Hillsborough MPO School Safety Study

Technical Memorandum

Identification and Prioritization of School Areas for Multimodal Safety Reviews Methodology

Introduction

The Hillsborough County Metropolitan Planning Organization (MPO) has a longstanding commitment to improving safety and mobility for all users and modes of transportation throughout Hillsborough County. The MPO along with the MPO's School Transportation Working Group (STWG) has made improving safety and mobility for students one of its priorities. To identify opportunities to enhance the safety and comfort of getting to and from school, the MPO has initiated a School Safety Study to prioritize public school areas in order to conduct multimodal safety reviews at ten school areas that will result in a list of actionable safety and mobility improvements. A data driven methodology for prioritizing school areas was needed to identify the school areas for multimodal safety reviews. Prioritizing school areas based on data such as pedestrian and bicycle crash history, number of students living within proximity to the school, and other safety, socioeconomic, and school related data inputs ensures that the reviewed schools are selected based on data rather than a complaint driven system. This technical memorandum provides an overview of the methodology that was used to identify and prioritize school areas within Hillsborough County.

Defining School Evaluation Areas

The initial step in identifying and prioritizing locations to conduct school multimodal safety reviews was to identify and define the school evaluation areas. Florida Administrative Code (6A-3.001 (3)) states that a reasonable walking distance for any student who is not otherwise eligible for transportation, is any distance not more than two (2) miles between the home and school or one and one-half (1 ½) miles between the home and assigned bus stop. Using F.A.C. 6A-3.001 (3) as a guide, a 2-mile walking boundary for each public school was created; the walking boundaries were developed in a geographic information system (GIS) utilizing the location of each school and a 2-mile distance from the school along the existing roadway network. It is noted that this method may differ from how the school district defines the 2-mile walk distance, but was considered sufficient for the purposes of this study. As a largely urban county, many of the schools within Hillsborough County are located relatively close to each other and therefore resulted in many of the 2-mile walk boundaries overlapping each other. To resolve the overlapping the 2-mile walking boundaries were overlaid with the respective school attendance boundaries; the area where the two boundaries intersect was used to create the 2-mile school evaluation areas, Figure 1 is an illustrative example of this process.

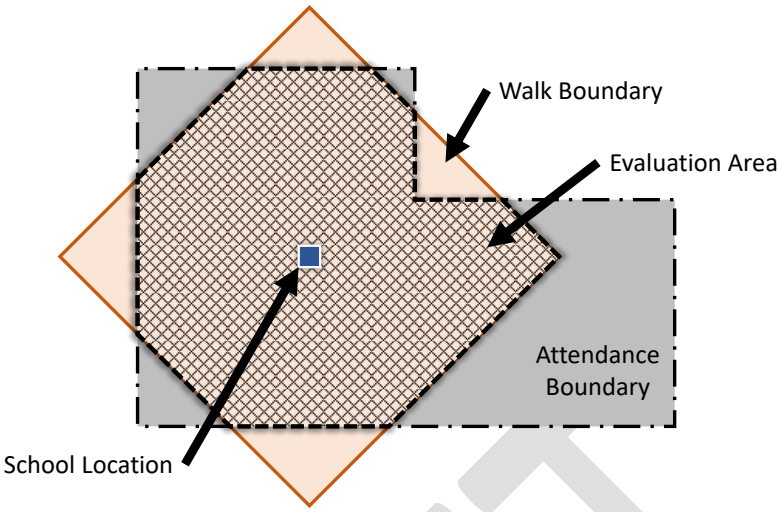

Figure 1: School Evaluation Area Development

Additionally, through discussions with the STWG, it was determined that it was important to develop additional smaller school evaluation areas that would allow for a more detailed evaluation of the areas closer to the school and could help in better determining where potential safety and mobility concerns exist. In addition to the 2-mile school evaluation areas, 1-mile and 0.5-mile evaluation areas were developed for each schools based on the same process used to develop the 2-mile evaluation areas.

