Clark County Pedestrian Crossing Prioritization Program

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Clark County
Pedestrian Crossing Prioritization Program
Final Report

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Introduction

The Pedestrian Crossing Prioritization Program (PCPP) is a joint effort by Clark County (County) and Kittelson & Associates, Inc. (Kittelson) to develop a process to identify priority locations for implementing new or enhanced pedestrian crossings. The recommended prioritization process follows national practices related to identifying pedestrian crossing locations and the County's pedestrian crossing guidance and practices. This report describes the PCPP framework for evaluating potential locations for crossing enhancements and outlines the screening process the County and Kittelson developed to identify and review locations. Detailed information on using the tools and updating the data files developed as part of the PCPP are described in Appendix A and Appendix B.

This report is organized into five parts:

1. **Summary** describes the PCPP framework and screening process for prioritizing pedestrian crossing treatments in the County.
2. **Framework** describes the scoring methodology and verification process.
3. **Screening Process** describes the screening process and the tools Kittelson created to screen and prioritize locations.
4. **Appendix A: User Guide** describes how to use the tool.
5. **Appendix B: Updating Files** provides guidance for updating the inputs to the PCPP tools.

Summary

In Fall 2019, Clark County adopted the County's 2020 – 2025 Transportation Improvement Program (TIP). The TIP has developed a prioritization approach using objective criteria to evaluate and prioritize transportation improvement projects. The PCPP builds upon the TIP prioritization and other County programs, most notably the Clark County Pedestrian Crossing Treatment Policy, to establish a framework for prioritizing locations based on objective criteria specific to pedestrian safety and demand at roadway crossings.

The County and Kittelson selected the criteria included in the PCPP framework to prioritize locations where there is both pedestrian demand and crossing risk based on roadway characteristics. The final criteria include factors that prioritize locations based on demand and risk that draw from demographic and land use data, existing roadway and pedestrian facility characteristics, and crash history. The framework establishes a consistent approach for evaluating locations which can be systematically applied for prioritizing crossing locations.

This report begins by presenting the framework and identifying the scoring methodology for the individual pedestrian crossing prioritization criteria. Then, the report describes the screening process Kittelson developed for evaluating potential crossings across the County. The process uses ArcGIS and Excel-based tools to facilitate scoring of locations and facilitate staff review to identify locations where new crossings or crossing enhancements are most likely to provide the greatest benefits for the County investment.

FRAMEWORK

The framework builds on current research finding and industry practices to prioritize locations with roadway characteristics that create crossing risks for pedestrians and where pedestrian activity is expected. The criteria for the prioritization process are divided into four groups. These four are:

1. **Demand (Demographic and Land Use):** The demand criteria evaluate locations based on sociodemographic and land use factors associated with increased pedestrian activity.
2. **Connectivity/Accessibility:** The criteria prioritize locations where the presence of sidewalks, trail crossings, and transit access provide greater pedestrian network connectivity. This group also considers the distance from existing marked crosswalks to prioritize locations where crossings outside of a marked crossing are more likely.
3. **Safety (Crossing Risk):** The crossing risk criteria assess characteristics associated with an increased likelihood of a crash event or more severe crash by considering traffic volumes, posted speeds, and number of traffic lanes.
4. **Safety (Crash History):** Crash history includes pedestrian crash frequency, fatal and severe injury crashes, and nearby pedestrian crashes based on the most recent five years of pedestrian-involved crashes.

Table 1 summarizes the individual criteria in each group and their scoring weights. Higher scores for individual criteria and for the composite score generated by the framework are more likely to be good candidates for crossing enhancements compared to those with lower scores. The table also includes a list of site considerations that are not included in the scoring framework, but which are necessary to consider when developing pedestrian crossing treatments for a location.

Table 1: Screening Criteria

Criteria Grouping	Criterion	Scoring Weights
Demand (Demographic and Land Use)	Transportation Disadvantaged Population (TDP) Index	0 to 5
	Low-Income Job Density	0 to 5
	Low- and Moderate-Income Percentage	0 to 5
	Public Schools[1]	0 to 5
	Parks and Recreational Facilities	0 to 5
	Commercial or High-Density Areas	0 to 5
Connectivity and Accessibility	Presence of Sidewalks	0 to 5
	Distance from Existing Marked Crosswalk	0 to 5
	Transit Access	0 to 5
	Trail Crossings	0 or 5
Crossing Risk	Average Annual Daily Traffic (AADT)	Multiplier
	Speed Limit	Multiplier
	Number of Lanes	Multiplier
Safety (Crash History)	Crash Frequency	0 to 2
	Fatal or Severe Injury Presence	0 to 2
	Nearby Crash	0 or 1
	Reported Safety Concern	0 or 1
Additional Site Considerations[2]	Observed Pedestrian Demand	N/A
	Urban or Rural Context	
	Signalized or Unsignalized	
	Intersection or Midblock	
	Existing Treatment	
	Redundancy	
	Design Feasibility Concerns	
	Improvement Costs and Expected Benefit	
	Potential Funding Sources	

[1]Includes Washington State University Vancouver
[2]Additional Site Considerations are applied by County to the highest scoring sites after the initial prioritization
Source: Kittelson & Associates, Inc. (2020)

SCREENING PROCESS

Kittelson developed the PCPP screening process in consultation with County staff. The screening process is a three-step approach for applying the framework countywide, reviewing locations with greater potential, and determining which locations to develop further as potential projects. The three steps are briefly summarized below:

1. **Initial Screening:** Evaluate potential crossing locations across the County to identify locations where pedestrian crossing improvements are likely to have greater benefit based on automated geospatial analysis.
2. **Full Scoring and Refinement**: Staff perform field visits or aerial reviews of higher scoring locations to refine the scoring of sites and identify other site-specific concerns.
3. **Project Development**: Staff select locations based on the refined scores and locations characteristics to develop into projects. Kittelson developed tools to support planning level evaluation of sites by showing recommended treatments and calculating preliminary benefit cost ratios.

Framework

This section describes the framework for prioritizing locations where pedestrian crossing treatments will have the greatest potential impact. It describes why criteria are included in the framework and how individual scores are calculated. It then describes how the individual criteria scores are aggregated into a location prioritization score. A higher prioritization score means that a location meets more criteria, as described below, and, therefore, is likely to see greater benefit from a pedestrian crossing treatment.

The framework is a standardized approach for evaluating locations consistently and efficiently. The following section describes the screening process for applying the framework to locations countywide to prioritize locations for pedestrian crossing treatments. Top scoring locations are likely strong candidates for treatments that reduce crossing risk and improve connectivity for pedestrians; however, engineering judgement and additional site consideration should be applied when selecting a final list of locations and developing specific treatment plans.

PRIORITIZATION CRITERIA

DEMAND (DEMOGRAPHIC AND LAND USE)

The first set of criteria prioritizes crossing locations where pedestrian activity is likely to be higher and there will be more need for new or enhanced pedestrian crossings. The demand factors seek to identify sociodemographic and land use factors associated with increased pedestrian activity. Demand is estimated in relation to demographic demand and land use demand. Demographic demand considers a transportation disadvantaged population (TDP) index, low-income job density, and a low- and moderate-income percentage to improve walking in traditionally underserved areas. It also considers where populations are more likely to rely on transit and walking for their everyday travel. Land use demand considers pedestrian generators like schools, parks, and high-density zones to prioritize locations where people are more likely to be walking. A summary of the demand criteria is provided in Table 2 and the scoring methodology for each criterion is described below.

Table 2: Scoring Rubric—Demand (Demographic and Land Use) Criteria Summary

Demand Criteria	Demand Metric	Scoring*
Demographic Demand	TDP Index	Between 0 and 5 points based on TDP index
	Low-Income Job Density	Between 0 and 5 points based on density of low-income jobs
	Low- and Moderate-Income Percentage	Between 0 and 5 points based on low- and moderate-income percentage
Land Use Demand	Public Schools[1]	Between 0 and 5 points based on proximity to schools
	Parks and Recreational Facilities	Between 0 and 5 points based on proximity to parks and recreational facilities
	Commercial or High-Density Areas	Between 0 and 5 points based on proximity to high density zones
Total		**Up to 30 points**

Source: Kittelson & Associates, Inc. (2020)
[1]Includes Washington State University Vancouver

Demographic Demand

Demographic characteristics are used to identify locations in the County where the demographic characteristics of residents indicate a greater propensity to walk or take transit. These characteristics also tend to be associated with disadvantaged populations. As a result, prioritizing these characteristics helps to target planning, design, and construction resources towards more equitable dispersion of project funding. The proposed process measures demographic demand using three criteria: Transportation Disadvantaged Population (TDP) Index, Low-Income Job Density, and Low- and Moderate-Income Percentage.

Transportation Disadvantaged Population Index

Description: Characteristics associated with a greater propensity to walk or take transit is measured using the TDP Index. This index prioritizes locations where the following characteristics are present at the highest rate in the local population:

- crossings in areas with higher proportions of elderly populations (age 65 and older);
- youth populations (age 17 and younger);
- non-white and Hispanic populations;
- populations with limited English proficiency;
- populations without access to a vehicle; and,
- populations with a disability.

