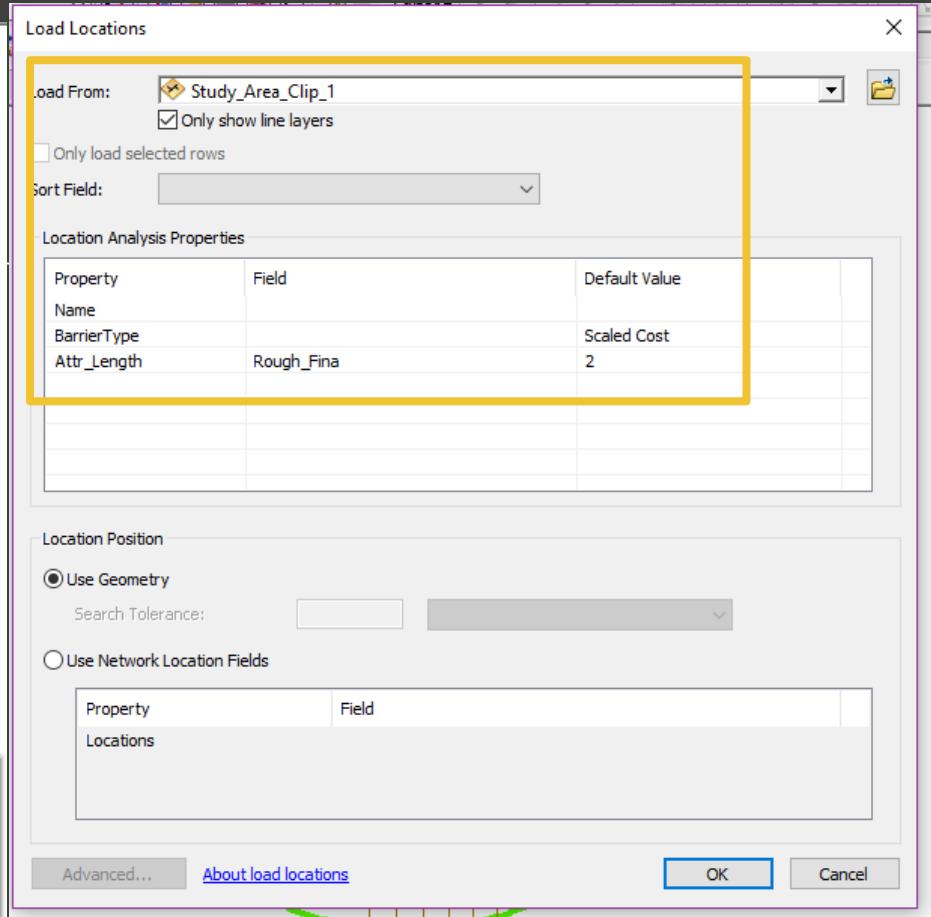
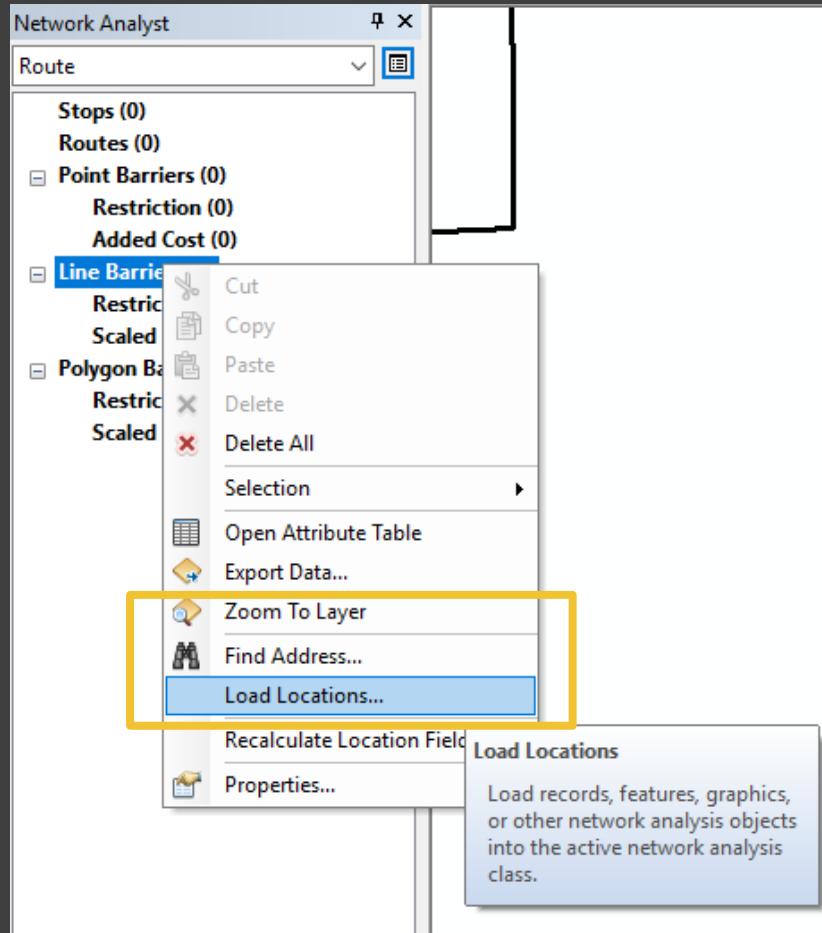
Study_Area_Network