Attributing Data to the School Evaluation Areas

Once the school evaluation areas were defined the next step was to attribute data to the evaluation areas. The following summarizes the data that attributed to the school evaluation areas.

Students Residing within School Area

Utilizing data provided from the Hillsborough County School District, the school evaluation areas were assigned with the number of students who reside within the school areas and attend the area school. There are many students who reside within the attendance boundary of one school, but attend another school for one reason or another; this screening was conducted as an exercise to gauge the number of potential students who may walk or bike to school. Therefore only students who reside within the school area and attend the school of that area were included in the evaluation.

Pedestrian and Bicycle Crash History

Using five-years of crash data (2012—2016) pedestrian and bicycle crashes were attributed to each school area. The pedestrian and bicycle crashes were then broken into two categories, total pedestrian and bicycle crashes and school related pedestrian and bicycle crashes. Total pedestrian and bicycle crashes were used to help assess the overall pedestrian and bicycle safety environment within the school evaluation area. Compared to many other crash types, pedestrian and bicycle crashes typically occur at a lower frequency and are often more random in nature which often makes interpreting pedestrian and bicycle crash patterns more challenging. Including total pedestrian and bicycle crashes into the evaluation of each school area helped to better identify locations that may have pedestrian and bicycle safety issues.

The school related pedestrian and bicycle crashes are a sub-set of the total pedestrian and bicycle crashes and included the crashes that met the following criteria:

- occurred on days when school was in session (based on Hillsborough County School District school calendars),
- occurred during typical arrival and dismissal hours (6:00 AM to 10:00 AM and 2:00 PM to 5:00 PM), and
- where the involved pedestrian and/or bicyclist was of school age (elementary school 5 – 11 years old, middle school 11 – 14 years old, high school 14 – 19 years old) for the area school.

While the above criteria was met, it does not necessarily mean that the identified school related crashes involved students traveling to or from school. However, for the purposes of a countywide screening it was determined that this data provided insight that could be used to identify locations where there may be a higher possibility of crashes involving students traveling to/from school.

Arterial and Collector Roadway Intersections

The number of major road (arterial and collector) intersections were attributed to each school area. For the screening process, these intersections included anywhere any street intersected with an arterial or collector road, and were used to represent the number of potential crossing conflicts within the school area. It was assumed that a higher number of arterial and collector road intersections indicated that there was a greater likelihood that students may need to cross a major road. and that there is a higher risk involved in those crossings.

MPO Identified Community of Concern

The Hillsborough MPO has identified communities of concern throughout the county to ensure equal access to affordable and reliable transportation and to ensure that certain groups don't accrue disproportionate benefits or burdens. Communities of concern are areas that face unique obstacles related to transportation and engagement based on multiple community characteristics including:

- Minority Populations
- Limited English Proficiency Households
- Low-Income Population
- Persons with Disabilities
- Zero Vehicle Households

The communities of concern were included in the screening to help distinguish areas that may have impediments to transportation that may result in a higher proportion of students walking/biking to/from school.

Free/Reduced Lunch

The percentage of evaluation area students who qualify for free/reduced lunch was used as a measure to help identify areas that may have potential socioeconomic barriers to transportation. Using this as a measure of socioeconomic condition, and a measure of potential transportation barriers, assists in helping

to identify school evaluation areas that may have students with a higher likelihood to walk/bike to/from school.

Getting to School Survey

The Getting Students to School Survey was sent to nearly 200,000 recipients to better understand and gain better insight on current school commuting practices. While the survey cover many topics, it primarily focused on the following topics:

- Demographics
- Current Commute
- Commuting Conditions
- Student Requests
- Commuting Considerations
- Awareness and Interest in Commuting Offerings

Based on the collected responses, the survey indicated that most students take a school bus or family vehicle to/from school. When asked if the student had asked for permission to walk/bike to/from school 80.3% of the respondents answered "no," and when asked in what grade would you give your student permission to walk/bike to school without an adult over 50% of the respondents answered "never." When asked what factors affect the decision to give your student permission to walk/bike to/from school the most impactful responses were distance, safety of intersections or crossings, and speed of traffic along the route. Some of the most frequently referenced comments from the survey related to poor road conditions and safety concerns about walking.