The index is calculated using the most recent U.S. Census Bureau five-year American Community Survey estimates at a block level. The index intentionally double counts populations who meet multiple criteria to identify locations where residents face greater risk of transportation limits. Appendix B provides the methodology for calculating the TDP Index.

Scoring Methodology: The scoring for this criterion is shown in Table 3. The maximum score for a location is 5 points.

Table 3: Scoring Rubric—TDP Index

TDP Index	Scoring
95th percentile or greater relative to all evaluated sites	5
All other sites	Interpolated between 0-5 points based on their percentile relative to the 95th percentile TDP Index

Source: Kittelson & Associates, Inc. (2020)

Low-Income Job Density

Description: This criterion uses Longitudinal Employer-Household Dynamics (LEHD) data to prioritize locations with a greater density of workers in lower paying jobs. The LEHD data provides information about where people live and work within three different monthly income classifications.[1] The scoring rubric uses LEHD data for the number of jobs in the lowest income category ($1,250 per month or less) block group. The number of jobs in each block group is divided by the area of the block group to capture job density. Appendix B provides information for updating the Low-Income Job Density.

Scoring Methodology: The scoring for this criterion is shown in Table 4. The maximum score for a location is 5 points.

Table 4: Scoring Rubric—Low-Income Job Density

Low-Income Job Density	Scoring
95th percentile or greater relative to all evaluated sites	5
All other sites	Interpolated between 0-5 points based on their percentile relative to the 95th percentile Low-Income Job Density

Source: Kittelson & Associates, Inc. (2020)

Low- and Moderate-Income Percentage

Description: This criterion uses Housing and Urban Development (HUD) Low- and Moderate-Income Summary Data to prioritize areas with a higher percentage of low- and moderate-income households. In the public data released by HUD, the low- and moderate-income data corresponds to households at or below 80% of the area median income.[2] Appendix B provides the methodology for calculating the Low- and Moderate-Income Percentage.

Scoring Methodology: The scoring for this criterion is shown in Table 5. The maximum score for a location is 5 points.

Table 5: Scoring Rubric— Low- and Moderate-Income Percentage

Low- and Moderate-Income Percentage	Scoring
95th percentile or greater relative to all evaluated sites	5
All other sites	Interpolated between 0-5 points based on their percentile relative to the 95th percentile Low/Mod Income Percentage

Source: Kittelson & Associates, Inc. (2020)

[1] LEHD data is available at https://onthemap.ces.census.gov/. Detail on downloading the data is provided in Appendix B.

[2] HUD Low- and Moderate-Income Summary Data is available at https://www.hudexchange.info/programs/acs-low-mod-summary-data/. Data is provided at the Census Tract.

Land Use Demand

Sites with land uses associated with greater pedestrian activity are given the highest priority. This includes public schools, parks and recreational facilities, commercial areas, and multi-family residential.

Public School

Description: The prioritization for schools mirrors the weighting established -in Clark County's Transportation Improvement Program (TIP) evaluation process. Crossing locations along a school frontage receive 5 points and projects within one-quarter mile of a school receive three points. Schools located between ¼ mile and 1 mile from a school receive 1 point to be consistent with Safe Routes to School requirements. Appendix B contains a list of the land zones included as schools.[3]

Scoring Methodology: The scoring for this criterion follows the scoring in Clark County's TIP evaluation process, as outlined in Table 6. The maximum score for a location is 5 points.

Table 6: Scoring Rubric—Public School

Public School	Scoring
Located on a school frontage (or within 300 feet of a school)	5
Located within ¼ mile of a school	3
Located between ¼ mile and 1 mile from a school	1
Closest school located greater than one mile away	0

Source: Kittelson & Associates, Inc. (2020)

Parks and Recreational Facilities

Description: Parks and recreational facilities tend to generate pedestrian activity on adjacent and nearby roads. Scoring rubric assigns points based on a location's proximity to a park or recreational facility. Additional points are assigned to locations at trail crossings in the Connectivity and Accessibility scoring section. Appendix B contains a list of the land zones included as parks and recreational facilities.

Scoring Methodology: The scoring for this criterion is shown in Table 7. The maximum score for a location is 5 points.

Table 7: Scoring Rubric—Parks and Recreational Facilities

Parks and Recreational Facilities	Scoring
Located in or fronting a park or recreational area	5
Located within ¼ mile of a park or recreational area	3
Closest park or recreational area is located greater than ¼ mile away	0

Source: Kittelson & Associates, Inc. (2020)

[3]Washington State University Vancouver is included in the list of schools. School are also included as eligible locations under the "Commercial/Higher Density Area" criterion and as a result, are intentionally double-counted.

Commercial/Higher Density Areas

Description: Locations zoned for high density commercial and residential uses are expected to generate pedestrian activity. Appendix B contains a list of the land zones included as commercial/higher density areas.

Scoring Methodology: The scoring for this criterion is shown in Table 8. The maximum score for a location is 5 points.

Table 8: Scoring Rubric—Commercial/Higher Density Areas

Commercial/Higher Density Areas	Scoring
Located in or fronting a commercial/higher density area	5
Located within ¼ mile of a commercial/higher density area	3
Closest commercial/higher density is located greater than ¼ mile away	0

Source: Kittelson & Associates, Inc. (2020)

CONNECTIVITY AND ACCESSIBILITY

The PCPP considers the relationship to existing infrastructure. Where the TIP prioritizes locations to identify opportunities for new infrastructure improvements (e.g., sidewalk), the PCPP prioritizes locations where sidewalk and other transportation connections are already in place. Locations for new crossings or crossing enhancements are prioritized by the framework where pedestrian activity is expected, prioritizing locations where there are existing sidewalks, trail crossings, and transit access. Locations that are far from existing marked crosswalks are also prioritized to help improve pedestrian network connectivity. A summary of the connectivity and accessibility criteria is provided in Table 9.

Table 9: Scoring Rubric—Connectivity and Accessibility Criteria Summary

Connectivity and Accessibility Metrics	Scoring*
Presence of Sidewalks	Between 0 and 5 points based on presence of sidewalks
Distance from Marked Crosswalk	Between 0 and 5 points based on distance from existing marked crosswalks
Transit Access	Between 0 and 5 points based on proximity to transit stops
Trail Crossings	5 points if located on regional trail crossing and 3 points if it is located on a local trail crossing
Total	Up to 20 points

Source: Kittelson & Associates, Inc. (2020)

Sidewalk Presence

Description: The criterion prioritizes locations with sidewalk on both sides of the roadway to connect existing pedestrian facilities and the potential for greater pedestrian activity.

Scoring Methodology: The scoring for this criterion is shown in Table 10. The maximum score for a location is 5 points.

Table 10: Scoring Rubric – Sidewalk Presence

Presence of Sidewalks	Scoring
Sidewalk on both sides of the roadway	5
Sidewalk on one side of the roadway	3
No sidewalk on either side of the roadway	0

Source: Kittelson & Associates, Inc. (2020)

Distance from Existing Marked Crosswalk

Description: Priority is given to locations that are more than 300 feet away from the nearest marked crosswalk, with greatest priority to locations that are more than 600 feet away. This is consistent with the Clark County Pedestrian Treatment Policy that notes crossings should be considered when "the [distance to the] nearest controlled crossing exceeds 600 feet." The guidance also directs pedestrians to the nearest crossing when the "nearest marked or protected crossing [is less than] 300 feet away." Locations that have existing marked crosswalks are given no points under this criterion.

Scoring Methodology: The scoring for this criterion is shown in Table 11. The maximum score for a location is 5 points.

Table 11: Scoring Rubric – Distance from Existing Marked Crosswalk

Location of Nearest Marked Crosswalk	Scoring
Nearest marked crosswalk located 600 or more feet away	5
Marked crosswalk within 300-600 feet	3
Marked crosswalk within 300 feet	0

Source: Kittelson & Associates, Inc. (2020)

Transit Access

Description: Locations near transit stops are prioritized to facilitate first-mile/last-mile accessibility to transit throughout the county. Transit stops increase crossing demand between sides of the street as pedestrian travel to and from destinations surrounding the transit stop.

Scoring Methodology: The scoring for this criterion is shown in Table 12. The maximum score for a location is 5 points.

Table 12: Scoring Rubric—Transit Access

Transit Access	Scoring
Located on a transit stop	5
Located within ¼ mile of a transit stop	3
Nearest transit stop located greater than ¼ mile away	0

Source: Kittelson & Associates, Inc. (2020)

Trail Crossings

Description: Trails are popular locations for pedestrians. As a result, locations adjacent to where trails cross or meet roadways are given the highest priority. The County categorizes trails into regional and local trails. Regional trails are longer and tend to have higher use, whereas local trails tend to be located within a single park or recreation space. As a result, regional trail crossings are given greater priority than local trails as they are more likely to cross roadways and tend to have higher pedestrian volumes.

Scoring Methodology: The scoring for this criterion is shown in Table 13. The maximum score for a location is 5 points.