Study_Area_Network_Jun

CityLimits_WI

CityOfMilwaukeeCrimeData_

UNIVERSITY OF WISCONSIN
MILWAUKEE



Network Analyst



Route



Stops (2)

- 1 1016 W Oklahoma Ave, Milwaukee
- 2 3070 S 20th St, Milwaukee, WI 532

Routes (1)

- 1016 W Oklahoma Ave, Milwaukee

Point Barriers (0)

Restriction (0)

Added Cost (0)

Line Barriers (498)

Restriction (0)

Scaled Cost (498)

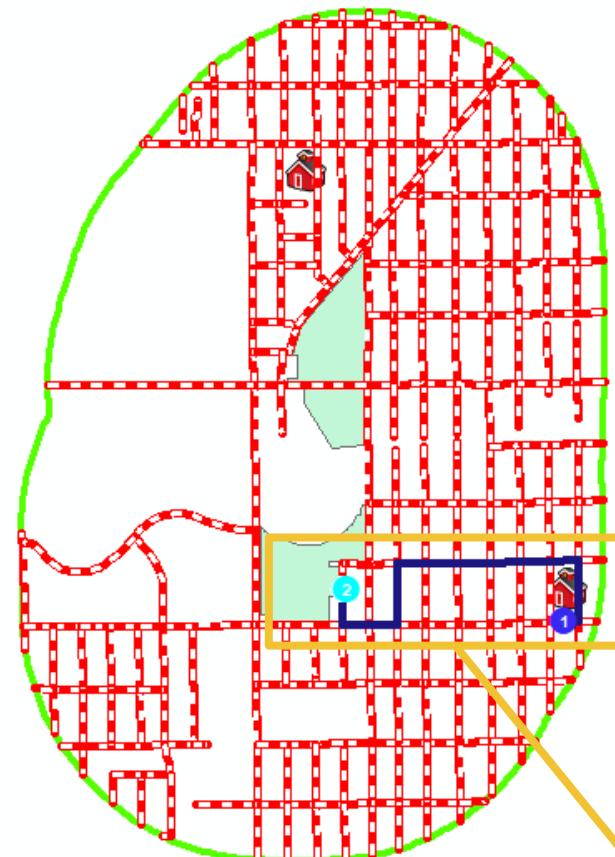
Locations 1

Locations 2

Locations 3

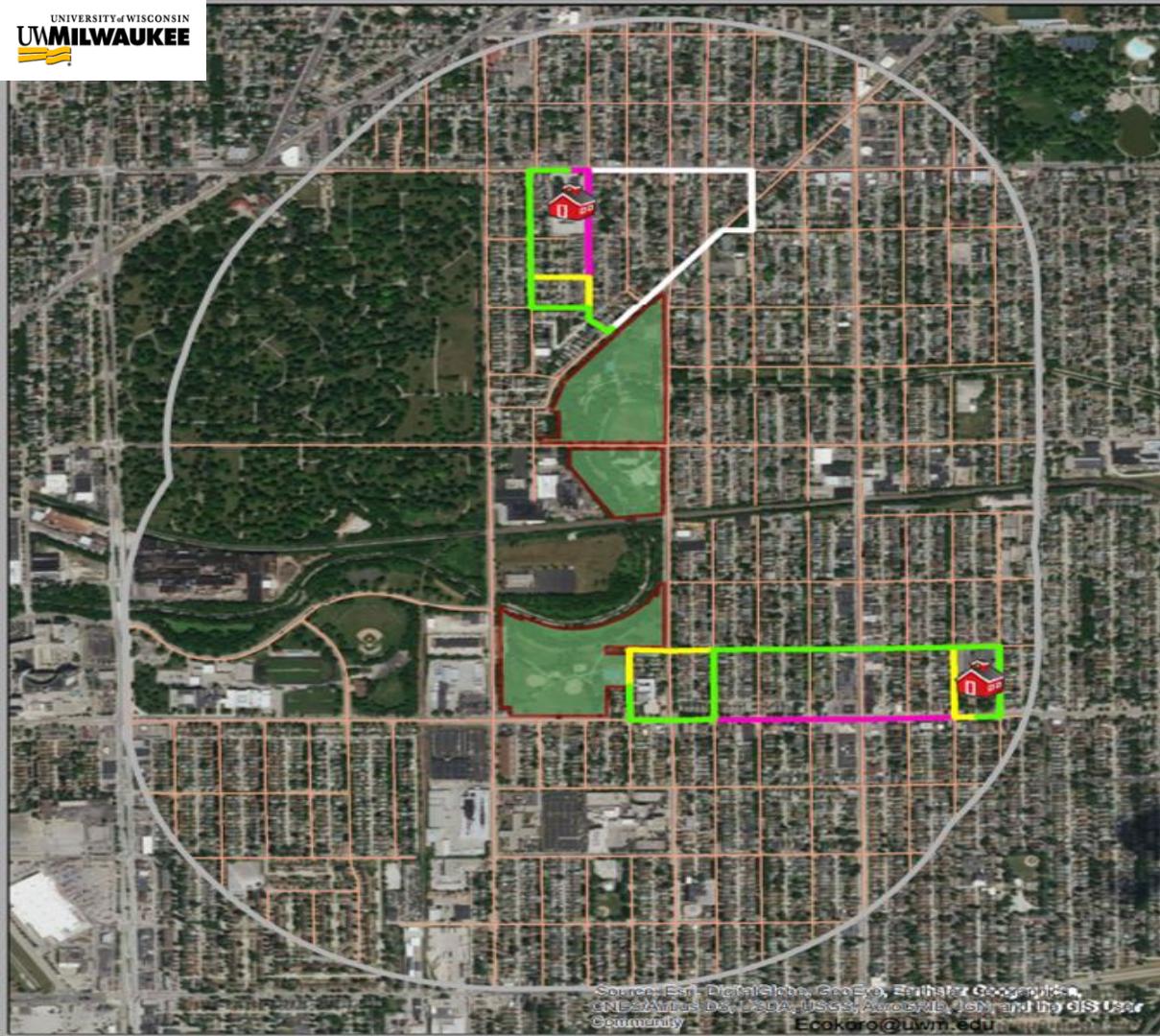
Locations 4

Locations 5



DPW Final Database, Network Ar
NetworkAnalystFiles
Study_Area_Clip_1
Study_Area_Network
Study_Area_Network_Jun
CityLimit_MKE
CityOfMilwaukeeCrimeData_

Network Analyst | Study_Area_Network



SAFE ROUTES FROM MILWAUKEE PUBLIC SCHOOLS TO PARKS SHOWING ALL COST

940 470 0 940 1,880
Feet



LEGEND

Sources: Esri, DigitalGlobe, GeoEye, Earthstar Geographics,
CNES/Airbus DS, USDA, USGS, Aerial³, IGN, and the GIS User
Community
Ecokids@uwm.edu