To help better understand the potential number of students within each school area that may currently be walking the evaluation process focused on the responses to questions 11 and 12 from the survey (following) and included all responses that indicated whether the student walks alone, walks with a parent, participates in a walking school bus, bicycles alone, or participates in a bike train.

- Survey Question 11 – *On a typical week, how many days does your student use each of these transportation methods to get to school?*
- Survey Question 12 – *On a typical week, how many days does your student use each of these transportation methods to get home from school?*

Non-Funded Transportation

Prior to the 2017-18 school year the Hillsborough County School District eliminated non-funded transportation services, also known as courtesy busing, for approximately 7,500 middle and high school students. This recent change is anticipated to increase the potential number of students walking or biking to school. The number of students who had previously been transported with non-funded transportation services were attributed to each school evaluation area and was used as a factor in determining the number of potential new student walkers/bikers within each school area.

Traditional School

Based on discussions with the STWG, it was determined that there was a need to differentiate between schools with a traditional attendance boundary and those with either a much broader attendance boundary or no boundary at all, i.e., magnet and charter schools. For the purpose of this evaluation, schools with a defined attendance boundary were classified as traditional school.

Screening and Prioritizing School Evaluation Areas

Once the data was attributed to each school evaluation area, a process for screening and prioritizing the school areas for future multimodal safety reviews needed to be developed. The result was the development of a two-step evaluation/prioritization process. The first step (screen 1) focused on identifying the number of students living in proximity to school, and on the number of pedestrian and bicycle crashes that occurred within the school evaluation areas. A result of the screen 1 process was a short-list of school areas that were further evaluated during the second step (screen 2). The screen 2 process focused on additional data attributes related to factors that may make walking/biking to school more probable and on existing built-environment/infrastructure conditions that could indicate potential challenges and/or barriers to walking/biking to/from school.

Before conducting the screen 1 evaluation and prioritization process, it was determined, through discussions with the STWG, that grouping the school evaluation areas by school type would allow for a more equitable comparison of the school evaluation areas; the schools were grouped into the following school types:

- Elementary Schools
- Middle Schools
- High Schools
- Other Schools (include magnet only and charter schools)

A primary reason for grouping the schools by school type is that attendance boundaries, and consequently the evaluation area boundaries, for the different school types can significantly vary in size. The use of typical school level feeder patterns, where multiple elementary schools feed a few middle schools, that feed one or two high schools, resulted in high school evaluation areas that were significantly larger than the middle and elementary school evaluation areas. Grouping the schools by type and comparing school areas and school populations of similar size allowed for a more consistent assessment of the school evaluation areas.

Screen 1 Data Evaluation

The School Safety Study's primary focus is to identify opportunities to improve the safety and comfort of students getting to/from school, so it was determined that the first evaluation and prioritization process (screen 1) should focus on data inputs related to safety conditions, and on the number of potential students that could benefit from potential safety improvements.

The following data attributes were used for the screen 1 evaluation:

- School Related Pedestrian and Bicycle Crashes
- Total Pedestrian and Bicycle Crashes
- Percent of Students Residing in the School Evaluation Area
- Ratio of School Related Pedestrian and Bicycle Crash to Students Residing in the Area

The initial evaluation of the school areas was completed by ranking the screen 1 data inputs for each school evaluation area (2-mile, 1-mile, and 0.5-mile) and by school type; Figure 2 provides an example of this process.