Table 13: Scoring Rubric—Trail Crossings

Trail Crossing	Scoring
Located at regional trail crossing (within 300 feet)	5
Located on local trail crossing (within 300 feet)	3
Not located on a trail crossing	0

Source: Kittelson & Associates, Inc. (2020)

CROSSING RISK

Crossing Risk criteria prioritize locations where roadway conditions increase pedestrian exposure (the likelihood of a crash event) or the potential severity of a collision. The categories are adapted from the Enhanced Crossing Treatment Selection table in the Clark County Pedestrian Treatment Policy. The PCPP sums the individual scores to create a weighting score and adds it to 1 to create a multiplicative factor. The factor is then applied to the combined demand and connectivity scores.

The maximum possible factor adds 30 percent to the demand and connectivity scores to prioritize locations with higher potential crossing risk. A summary of the crossing risk weights is provided in Table 14.

Table 14: Weighting Rubric—Crossing Risk Multiplier Summary

Crossing Risk Factor	Scoring Weight*
AADT	Between 0 and 0.1 based on traffic volumes
Speed Limit	Between 0 and 0.1 based on speed limit
Number of lanes	Between 0 and 0.1 based on number of lanes

*Sum of weights is added to 1 and multiplied by the combined demand and connectivity score

Source: Kittelson & Associates, Inc. (2020)

Average Annual Daily Traffic (AADT)

Description: The weighting criterion evaluates crash risk based on average daily traffic using five scoring categories based on the Clark County Pedestrian Crossing Treatment Policy guidance.

Scoring Methodology: The weighting for this criterion is provided in Table 15. The maximum additional weight at a location is 10%.

Table 15: Weighting Rubric–AADT

AADT	Scoring Weight
Greater than 15,000	0.10
Between 12,000 and 15,000	0.08
Between 9,000 and 12,000	0.06
Between 6,000 and 9,000	0.04
Between 4,000 and 6,000	0.02
Less than 4,000	0

Source: Kittelson & Associates, Inc. (2020)

Speed Limit

Description: The weighting criterion evaluates crash risk based on speed limit using three categories from the Clark County Pedestrian Crossing Treatment Policy guidance. This category can be further refined to include 85th percentile speed instead of the speed limit in refined screening processes.

Scoring Methodology: The weighting for this criterion is provided in Table 16. The maximum additional weight at a location is 10%.

Table 16: Weighting Rubric—Speed Limit

Speed Limit	Scoring Weight
40 mph or greater	0.10
35 mph	0.05
30 mph or less	0

Source: Kittelson & Associates, Inc. (2020)

Number of Lanes

Description: The weighting criterion evaluates crash risk based on number of lanes using three categories based on the Clark County Pedestrian Crossing Treatment Policy guidance. Based on observations from a site review, County staff may choose to consider additional roadway characteristics to refine measurements of pedestrian exposure, such as parking lanes, transit stops, or lane width.

Scoring Methodology: The weighting for this criterion is provided in Table 17. The maximum additional weight at a location is 10%

Table 17: Weighting Rubric—Number of Lanes

Number of Lanes	Scoring Weight
4 or more Lanes	0.10
3 Lanes	0.05
2 Lanes	0

Source: Kittelson & Associates, Inc. (2020)

SAFETY (CRASH HISTORY)

Safety (Crash History) is also considered for prioritizing locations (this provides consistency with the Transportation Safety Management Program). Pedestrian-involved crashes are relatively infrequent compared to other crash types. As a result, they are an imperfect metric for identifying risk and potential for future pedestrian-involved crashes. Therefore, the crash history scoring criteria are assigned lower scores relative to other criteria. A summary of the crash history scoring criteria is provided in Table 18.

Table 18: Scoring Rubric—Safety (Crash History) Summary

Crash History Metric	Scoring*
Crash Frequency	Between 0 and 2 points based on number of crashes
Fatal or Serious Injury Presence	Between 0 and 2 points based on number of fatal or severe crashes
Nearby Crash	1 point for sites within crashes within 500 feet
Reported Safety Concern	1 point for sites supported by formal public outreach

Source: Kittelson & Associates, Inc. (2020)

Crash Frequency

Description: Locations with reported pedestrian crashes are given the highest priority. Pedestrian-involved crashes are counted for a location if they have occurred within 250 feet of the location.

Scoring Methodology: The scoring for crash frequency is provided in Table 19. The maximum score for a location is 2 points.

Table 19: Scoring Rubric—Crash Frequency over Period

Crash Frequency	Scoring
Site with multiple pedestrian-involved crashes	2
Site with one pedestrian-involved crash	1
Site with no pedestrian-involved crashes	0

Source: Kittelson & Associates, Inc. (2020)

Fatal or Severe Injury Presence

Description: Additional prioritization is added if a crash occurring within 250 feet of the locations resulted in a fatality or severe injury.

Scoring Methodology: The scoring for this criterion is provided in Table 20. The maximum score for a location is 2 points.

Table 20: Scoring Rubric—Fatal or Severe Injury Presence

Fatal or Severe Injury Presence	Scoring
Site with multiple fatal or severe injury crashes	2
Site with one fatal or severe injury crash	1
Site with no fatal or severe injury crashes	0

Source: Kittelson & Associates, Inc. (2020)

Nearby Crash

Description: Pedestrian conditions are often similar along a roadway or at adjacent intersections such that nearby crashes may indicate a higher systemic risk for additional pedestrian crashes. Therefore, the scoring adds a point at locations where a crash has occurred within 500 feet of the locations.

Scoring Methodology: The scoring for this criterion is provided in Table 21. Scores that meet this criterion receive 1 point.

Table 21: Scoring Rubric—Nearby Crash

Nearby Crash	Scoring
Site with one or more crashes within 500 feet	1
Site with no crashes within 500 feet	0

Source: Kittelson & Associates, Inc. (2020)

Reported Safety Concern

Description: Location where County staff, or a recognized group, have reported a possible safety concern. The location does not need to have a reported pedestrian-involved crash.

Scoring Methodology: The scoring for this criterion is provided in Table 22. Scores that meet this criterion receive 1 point.

Table 22: Scoring Rubric—Reported Safety Concern

Reported Safety Concern	Scoring
Site with formal safety concern	1
Site with no formal reported safety concern	0

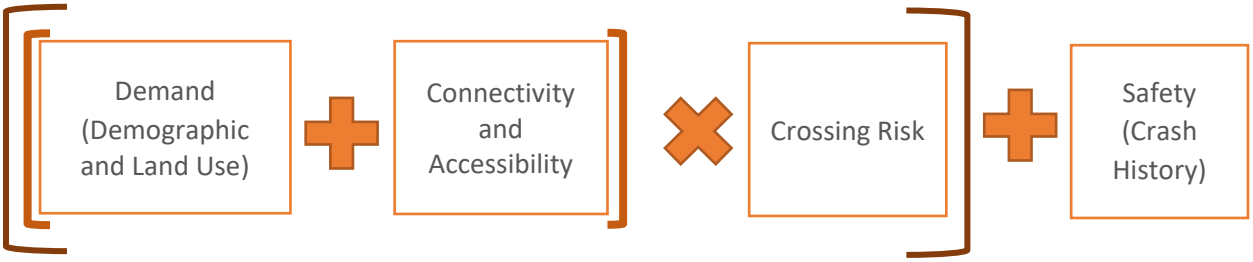
Source: Kittelson & Associates, Inc. (2020)

PRIORITIZATION SCORE CALCULATION

The prioritization score is assigned to each evaluated location by aggregating the individual criteria scores. The PCPP seeks to prioritize locations that have **both** expected pedestrian crossing activity and crossing risk, rather than simply one or the other. As a result, the individual criteria that identify expected pedestrian activity (Demand, and Connectivity and Accessibility) are summed. This summation is then multiplied by a factor that increases scores based on expected increased crossing risk. The Crossing Risk factor is determined by summing the individual Crossing Risk criteria of posted speed, number of lanes, and traffic volume of the crossing site.

The last step in the calculation adds the Safety (Crash History) criteria scores to arrive at a total pedestrian crossing prioritization score. The Safety (Crash History) criteria are not weighted by the Crossing Risk multiplier to avoid overweighting sites with a reported pedestrian crash given the relative sparsity of these crashes in the County. Figure 1 presents the proposed scoring approach for the criteria graphically.

Figure 1: Proposed Clark County Prioritization Criteria



The prioritization score should not be considered the final criteria for where to place a crossing treatment. The goal of the prioritization process is to order locations to assist County staff in reviewing locations for new or enhanced crossings as part of the project development process. For the top scoring sites, additional site review may be needed to determine the feasibility and/or expected benefit of installing or enhancing a crossing at the prioritized location (see page 20 for more details of site considerations).

Pedestrian Crossing Screening Process

This section describes the process and tools developed to screen the County road network and identify locations with the greatest potential benefit from a new or enhanced pedestrian crossing treatment. The process and tools automate the PCPP scoring framework to the extent that consistent, countywide data is available while providing a repeatable and data-driven approach for evaluating potential locations for installing pedestrian crossing treatments. A user manual with step-by-step instructions for implementing the tools is included in Appendix A.