- Study Area - 1/2 Mile Radius of Parks
- Lincoln Avenue Elementary School
- Zablocki Public Elementary School
- Lincoln Final Route
- Lincoln Arterial Weighted Route
- Lincoln Signal Weighted Route
- Lincoln Crash Weighted Route
- Lincoln Shortest Weighted Route
- Lincoln Crime Weighted Route
- Zablocki Final Route
- Zablocki Arterial Weighted Route
- Zablocki Signal Weighted Route
- Zablocki Crash Weighted Route
- Zablocki Shortest Weighted Route
- Zablocki Crime Weighted Route
- Streets in Study Area
- Pulaski Park & KK Sports Center

SAFE ROUTES FROM LINCOLN AVENUE ELEMENTARY SCHOOL TO PULASKI PARK WITH ARTERIAL WEIGHTED COST

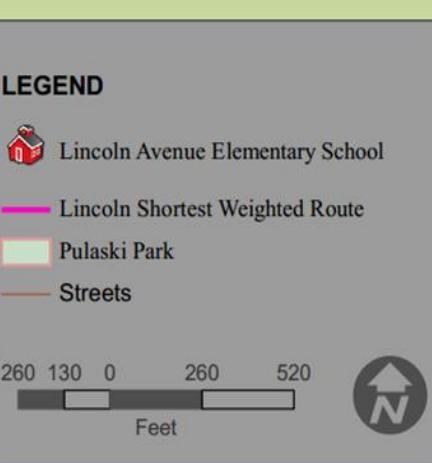
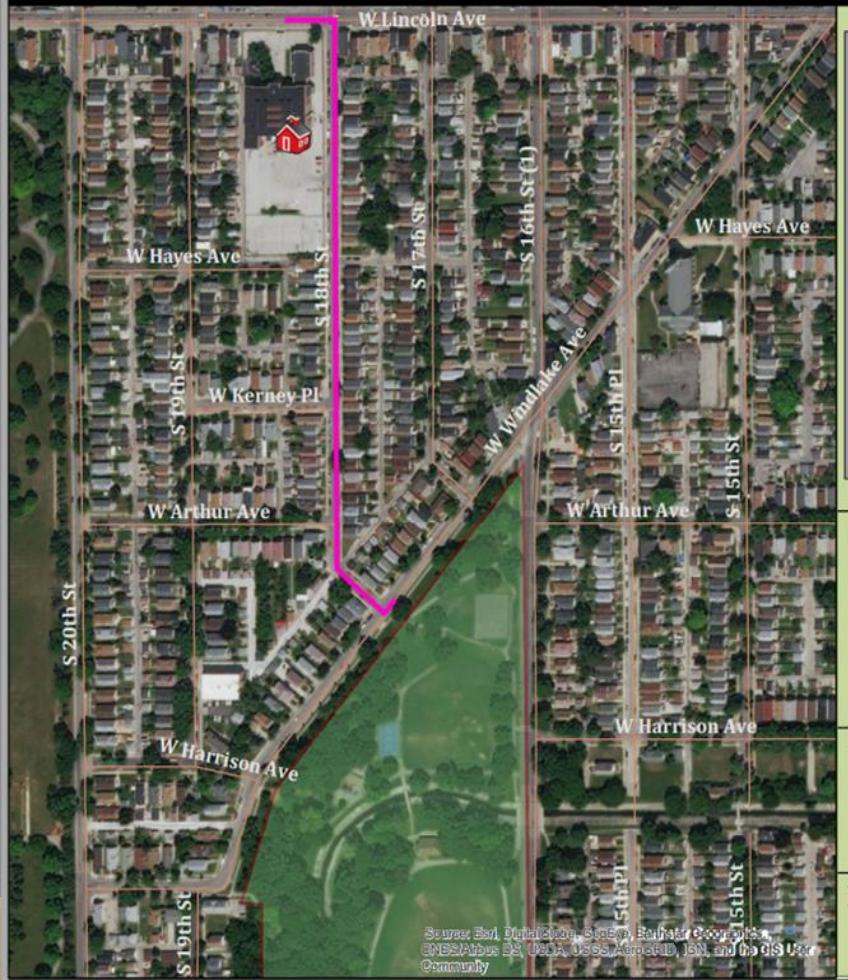