School	2-Mile Area							
	School Related Crashes		Total Crashes		Area Students		School Related Crashes per 100 Area Students	
	Value	*Rank*	*Value*	*Rank*	*Value*	*Rank*	*Value*	*Rank*
Middle School A	4	2	17	1	86.3%	1	1.79	3
Middle School B	1	3	9	3	41.7%	3	2.38	2
Middle School C	7	1	16	2	71.6%	2	7.22	1

Figure 2: Screen 1 Ranking Example

Next, to help prioritize the data attributes, a weighting scheme was developed and applied to the ranked inputs. Based on discussions with the STWG, it was determined that the highest emphasis should be placed on school related pedestrian and bicycle crashes, with total pedestrian and bicycle crashes, the percentage of enrolled students residing in the area, and the ratio of school related crashes to areas students following. The following weightings were developed applied to the attribute rankings:

- School Related Pedestrian and Bicycle Crashes – 50%
- Total Pedestrian and Bicycle Crashes – 20%
- Percent of Students Residing in the School Evaluation Area – 20%
- Ratio of School Related Pedestrian and Bicycle Crash to Students Residing in the Area – 10%

After applying the weights to the data rankings, a composite score/rank for each school area was developed using the sum of the weighted data rankings, Figure 3 provides an example of the weighting and composite rankings.

School	2-Mile Area					
	School Related Crashes	Total Crashes	Area Students	School Related Crashes per 100 Area Students	Weighted Composite Score	Weighted Composite Rank
	Weighted Rank	*Weighted Rank*	*Weighted Rank*	*Weighted Rank*		
Middle School A	1	0.2	0.2	0.3	1.7	2
Middle School B	1.5	0.6	0.6	0.2	2.9	3
Middle School C	0.5	0.4	0.4	0.1	1.4	1

Figure 3: Screen 1 Weighted Composite Score/Rank Example

After applying the attribute ranking weighting, and calculating the weighted composite score/rank for each evaluation area, a weighting based on the evaluation area distance was applied. The distance weighting allows the evaluation to emphasize the areas closest to the schools, e.g., a crash located within a few hundred feet from a school would be weighted higher than a crash that occurred more than a mile from the school. The following weights were applied based on the three evaluation distance areas:

- 2-Mile – 31%
- 1-Mile – 33%
- 0.5-Mile – 36%

After applying the distance weighting, a weighted area composite score/ranking was calculated based on the sum of the weighted area rankings, Figure 4 provides an example of this process.

School	2-Mile Area	1-Mile Area	0.5-Mile Area	Weighted Area Composite Score	Weighted Area Composite Ranking
	Weighted Composite Rank	Weighted Composite Rank	Weighted Composite Rank		
Middle School A	0.62	0.33	0.36	1.31	1
Middle School B	0.93	0.99	1.08	3.00	3
Middle School C	0.31	0.66	0.72	1.69	2

Figure 4: Screen 1 Weighted Area Composite Score/Rank Example

Developing the Screen 1 Short-List

A short-list of school evaluation areas was created using the screen 1 weighted area rankings from each school type group. The short-list is comprised of the top school areas from each school type. The school area short-list was then used for further evaluation of the school areas in the screen 2 evaluation process. The following is a list of the schools that were included in the screen 1 short list, in alphabetical order:

- Adams Middle School
- B.T. Washington Elementary School
- Brandon High School
- Chamberlain High School
- Cleveland Elementary School
- Coleman Middle School
- Edison Elementary School
- Ferrell Middle Magnet School
- Foster Elementary School
- Gaither High School
- Hillsborough High School
- James Elementary School
- King High School
- Leto High School
- Mann Middle School
- Memorial Middle School
- Mendenhall Elementary School
- Middleton High School
- Miles Elementary School
- Monroe Middle School
- Mort Elementary School
- Muller Elementary Magnet School
- Pierce Middle School
- Plant High School
- Potter Elementary School
- Riverview High School
- Robinson High School
- Sessums Elementary School
- Sulphur Springs K-8 Community School
- Turner/Bartels K-8 School
- Twin Lakes Elementary School
- Van Buren Middle School
- Webb Middle School
- Young Middle Magnet School