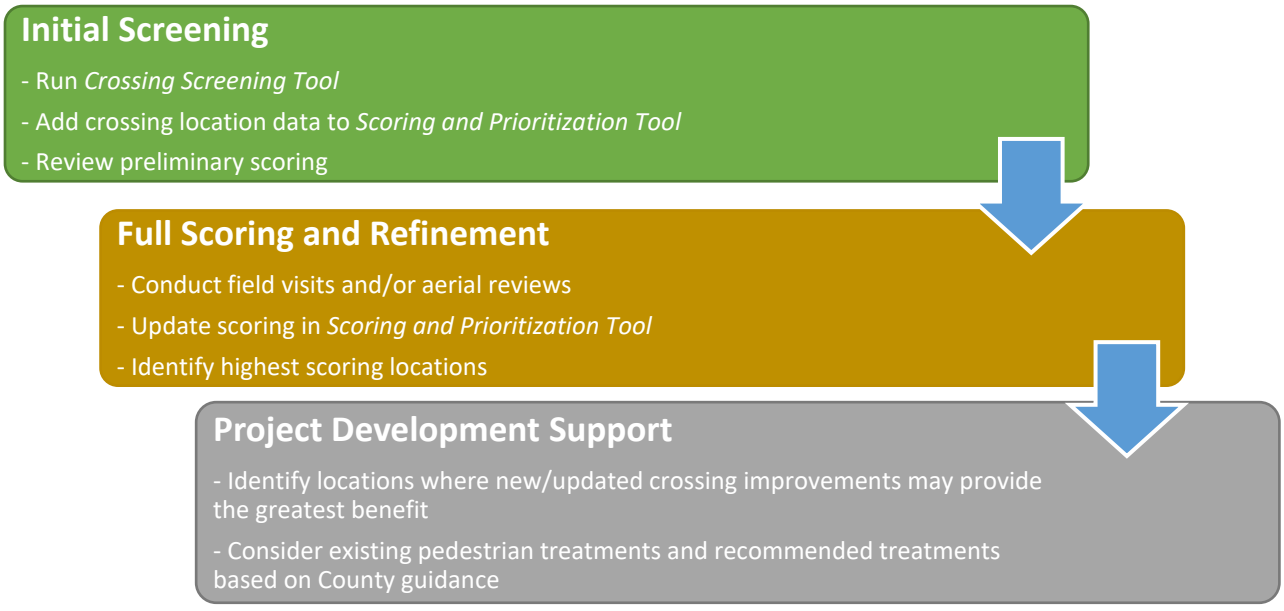
PROCESS OUTLINE AND DATA CONSIDERATIONS

To develop the screening process, Kittelson evaluated each criterion to determine whether consistent, countywide geospatial data was available to accurately estimate scores. Some data, such as AADT and crash data, can be processed with significant accuracy and efficiency using spatial analysis. However, other inputs, such as design feasibility concerns, are best evaluated on a site-by-side basis through aerial reviews or field visits. The PCPP screening process was developed considering the availability of data and the need for further site-specific reviews. It includes two-stages:

4. **Initial Screening:** The initial screening evaluates potential crossing locations across the County to identify locations where pedestrian crossing improvements are likely to have greater benefit based on automated geospatial analysis.
5. **Full Scoring and Refinement**: The refinement stage recognizes the need for staff to perform field visits or aerial reviews of higher scoring locations to refine the scoring of sites and identify other site-specific concerns.

Figure 2 outlines the screening process and shows how the prioritization steps build to a treatment plan.

Figure 2: Outline of Screening Process



Source: Kittelson & Associates, Inc. (2020)

INITIAL SCREENING

The initial step of the screening process scores sites using available geospatial data to apply the PCPP framework. The initial screening uses two tools, the Crossing Screening Tool, and the Scoring and Prioritization Tool. These two tools identify potential crossing locations and collect the available data in a consistent format. They then apply the PCPP scoring methodology to develop a preliminary score and priority list for more detailed review. This portion of the screening process does not include criteria that require field visits or aerial reviews. *The user guide with step-by-step instructions for the tools can be found in Appendix A.*

CROSSING SCREENING

The screening starts with running the Crossing Screening Tool. The goal of the Crossing Screening Tool is to automate collection of data for criteria where the results can reliably be summarized using geospatial data. This allows County staff to target their time for detailed analysis of specific locations. While detailed reviews are recommended for any locations where a project is under consideration, categorizing and prioritizing sites for field visits is not practical across a large geographic area.

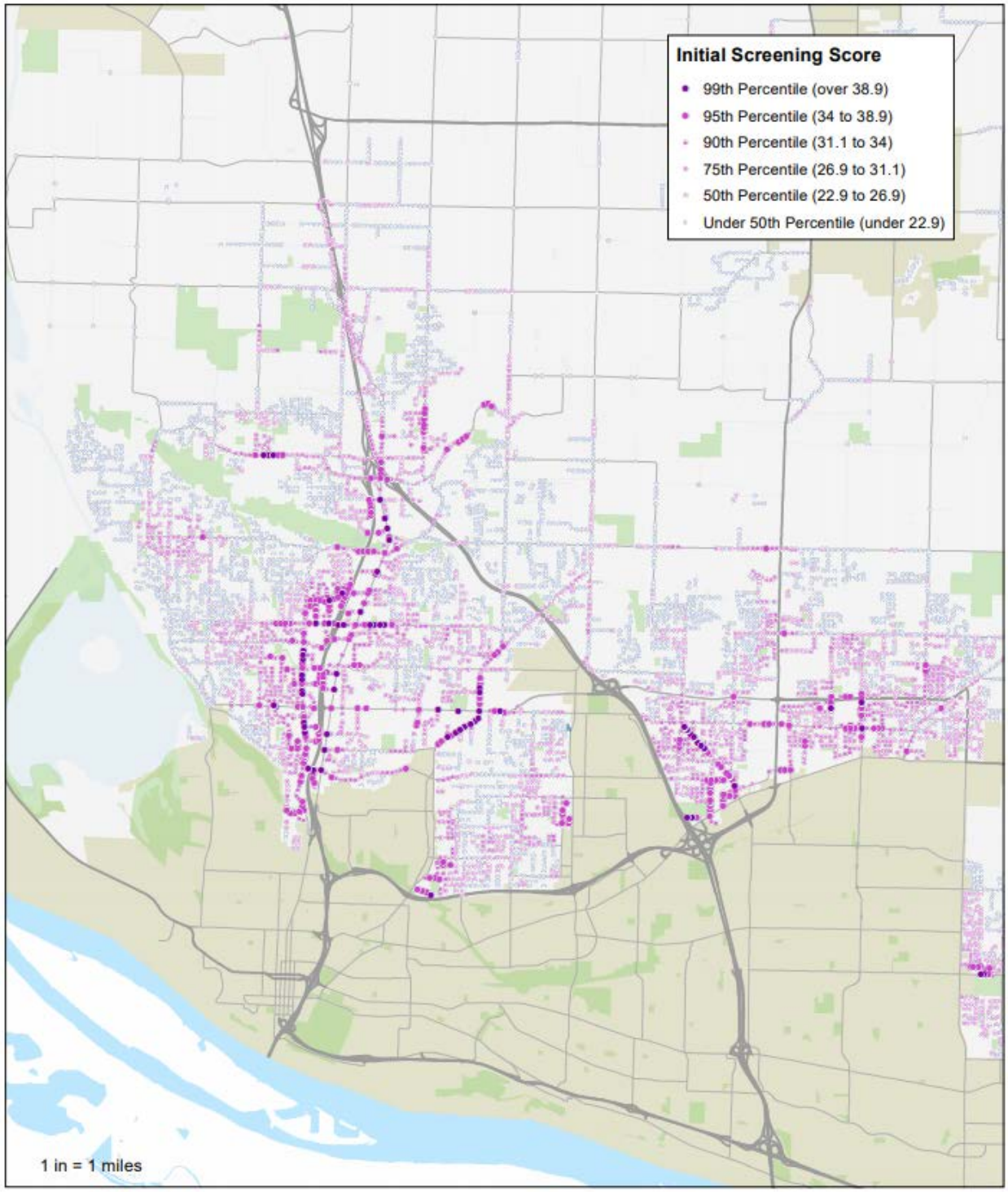
The Crossing Screening Tool is a Python-based script in ArcMap that consolidates available countywide geospatial information for the PCPP scoring criteria. The tool creates a set of screening locations that consists of intersection and potential midblock crossing locations. The screening locations are then evaluated based on roadway and intersection data inputted by the user. The tool uses a series of spatial analyses to summarize relevant data for each potential crossing. The output of the Crossing Screening Tool is a shapefile with point data organized in a consistent format.

SCORING AND PRELIMINARY PRIORITIZATION

Next, the data in the shapefile created by the Crossing Screening Tool is transferred to the Scoring and Prioritization Tool. This tool is an Excel-based spreadsheet tool that organizes and calculates the PCPP criteria scores. Based on the initial screening, the tool calculates a preliminary score and orders each of the screening locations by relative score. Results of the initial preliminary prioritization calculated as part of the development of the PCPP are shown in Figure 3. Based on the initial screen, Kittelson found:

- Preliminary PCPP scores range from 10 to 48.4 out of 71 total available points.
- The top 100 locations have scores exceeding 37 points.
- Four of the top 100 locations are signalized intersections

Figure 3: PCP Preliminary Screening Score – Southwest County



Source: Kittelson & Associates, Inc. (2020)

FULL SCORING AND REFINEMENT

After the initial prioritization screening, County staff can review locations to determine which ones to move forward into feasibility analysis. The tool generates an ordered list of locations across the County based on available spatial data. Reviewing specific condition may reveal the need to reevaluate specific factors regarding land use, pedestrian facilities, and roadway conditions. The Scoring and Prioritization Tool includes fields for updating each of these characteristics. The tool updates the score and rank of the locations based on any refinement.