SAFE ROUTES FROM LINCOLN AVENUE ELEMENTARY SCHOOL TO PULASKI PARK WITH CRASH WEIGHTED COST



Google 2018

SAFE ROUTES FROM LINCOLN AVENUE ELEMENTARY SCHOOL TO PULASKI PARK WITH SHORTEST ROUTE WEIGHTED COST



CLIENT

City of Milwaukee Department of Public Works

James Hannig, AICP

Pedestrian & Bicycle Coordinator

Marissa Meyer

Associate Transportation Planner

DESIGNED BY

Andrew Saleh

Emmanuel Okoro

Robert Vander Heiden

PROJECT SUPERVISOR

Dr. Robert Schneider

URBPLAN 793



After ground-truthing and mathematical mean considerations, we feel this basic route is still useful in many ways.



SAFE ROUTES FROM LINCOLN AVENUE ELEMENTARY SCHOOL TO PULASKI PARKS COMBINED WEIGHTED COST

LEGEND

- Lincoln Avenue Elementary School
- Lincoln Final Route
- Pulaski Park
- Streets



CLIENT

City of Milwaukee Department of Public Works

James Harrig, AICP

Pedestrian & Bicycle Coordinator

Marissa Meyer

Associate Transportation Planner

DESIGNED BY

Andrew Saleh

Emmanuel Okoro

Robert Vander Heiden

PROJECT SUPERVISOR

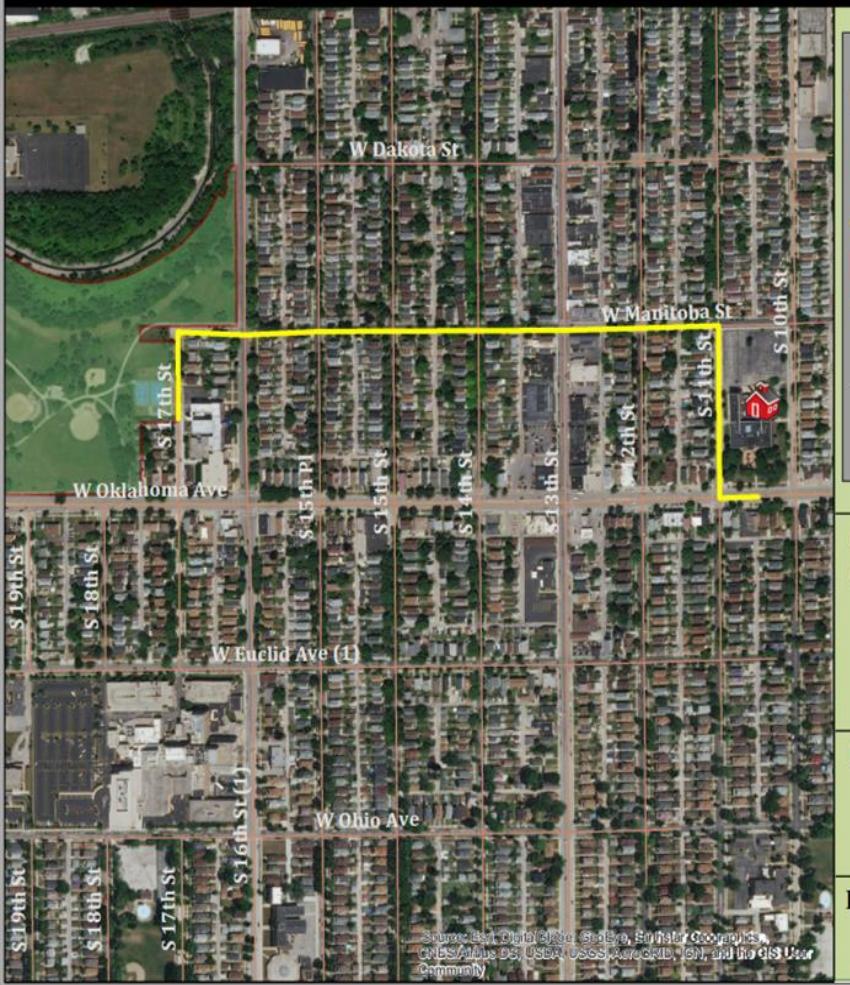
Dr. Robert Schneider

URBPLAN 793



Final routes were determined based on client feedback, data accuracy, and group judgement after considering mean values.