Screen 2 Data Evaluation

The second screen process involved looking at other contributing data that may indicate a higher propensity for walking and biking and factors that could make walking and biking to school more challenging. Similar to the screen 1 data evaluation, the screen 2 evaluation involved ranking and

prioritizing data attributes, but unlike the screen 1 evaluation that included all public schools in Hillsborough County, the screen 2 evaluation was conducted only on the schools included on the screen 1 short-list. This section will review the screen 2 data inputs and evaluation/prioritization process.

The following data attributes were used for the screen 2 evaluation:

- Arterial Road Intersections
- Collector Road Intersections
- Percent of Area Students Qualifying for Free/Reduced Lunch
- Within Identify Community of Concern
- Getting to School Survey Responses
- Non-Funded Transportation Students
- Traditional School Designation

Similar to the screen 1 process, the screen 2 data attributes for each school area were ranked for each school evaluation area (2-mile, 1-mile, and 0.5-mile); Figure 5 shows an example of the ranking process.

School	2-Mile Area						General Inputs - Valid for all Areas							
	Arterial Intersections		Collector Intersections		% Free/Reduced Lunch		Within Community of		Survey Responses		Non-Funded Transp. Services		Traditional School	
	Value	*Rank*	*Value*	*Rank*	*Value*	*Rank*	*Value*	*Rank*	*Value*	*Rank*	*Value*	*Rank*	*Value*	*Rank*
Short-List School A	97	2	104	2	74%	1	Yes	1	17	2	47	2	Yes	1
Short-List School B	124	1	117	1	58%	2	Yes	1	6	3	23	3	Yes	1
Short-List School C	39	3	63	3	49%	3	Yes	1	34	1	104	1	Yes	1

Figure 5: Screen 2 Ranking Example

Again similar to the screen 1 process, a weighting scheme was applied to the ranked data attributes. Through discussions with the STWG, the following weights were developed and applied to the screen 2 rankings:

- Arterial Road Intersections – 30%
- Collector Road Intersections – 25%
- Percent of Area Students Qualifying for Free/Reduced Lunch – 15%
- Within Identify Community of Concern – 5%
- Getting to School Survey Responses – 5%
- Non-Funded Transportation Students – 15%
- Traditional School – 5%

After applying the weights to the data rankings a composite score/rank for school area was developed using the sum of the weighted data rankings, Figure 6 provides an example of the weighting and composite rankings.

School	2-Mile Area			General Inputs - Valid for all Areas				2-Mile Weighted Composite Score	2-Mile Weighted Composite Rank
	Arterial Intersections Weighted Rank	Collector Intersections Weighted Rank	% Free/Reduced Lunch Weighted Rank	Community of Concern Weighted Rank	Survey Responses Weighted Rank	Non-Funded Transp. Services Weighted Rank	Traditional School Weighted Rank		
Short-List School A	0.6	0.5	0.15	0.05	0.1	0.3	0.05	1.75	2
Short-List School B	0.3	0.25	0.3	0.05	0.15	0.45	0.05	1.55	1
Short-List School C	0.9	0.75	0.45	0.05	0.05	0.15	0.05	2.4	3

Figure 6: Screen 2 Weighted Composite Score/Rank Example

After applying the attribute rank weighting, and calculating the weighted composite score/rank for each evaluation area, a weighting based on the evaluation area distance was applied. The distance weighting allows the evaluation to emphasize the areas closest to the schools; the following weights were applied based on the three evaluation distance areas:

- 2-Mile – 31%
- 1-Mile – 33%
- 0.5-Mile – 36%

After applying the distance weighting, a weighted area composite score/ranking was calculated based on the sum of the weighted area rankings, Figure 7 provides an example of this process.