The potential reasons for refinement include:

- Imprecise Spatial Data – Spatial data may not capture the nuance of a specific location. For example, spatial files may not capture the exact location where a trail crossing meets the road.
- New Conditions – Review of locations identifies an update since data was collected. For example, an expected increase in AADT due to a new land use, a recently completed project, or a recently reported pedestrian crash.

PROJECT DEVELOPMENT SUPPORT

The third part of the screening process provides a framework to support evaluating sites for potential treatments. County staff can identify which sites to consider for treatments when refining the score for individual locations. The selected locations are added to a separate sheet in the Scoring and Prioritization Tool where treatment decisions are supported by the tool.

TREATMENT CONSIDERATIONS

In the potential project sheet, the Scoring and Prioritization Tool populates the location of the potential crossings as well as characteristics cited in the County's crossing guidance for determining the recommended treatment. As shown in Table 23, the County's crossing guidance includes the location's control (if any), AADT, lane number, and speed limit. Based on the characteristics, the tool identifies recommended treatments for non-signalized locations based on the Clark County Pedestrian Crossing Treatment Policy guidance. Signalized locations do not receive a recommended treatment.

While the screening tool will provide a recommendation for treatment for a location, County staff may identify characteristics in their review of the location indicating that the recommended treatment may not be the best and instead:

- a different crossing treatment should be used; or,
- the location should not be considered for a crossing.

Table 23: Clark County Recommendations for Marked Crosswalks and Enhanced Pedestrian Crossing Treatments at Uncontrolled Locations

ROADWAY TYPE (NUMBER OF TRAVEL LANES)	VEHICLE ADT > 4,000 TO 6,000			VEHICLE ADT > 6,000 TO 9,000			VEHICLE ADT > 9,000 TO 12,000			VEHICLE ADT > 12,000 TO 15,000			VEHICLE ADT >15,000		
	SPEED LIMIT														
	≤ 30 MPH	35 MPH	≥ 40 MPH	≤ 30 MPH	35 MPH	≥ 40 MPH	≤ 30 MPH	35 MPH	≥ 40 MPH	≤ 30 MPH	35 MPH	≥ 40 MPH	≤ 30 MPH	35 MPH	≥ 40 MPH
2 Lanes	A	A	B	B	B	B	B	B	B	B	B	E	B	B	E
3 Lanes	A	A	B	C	C	D	C	D	D	C	D	E	D	D	E
Multi-Lane (4 or more Lanes)	C	C	C	C	C	D	C	D	E	D	D	E	D	D	E

NOTES:

- *Shared-use path crossing locations with ADT less than 4,000 ADT may qualify for marked crosswalks and/or enhanced pedestrian crossing treatments as shown in the column for "Vehicle ADT >4,000 to 6,000."*
- *Installation of marked crosswalk or enhanced crossing treatment, at any location, subject to engineering study and judgement that accounts for factors such as sight distance, traffic safety, traffic operations, other field conditions and pedestrian population. The engineering study must include a site-specific delay analysis, using the HCM.*

LEGEND

- **A** Marked Crosswalk
- **B** Marked Crosswalk with Flashing Beacon
- **C** Marked Crosswalk with Median Island
- **D** Marked Crosswalk with Flashing Beacon and Median Island
- **E** Marked Crosswalk with Pedestrian Hybrid Beacon (PHB) or Traffic Signal

REFERENCES:

- *Zegeer, Steward, Huang, "Safety Effects of Marked vs Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines", FHWA, 2002.*
- *Manual on Uniform Traffic Control Devices (MUTCD), 2009 Edition, published by FHWA.*
- *Highway Capacity Manual (HCM), 2016 sixth edition, published by TRB.*

Source: Clark County Pedestrian Crossing Treatment Policy, 2018

BENEFIT COST RATIO

Based on staff input and crash history, the tool also produces a preliminary cost benefit calculation for each site when crash modification factors (CMFs) are available. The cost benefit analysis is based on average project type costs and is appropriate for general planning. Costs should be refined as the location is moved forward into the project development process.

ADDITIONAL SITE CONSIDERATIONS

During the location refinement and project development, County staff may evaluate sites for other factors that may influence the feasibility or expected benefits of a new or enhanced crosswalk. These considerations can help prioritize locations and direct resources for installing or upgrading pedestrian crossings where they are most likely to have the greatest safety and accessibility benefits.

OBSERVED PEDESTRIAN DEMAND

Observed pedestrian demand is the counted number of people crossing the street at a given location for a specified period. Although the County does not have countywide information on pedestrian volumes, observed pedestrian demand may be considered when determining the appropriate crossing facility or selecting a preferred site. Additionally, the type of crossing facility available, or absence of, influences crossing demand. Locations with a relatively small observed volume of crossings may serve a greater demand once a crossing is installed or enhanced. Therefore, it may be necessary to consider the expected pedestrian demand in addition to observed demand when considering a crossing treatment.

URBAN OR RURAL CONTEXT

Needs differ in rural and urban contexts. Potential crossing locations are flagged based on the urban growth boundary so that the County may consider scores relative to context and implement a combination of urban and rural crossings.

INTERSECTION OR MIDBLOCK CROSSING TYPE

The County may consider the different needs and values of intersection and midblock crossing types. Midblock crossings are typically considered at locations where there is a clear demand for pedestrians not served by adjacent intersections. Common example locations for midblock crossings include trail crossings, school entries, and transit stops.

EXISTING TREATMENT

The County may consider a given location and assess how closely the location and adjacent environment aligns with their policy's treatment recommendation. Existing or proposed treatments inappropriate for a given context may increase crossing risk by encouraging people to cross at a location that does not provide sufficient stopping sight distance to motorists. Some existing pedestrian crossing treatments may have been appropriate for a prior location context or based on previous analysis that resulted in implementing the existing treatment.

REDUNDANCY

When considering a crossing location and treatment, the extent and location of the closest pedestrian crossing should be considered to determine the need to upgrade an existing crossing facility or shift the location to optimize spacing between crossings.

DESIGN FEASIBILITY CONCERNS

Site features and project location context may influence the feasibility of installing a crosswalk at a particular location. These include driveways, utilities, environmental impacts and mitigations, curves, or other visibility limitations. In some cases, these concerns may be resolved by shifting the crosswalk location, but in others the County may consider a different crossing location because of design constraints.

NETWORK CONNECTIVITY BENEFIT

Crossing facilities should be prioritized where they are best able to provide a network benefit and expand pedestrian access to destinations. Sites should be evaluated to consider the overall connection to other walking facilities and the overall benefits to accessing destinations throughout the County by walking or connections to other modes.

IMPROVEMENT COSTS AND EXPECTED BENEFIT

A planning-level cost can be applied to a location based on the anticipated crossing type required. The overall network benefit of installing a crosswalk is difficult to quantify, however the anticipated safety benefit can be considered using crash modification factors or expected safety benefit(s).

POTENTIAL FUNDING SOURCES

There are a variety of potential funding sources for crossing treatments. This includes Highway Safety Improvement Program, the Transportation Alternatives Program, Surface Transportation Block Grant Program, Congestion Mitigation and Air Quality Improvement Program, Washington Department of Transportation (WSDOT) Safe Routes to Schools Program, development impact fees, and state funding for locations that connect to state roadway facilities. By pursuing multiple funding sources, the County can maximize funding for pedestrian crossing projects.

Appendix A: User Guide

This section describes the mechanics of the Crossing Screening Tool and Scoring and Prioritization Tool. It provides instructions for implementing the two tools to generate a list of candidate locations for crossing improvements. The locations are ordered according to the PCPP scoring framework to facilitate more detailed review by County staff.