SAFE ROUTES FROM ZABLOCKI PUBLIC ELEMENTARY TO KK SPORT CENTER WITH ARTERIAL WEIGHTED COST



LEGEND

Zablocki Public Elementary School

Zablocki Arterial Weighted

KK Sports Center

Streets

400 200 0 400 800



CLIENT

City of Milwaukee Department of Public Works

James Hannig, AICP

Pedestrian & Bicycle Coordinator

Marissa Meyer

Associate Transportation Planner

DESIGNED BY

Andrew Saleh

Emmanuel Okoro

Robert Vander Heiden

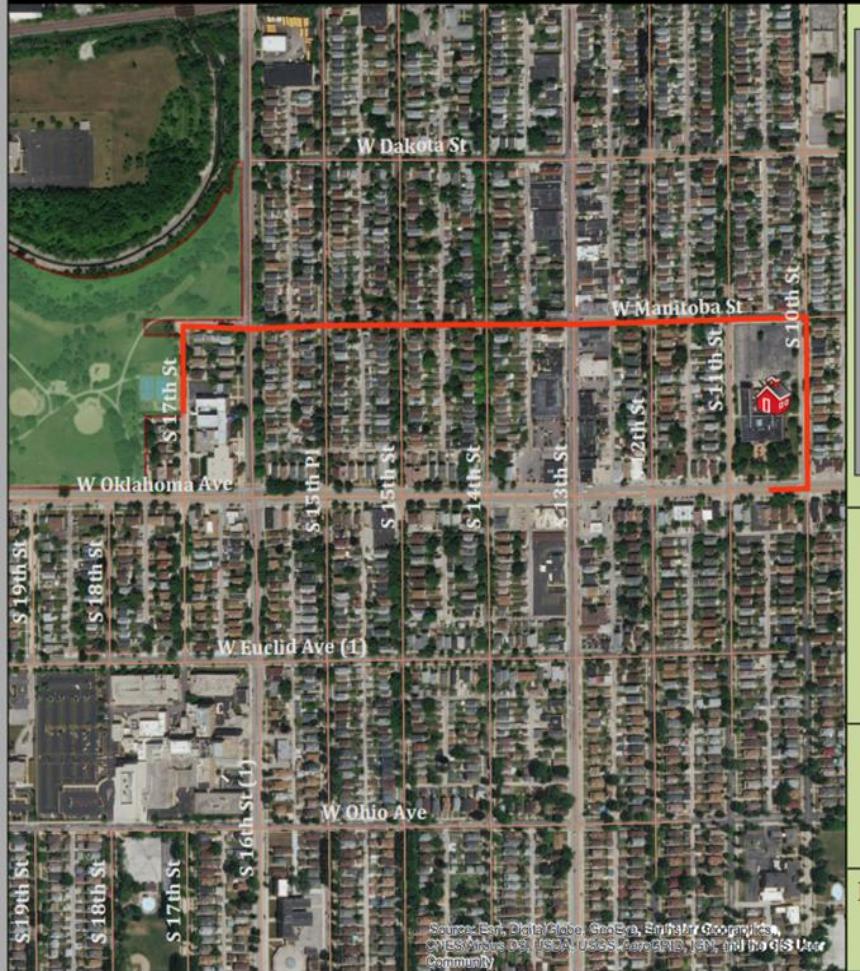
PROJECT SUPERVISOR

Dr. Robert Schneider

URBPLAN 793



SAFE ROUTES FROM ZABLOCKI PUBLIC ELEMENTARY TO KK SPORTS CENTER WITH CRASH WEIGHTED COST



LEGEND

- Zablocki Public Elementary School
- Zablocki Crash Weighted Route
- KK Sports Center
- Streets



CLIENT

City of Milwaukee Department of Public Works

*James Hannig, AICP
Pedestrian & Bicycle Coordinator
Marissa Meyer
Associate Transportation Planner*