School	2-Mile Area	1-Mile Area	0.5-Mile Area	Weighted Area Composite Score	Weighted Area Composite Ranking
	Weighted Composite Score	Weighted Composite Score	Weighted Composite Score		
Short-List School A	0.62	0.33	0.72	1.67	2
Short-List School B	0.31	0.66	0.36	1.33	1
Short-List School C	0.93	0.99	1.08	3.00	3

Figure 7: Screen 2 Weighted Area Composite Score/Rank Example

Prioritizing the School Areas

The weighted composite scores from the screen 1 and screen 2 evaluation were then combined to create a final composite score and ranking that was used to prioritize the short-list school areas and identify the top school areas for multimodal reviews. Figure 8 provides an example of how the scores/rankings were combined and Table 1 contains the actual combined composite scores and rankings for the short-list school areas.

School	Screen 1 Weighted Area Composite Score	Screen 1 Weighted Area Composite Ranking	Screen 2 Weighted Area Composite Score	Screen 2 Weighted Area Composite Ranking	Combined Weighted Composite Score	Combined Weighed Composite Ranking
Short-List School A	1.31	1	1.67	2	2.98	1
Short-List School B	3.00	3	1.33	1	4.33	2
Short-List School C	1.69	2	3.00	3	4.69	3

Figure 8: Example of Combined Weighted Rankings

Table 1: Combined Short-List Composite Scores and Rankings

School	Combined Composite Rank	
	Score	Rank
Adams Middle School	36.3	22
B. T. Washington Elem School	32.7	16
Brandon High School	31.6	13
Chamberlin High School	24.4	8
Cleveland Elem School	43.0	29
Coleman Middle School	29.4	11
Edison Elem School	40.6	27
Ferrell Middle Magnet School	18.2	4
Foster Elem School	35.9	21
Gaither High School	32.5	15
Hillsborough High School	14.9	2
James Elem School	41.1	28
King High School	32.5	14
Leto High School	23.2	6
Mann Middle School	52.2	35
Memorial Middle School	34.0	17
Mendenhall Elem School	36.4	23
Middleton High School	24.5	9
Miles Elem School	51.3	33
Monroe Middle School	49.9	31
Mort Elem School	34.5	18
Muller Elementary Magnet School	23.5	7
Pierce Middle School	31.3	12
Plant High School	17.7	3
Potter Elem School	40.3	25
Riverview High School	35.7	20
Robinson High School	40.0	24
Sessums Elem School	52.2	34
Sulphur Springs K-8 Community School	9.9	1
Turner/Bartels K-8 School	51.1	32
Twin Lakes Elem School	46.5	30
Van Buren Middle School	27.7	10
Webb Middle School	40.3	26
Wilson Middle School	35.4	19
Young Middle Magnet School	20.2	5

The next step was to review the prioritized school area list to identify any school areas that had recently been reviewed for safety and mobility improvements; if an area had recently been reviewed it was removed from the final list and the next school area on the short-list was added to the final list.

Finally, the prioritized final school area list was reviewed to see if it makes sense to combine school areas based on their proximity to other school areas on the final list. For this evaluation it was determined that three schools – Middleton High School, Ferrell Middle Magnet School, and Young Middle Magnet School – were close enough to each other to combine these three school areas as one school area for review purposes.

Figure 9 is a flowchart that provides an overview of the process reviewed in this methodology memorandum.