STEP 1. CROSSING SCREENING TOOL

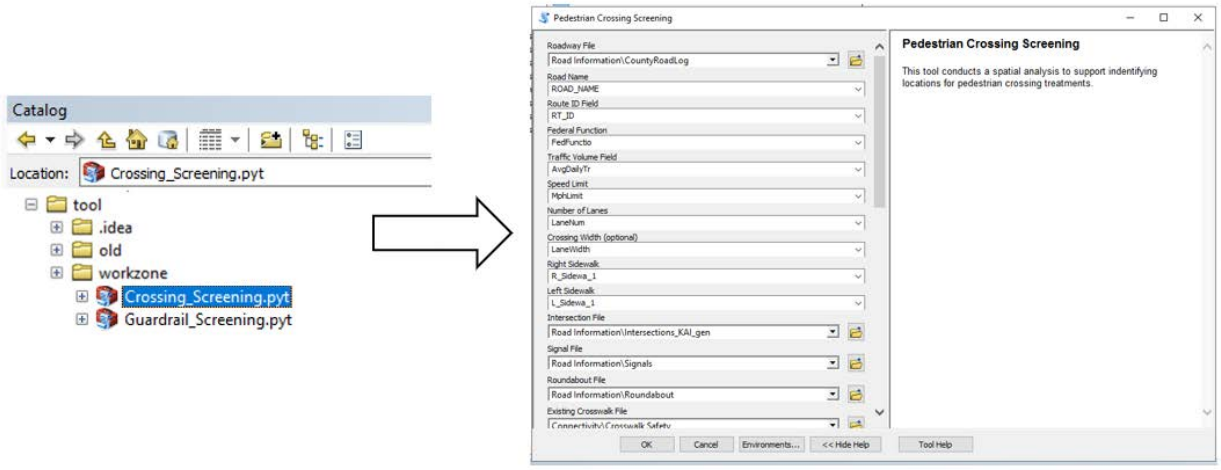
The Crossing Screening Tool is a Python-based tool run though ArcMap that evaluates a set of intersections and midblock locations to identify location conditions at the site. Intersection locations are identified based on a user input file and midblock locations are generated along the County road network based on distance from adjacent intersections.

The tool uses a series of spatial analyses to summarize relevant data for each potential crossing. Data includes inputs related to land use, pedestrian connectivity, roadway characteristics, and crash history. The output of the Crossing Screening Tool is a shapefile with point data organized in a consistent format for use in the next step in the screening. Running the tool requires an ArcGIS desktop Advanced license.

1.1 OPENING THE TOOL

The user interface is launched by navigating to the folder containing the tool in the ArcMap Catalog. The tool is launched by clicking on the Crossing Screening Toolbox and double-clicking on the script. When the user launches the tool, it opens as window requesting user inputs as shown in Exhibit 1.

Exhibit 1: Launching Crossing Screening Tool



After launching the tool, the user identifies files for running the screening. Adding the appropriate files to the "Table of Contents" before running the tool streamlines file selection by creating a drop-down menu for the user to select files from. The tool requires eight spatial files and several parameter specifications, as described in "Screening Inputs" below.

1.2: SCREENING INPUTS

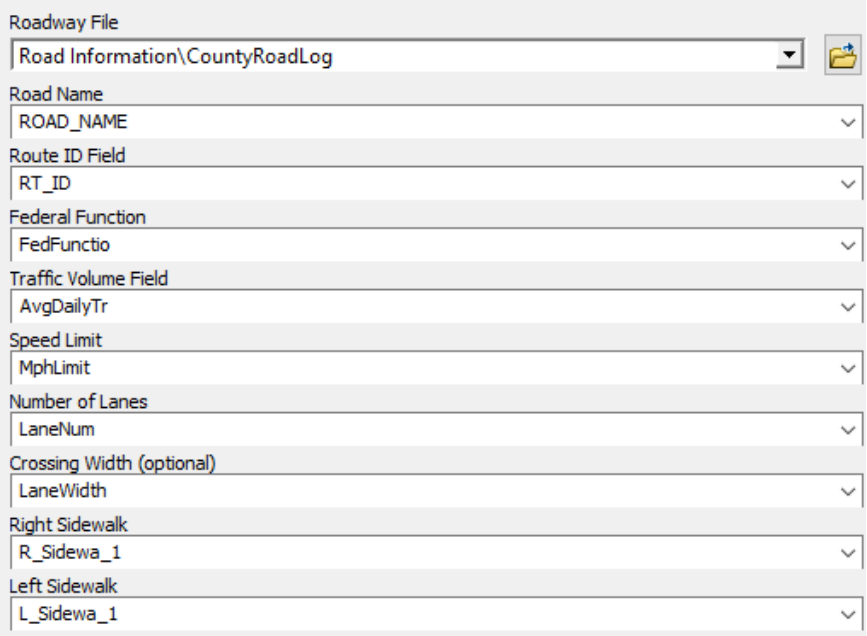
The figures included in this report section show the inputs when using the base data files provided by Kittelson in the "Pedestrian_Crossing_Screening" MXD file.

1.2.1 Linear Referenced Network Layer

The user starts by identifying the linear referenced road network for the County. Next, the user is prompted to identify the location where specific data is stored within the file, as shown in Exhibit 2. The tool uses the following parameters from the existing County Road Log data:

- "Road Name" – text field with the road name
- "Route ID Field" – unique ID for roadways in the segment
- "Federal Function" – text designation with urban / rural designation. Designed to work with field in the provided County Road Log
- "Traffic Volume Field" – numeric field for AADT
- "Speed Limit" – numeric field for speed limit
- "Number of Lanes" – numeric field for total number of lanes on road
- "Right Sidewalk" – numeric value for sidewalk widths on the right side of the roadway
- "Left Sidewalk" – numeric value for sidewalk widths on the left side of the roadway

Exhibit 2: Linear Reference Road Network Inputs

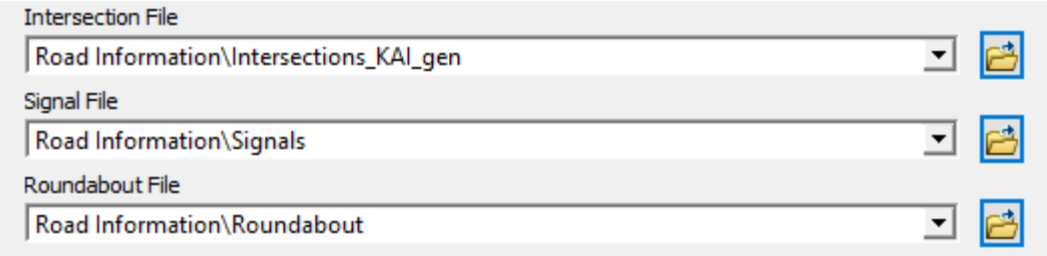


The tool references the roadway network using spatial analyses to identify roadway characteristics at intersection and midblock screening locations (described on page 27). For characteristics where multiple characteristics are present at the locations (e.g., AADT on intersecting roads), the tool either: (1) records the value that drives the score (i.e., the max speed present at an intersection is used for scoring purposes); or (2) creates a list of values that can be more effectively evaluated using excel formulas in the Scoring and Prioritization Tool.

1.2.3 Intersection and Control

The user then identifies layer files describing intersections and intersection control. The "Intersection File" is used by the tool to identify intersection locations to use in the screening. The tool combines these locations with the midblock locations to create the full set of screening locations. The "Signal File" and "Roundabout File" layers are used to identify existing signal and roundabout control at intersections.

Exhibit 3: Intersection and Control Inputs



1.2.4 Crosswalk Information

The user identifies a layer file with the locations and description of existing marked crosswalks. The location of the crosswalks in the layer is used to measure the relative proximity of crosswalks. In addition, the screening identifies characteristics of the crosswalk if present. This information is retained to inform treatment considerations. **Note:** The tool is designed to work with the crosswalk layer file provided by the County and expects four specific fields:

- "Control" – the control type present at the location
- "Lighting" – if there is lighting present at the location
- "Refuge Island" – if a refuge island is present at the location
- "School Crossing" – if the crosswalk is used as a specified school crossing location

Exhibit 4: Crosswalk Input

1.2.5 Trails

The user identifies a layer with the County trail network and the field identifying which trails are regional trails. The tool requires a layer with line geometry. For each line feature, the tool exports endpoints of the trails to estimate trailheads and exports points at any intersection with a County road. The tool records whether the trail is classified as a regional or local trail.

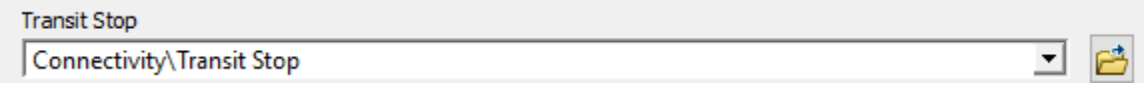
The column identifying regional trails must classify trails as either "Regional" or "Local". Using different naming terminology will produce classification errors in the Scoring and Prioritization Tool.

Exhibit 5: Trails Input

1.2.6 Transit

The user identifies a layer with the location of County transit stops. Stops are used to focus the screening on the locations along a route where individuals access and alight the bus. The tool measures the distance from screening locations to the nearest transit stops. Transit stop data provided by Kittelson was created using C-Trans' General Transit Feed Specification (GTFS) file. The user may choose to consider only routes with more frequent service. To do this, Kittelson recommends that the user apply a "definition query" to select stops on more frequent routes.