DESIGNED BY

*Andrew Saleh
Emmanuel Okoro
Robert Vander Heiden*

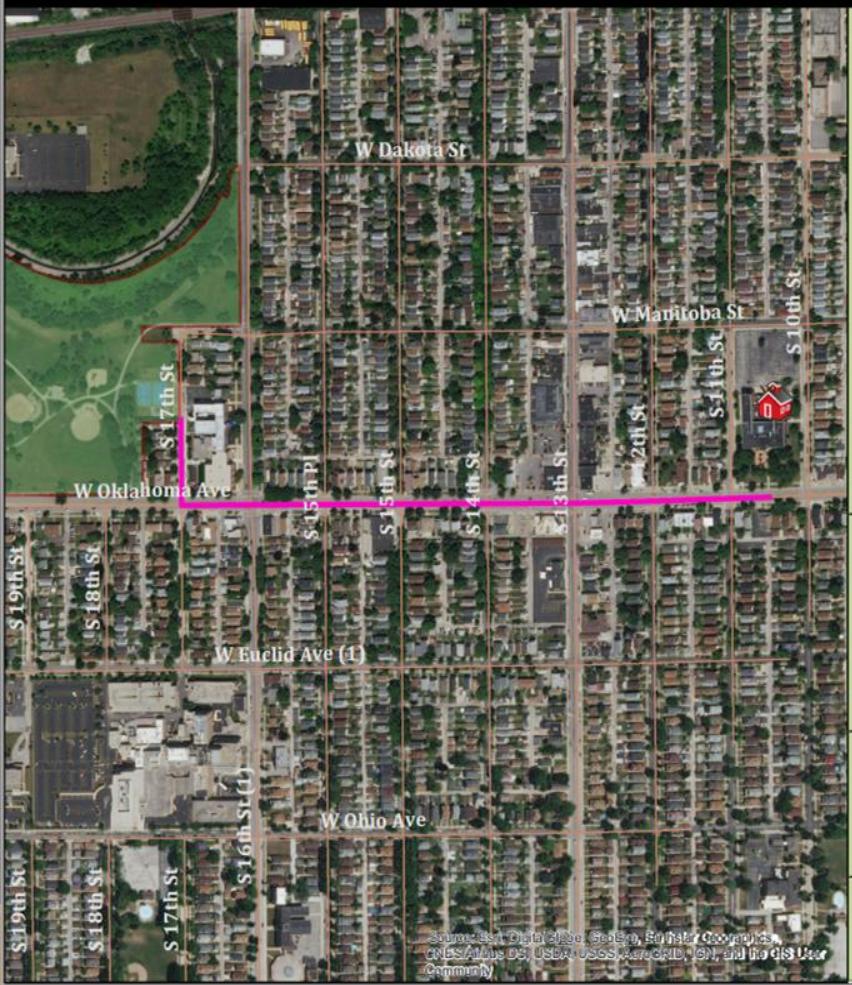
PROJECT SUPERVISOR

*Dr. Robert Schneider
URBPLAN 793*

Source: Esri, DigitalGlobe, GeoSoc, Earthstar Geographics,
CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User
Community



SAFE ROUTES FROM ZABLOCKI PUBLIC ELEMENTARY TO KK SPORT CENTER WITH SHORTEST WEIGHTED COST



LEGEND

- Zablocki Public Elementary School
- Zablocki Shortest Weighted Route
- KK Sports Center
- Streets



CLIENT

City of Milwaukee Department of Public Works

*James Hannig, AICP
Pedestrian & Bicycle Coordinator
Marissa Meyer
Associate Transportation Planner*