Evaluation Results

Using the evaluation methodology described in this technical memorandum the 10 school areas that were selected for multimodal safety reviews were:

- Chamberlain High School
- Coleman Middle School
- King High School
- Leto High School
- Middleton High School, Ferrell Middle Magnet School, and Young Middle Magnet School
- Muller Elementary Magnet School
- Pierce Middle School
- Plant High School
- Sulphur Springs K-8 Community School
- Van Buren Middle School

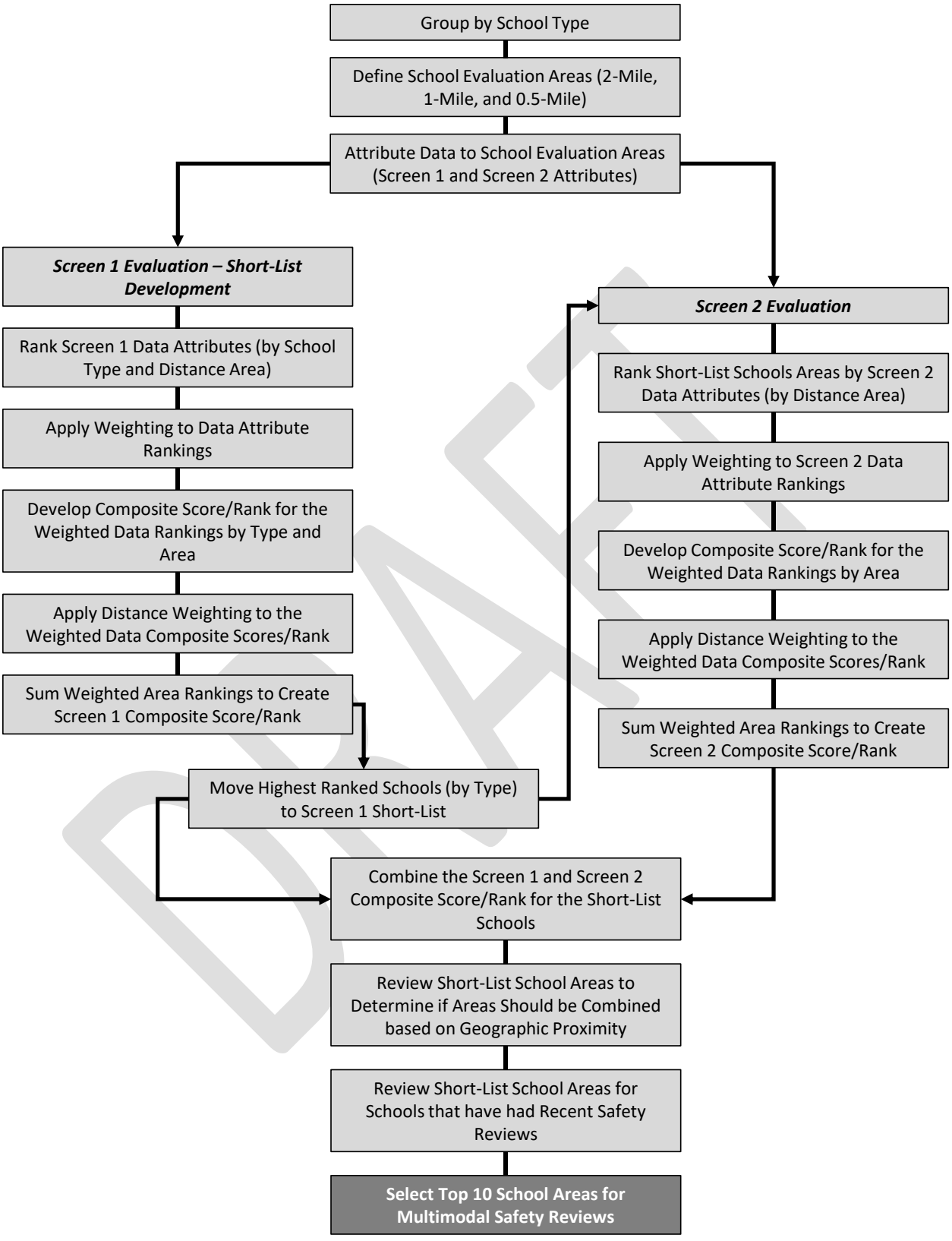

Figure 9: Methodology Overview Flowchart