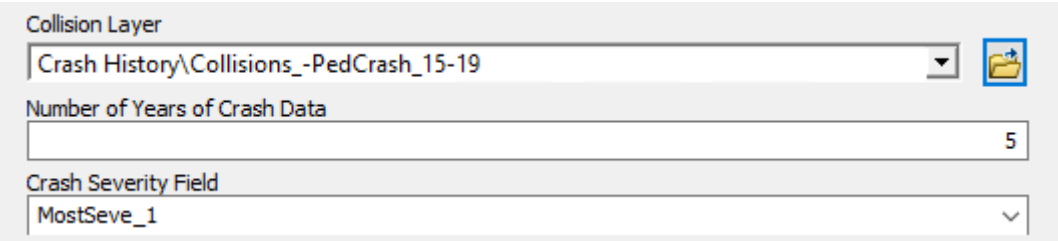
Exhibit 6: Transit Input



1.2.7 Crash Information

The user identifies a layer with geolocated crashes involving pedestrians. After identifying the layer, the user must identify the crash severity data column and the number of years of crash data being evaluated. The tool is coded to interpret crash severity ratings as defined by WSDOT[4]. The severity information is in the column titled "Most Seve_1"[5] in the file provided by Kittelson.

Exhibit 7: Pedestrian Involved Crashes Input



1.2.8 Land Use Information

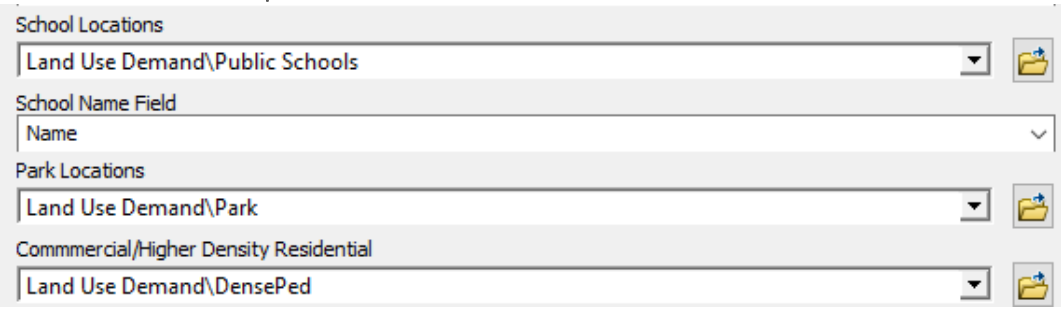
The user identifies layer files that show geographies for the three land use types using polygon geographies. To appropriately screen locations, the user should use geometry that describes the property boundaries of the given land use rather than a point geography centered on the land use. For the school layer, the user also identifies the column in the file with the school name. This information is carried forward to give context for screened locations.

The prepared files include layers created with the County to capture park locations and pedestrian generating land uses. The files are created from a countywide parcel level dataset by filter for specific land use types. Appendix B provides a summary of the filters if a user chooses to redefine the land uses considered by the tool. The layers should be updated when known rezoning occurs.

[4] Information about the Washington DOT crash data structure can be found at https://www.wsdot.wa.gov/mapsdata/crash/crashdata.htm

[5] The provided file is assigned a definition query that restricts the crash data to "pedestrian-involved" crashes between 1/1/2013 and 12/31/2017.

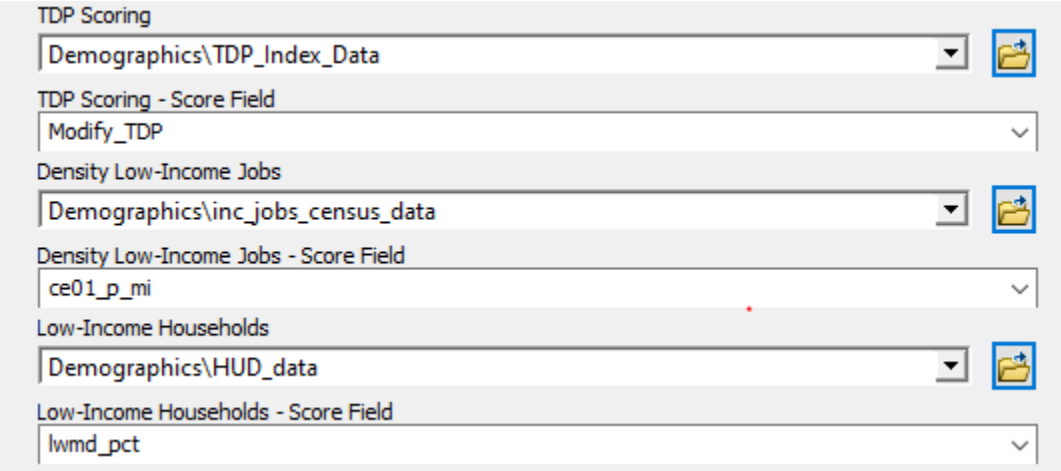
Exhibit 8: Land Use Inputs



1.2.9 Demographic Information

The user identifies demographic information to use in the prioritization process. The prioritization uses three demographic metrics, TDP Index, Density of Low-Income Jobs, and number of Low-Income Households. For each metric, the user identifies the layer with the information and the field within the layer that contains the metric. **Note:** Census statistics used in this metric change annually as new data is produced. Appendix B provides a description of where to find data and how to recalculate the metrics.

Exhibit 9: Demographic Metric Inputs



1.3 GENERATING TEST LOCATIONS FOR MIDBLOCK CROSSINGS

The tool generates midblock screening locations based on roadway, crosswalk, and trail information provided. The midblock screening locations are combined with the locations identified in the intersection file. This step of the tool is included for informational purposes and does not require action from the user. The tool generates the midblock testing locations using specific methods for urban roads and trail crossings and trailheads:

Crosswalks

1. **Identify Midblock Crosswalks**. The screening tool filters the crosswalk layer for crosswalks located at midblock locations (crosswalks at intersections are captured by the intersection layers).
2. **Simplify Data**. The County crosswalk layer includes multiple points at some locations. The screening tool consolidates locations into individual points if the points are within 100 feet of each other. The resulting points are then snapped to the roadway network.

Trail Heads

1. **Generate Trail Crossings**. The screening tool intersects the roadway layer with the trail layer to identify where trail segments cross a roadway. This creates midblock screening locations specific to trail crossings.
2. **Generate Trailhead Points**. The tool identifies end points of trail segments and measures the distance of the points to the road network. If the distance is less than 100 feet, the points are joined to the roadway to represent likely trailhead locations.
3. **Clean Records**. The screening tool measures the distance between the trailhead points, trail crossings, and crosswalk locations. If the points are located within 100 feet of each other, the tool retains only one point, prioritizing existing crosswalks, then trail crossings.

Urban Roadways – Potential Locations

1. **Select roads that are urban**. The screening tool identifies roads that are designated as urban since midblock crossings are rarely created on rural roads.
2. **Select blocks that are more than 600 feet long**. Per the Clark County Pedestrian Crossing Treatment Policy, pedestrians are redirected to the nearest crossing when the nearest crossing is less than 300 feet away[6], therefore midblock crossings are only be considered on blocks more than 600 feet long.
3. **Create scoring points at 300-foot intervals**. The ArcGIS function used in the tool generates equally spaced points starting from one end of each block traveling towards the other end of the segment. As a result, the function generates locations within 300 feet of the end of the block. The tool removes any point generated within 200 feet of the intersection. This approximation ensures that points are placed no further than 500 feet from the end of the segment.

[6]Per County guidance, If the location is a shared-use path crossing a roadway, a crosswalk would be considered if it is greater than 200 feet from the nearest marked or protected crossing.

1.4 SAVING THE FILE

The user identifies the folder location and output name for the tool. The result layer is saved to this location. **Note: Do not include spaces in the names for the output folder or output file names.** Spaces can create file saving issues. The file is saved as a shapefile. User can use the file to spatially reference locations after they are evaluated in the Scoring and Prioritization Tool. Information on how to cross-reference is provided in Step 2.4.

STEP 2: SCORING AND PRIORITIZATION TOOL

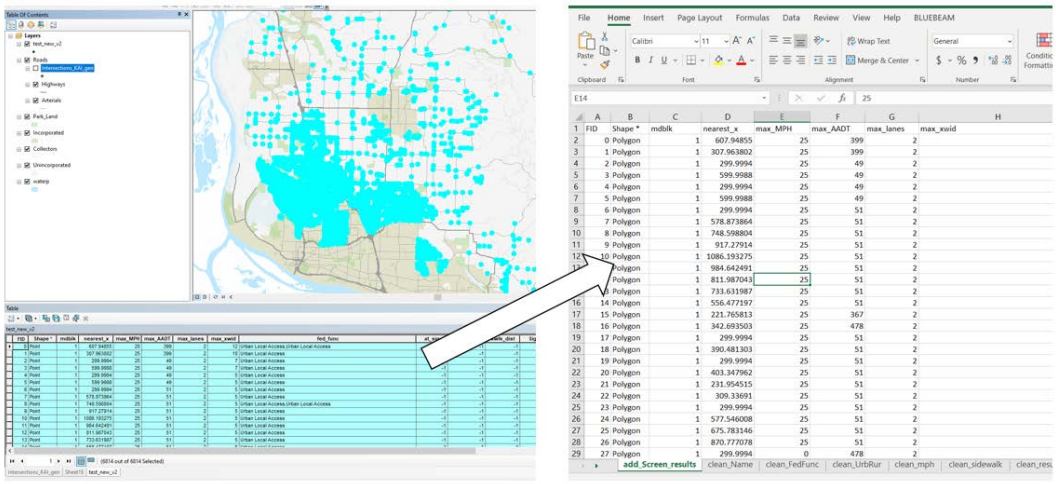
Step 2 is conducted using the Scoring and Prioritization Tool. The Scoring and Prioritization Tool is an Excel-based tool that functions separately from the Crossing Screening Tool and facilitates prioritization and scoring of locations. Users transfer take the results layer created by the Crossing Screening Tool and add the data to the Scoring and Prioritization Tool. They then work in Excel to prioritize locations and identify potential locations for pedestrian crossing treatments. The weighting methodology described in the "Tool Scoring" section is applied in the Scoring and Prioritization Tool. It processes the results from the Crossing Screening Tool in three steps:

- **Data Input** – Transfer data from the Crossing Screening Tool into the Scoring and Prioritization Tool.
- **Initial Screening –** The Crossing Screening Tool calculates an initial screening for each of the characteristics included in the PCPP Framework and orders the sites to identify promising locations for review.
- **Full Scoring and Refinement** – User reviews locations ordered by the initial screening score in the Excel Spreadsheet. The spreadsheet provides defined cells for users to add or refine measurements for each metric. The sheet rescores locations based on the user's input.