DESIGNED BY

*Andrew Saleh
Emmanuel Okoro
Robert Vander Heiden*

PROJECT SUPERVISOR

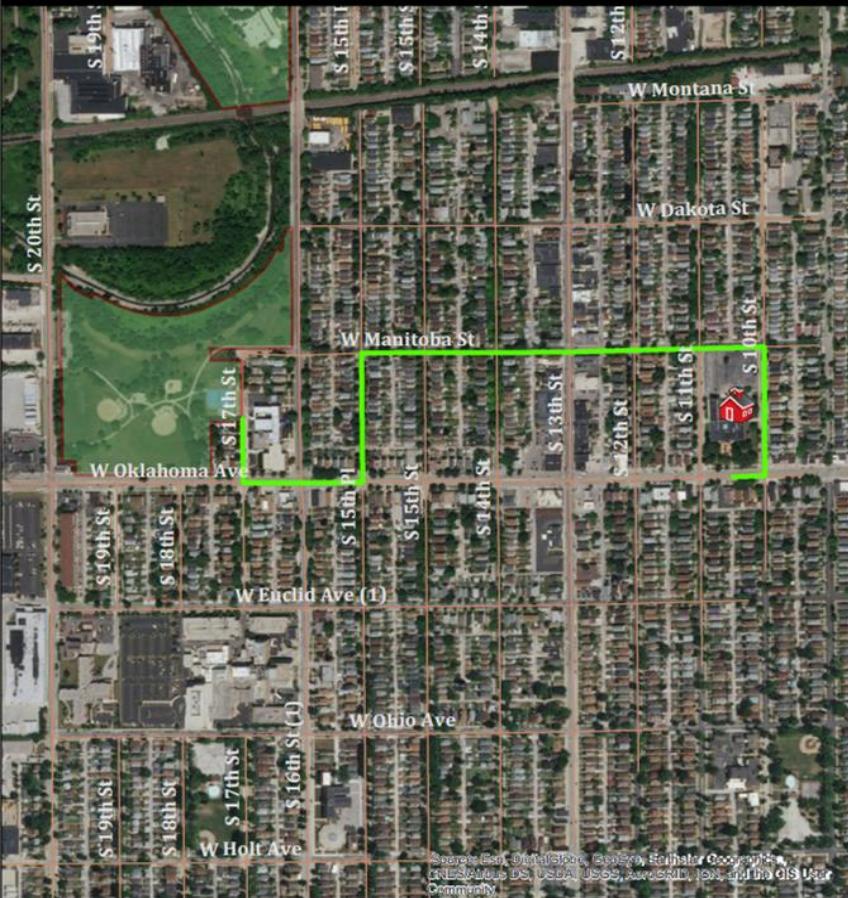
*Dr. Robert Schneider
URBPLAN 793*



Google 2018



SAFE ROUTES FROM ZABLOCKI PUBLIC ELEMENTARY SCHOOL TO KK SPORTS CENTER WITH COMBINED WEIGHTED COST



LEGEND

- Zablocki Public Elementary School
 - Zablocki Final Route
 - KK Sports Center
 - Streets
- 500 250 0 500 1,000
Feet

CLIENT

City of Milwaukee Department of Public Works
James Hannig, AICP
Pedestrian & Bicycle Coordinator
Marissa Meyer
Associate Transportation Planner

DESIGNED BY

Andrew Saleh
Emmanuel Okoro
Robert Vander Heiden

PROJECT SUPERVISOR

Dr. Robert Schneider
URBPLAN 793



Final routes were determined based on client feedback, data accuracy, and group judgement after considering mean values.

Ground Truthing



- Crosswalks
- Sidewalk Quality
- Blind turns
- Traffic Volume
- Signalized intersection
- It is obviously safer to access these schools from the rear.



Problems:

- Intersections such as 13th and Manitoba on the route from Zablocki to KK Sports Center
 - Flashing signs
 - In-street pedestrian signs
 - Curb extensions
 - Increased Enforcement

"Investing in walking infrastructure saves money in the long-run: The National Safety Council estimates the cost of a pedestrian fatality at \$4.3 million, while a curb extension costs as little as \$50,000, and a high visibility crosswalk costs about \$1,200." [Sam Schwartz Engineering PLLC and America Walks]



Final Suggestions and Conclusions:

- Ground truth entrance and exit points.
- Ground truth routes to identify problem areas where additional signage should be improved.
- Usefulness of crime and signal data is questionable.
- Walk time in seconds, arterial versus corollary, and total crashes per WISLR segment appear to produce the best routes.



Final Suggestions and Conclusions:

- What about taking this to a city-level?
 - This is possible, but start simple.
- How could one make stop points more accurate outside of a study area?
 - Idea: MPS provides school exit points.
- Are alleys safe for pedestrians?
- Dime vs. WISLR?
- Is it worth looking into VRP or OD-Matrix vs. basic routing? Geoprocessing this city-wide?
- What about better sidewalk or speed information?



Thank You

Thank You

**DPW, Dr. Schneider, and our fellow
classmates.**

Any Questions???