2.1. DATA INPUT

Begin by opening ArcMap and the Scoring and Prioritization Tool in Excel. In Excel, save a new clean version of the spreadsheet tool. This should be done each time running the tool to maintain previous records and work from a clean file. Then, in ArcMap, add the result layer generated by the Crossing Screening Tool and open the attribute table for the layer. Select the "select all" option for the table. This will highlight all of the records in the file. Copy all of the records to the computer's clipboard. Bring up the Scoring and Prioritization Tool and navigate to the tab named "add_Screen_results" as shown in Exhibit 10. The tab should be empty of any data. If it is not, delete the records. Paste the data copied from the results layer into the "add_Screen_results" tab.

Exhibit 10: Transfer Data from Crossing Screening Tool to Scoring and Prioritization Tool



The notebook begins processing the data when it is pasted into the tab. **Users should expect the Excel file to pause for a moment to complete calculations due to the file size**. Users may consider reducing the number of results in the Network Screening Tool results layer to speed up processing. This can be done by running a "definition query" on the file in ArcMap to parse only certain location types.

2.2 SCREENING

The initial screening considers each of the factors included in the PCPP Framework. The Crosswalk Screening Tool generates information for each factor that is then scored based on the framework prioritization scoring. The first steps in the Initial Screening do not require any action from the user. They are described here to inform the users on how the tool works so that updates can be made if necessary.

2.2.1 Cleaning Steps

The first part of the screening is a set of processing tabs that clean outputs from the Network Screening Tool Output. The variables cleaned are below with the sheet name where processing is completed:

- **Intersection Name** ("clean_Name") – Network Screening Tool creates a comma separated list of streets names from roads that intersect with the intersection or midblock location. The sheet in the tool reviews the street names in the list and deletes repeated street names. The remaining names are reformatted separated with backslashes.
- **Federal Function** ("clean_FedFunc") – Network Screening Tool creates a comma separated list of street federal functions based on the roads that intersect with the intersection or midblock locations. The sheet in the tool identifies the highest function roadway for scoring the site. Cleaning is designed to work with the existing variables in the County Road Log column name "FedFunctio". The variables are a combination of "Urban" / "Rural" and "Local" / "Collector" / "Arterial".
- **Urban / Rural** ("clean_UrbRur") – The tool references the same field used for the Federal Function. If the comma separated field includes a road that is urban, the intersection or midblock locations is identified as an "Urban" location. If field only includes "Local" designated roads, the intersection or midblock is designated as "Local".
- **Speed Limit** ("clean_MPH") – The Network Screening Tool identifies the highest speed limit present on roads at each intersection or midblock locations; however, speed limit information is not available at all locations in the County Road Log. As a result, the Scoring and Prioritization school updates the field to add Prima Facie speed limits. Rural locations receive a speed limit of 50 mph and urban location receive different speed limits based on functional classification – 45 mph for arterials, 35 for collectors, and 25 for local roads. The Prima Facie speed limits can be adjusted by changes the highlighted cells on the sheet "clean_mph".
- **Sidewalks** ("clean_sidewalks") – The Network Screening Tool generates a comma separated list identifying the width of the "left" and "right" sidewalk of roads intersecting the tested locations. The cleaning sheet reviews each road in the list and identifies the conditions that would score highest in the framework. Then the conditions are assigned a value 0, 1, or 2 which corresponds to "No Sidewalks", "Sidewalks on One Side of Road", or "Sidewalks on Both Sides of Road".

2.2.2 Simple Results

After the cleaning is complete, the Scoring and Prioritization Tool summarizes the results in a new tab called "clean_results". The user does not need to interact with this tab. It exists to attach the cleaned data to the other results from the Network Screening.

2.2.3 Preliminary Scoring

The scoring is completed across two tabs of the workbook. The user does not need to interact with these sheets unless the County decides to make changes to the weighting of specific factors.

- "scoring_reference" includes a set of tables corresponding to the scoring outlined in Clark County's in PCPP Framework. It includes scoring for each of the variables in the framework. The scores for the three demographic metrics are calculated by referencing the 95th percentile for each metric for input data. **Note:** If the County chooses to alter weighting of different factors in the framework, the tool can be updated by changing the values stored in this sheet. It is also possible to adjust the cutoffs between different tiers in variables using the "Reference" column; however, this is not recommended without due care for implications as the tool uses the variables in more complex methods, increasing the potential for unexpected errors.
- "prelim_scoring" calculates the preliminary scoring by referencing the tables in "reference_scoring" and applying the appropriate scores for each variable. The sheet conducts two separate rankings that feed into the two user work zones where locations are listed by scoring order. Users should **not** reorder the data in the "prelim_scoring" tab. This can break the referencing functions used in the workbook resulting in incorrect scoring in later tabs.

2.3 LOCATIONS REVIEW AND REFINEMENT

The screening results are provided in three sheets. The sheets provide are designed to provide options for to examining and refining the screening results.

- **Exploration Interface** ("exploration_workzone") facilitates preliminary review of locations. Users can select for specific type of locations and review preliminary scoring on a single sheet.
- **Refinement Interface** ("refinement_workzone") facilitates detail review and scoring or locations. This is the locations where users identify sets of locations for potential projects.
- **Record of Scoring** ("record_of_locations") provides record of preliminary scoring as refinement is conducted. This sheet includes same detail as Refinement Interface and allows users to reference the initial scoring of each location.

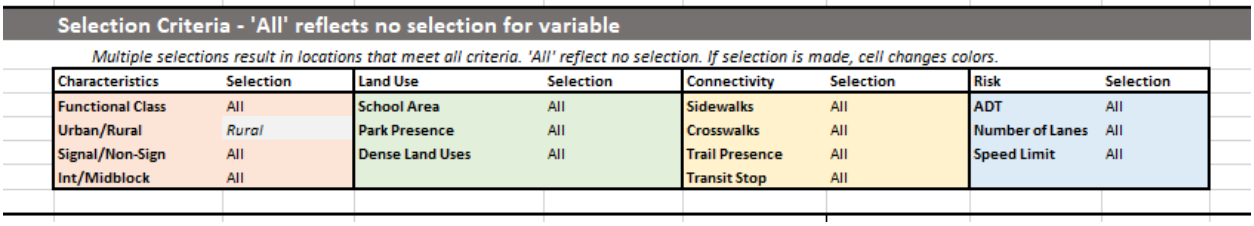
2.3.1 Exploration Interface

This interface is designed to facilitate high level review of locations. It provides a more limited set of information based exclusively on the Network Screening Tool results. Users can quickly compare locations and understand how a specific location compares to similar locations (for example, comparing a midblock location against other midblock locations). **Note:** This interface is for preliminary review. User should use the Refinement Interface to evaluate/update preliminary screening scores and select projects.

The sheet has three major components:

- **Selection Criteria** – This the interactive portion of the tool. It contains a set of drop-down selection boxes that allow the user to choose for different locations characteristics. Based on user selection, the tool selects locations meeting the criterium and provides those locations by score (if multiple selections are made results show locations that meet all criteria). Exhibit 11 shows the selection for evaluating the highest scoring rural locations.

Exhibit 11: Exploration Interface - Rural Location Review



Selection Criteria - 'All' reflects no selection for variable

Multiple selections result in locations that meet all criteria. 'All' reflect no selection. If selection is made, cell changes colors.

Characteristics	Selection	Land Use	Selection	Connectivity	Selection	Risk	Selection
Functional Class	All	School Area	All	Sidewalks	All	ADT	All
Urban/Rural	*Rural*	Park Presence	All	Crosswalks	All	Number of Lanes	All
Signal/Non-Sign	All	Dense Land Uses	All	Trail Presence	All	Speed Limit	All
Int/Midblock	All			Transit Stop	All		

- **Screening Locations Information** – The results are presented in a table that summarize descriptive information about the locations and preliminary scoring results. The left part of the table provides descriptive information about the locations based on the preliminary screening. The description includes the FID field which can be used to reference locations in ArcGIS (more detail is provided in the Refinement Interface guidance). **Note:** It is not possible to update this information based on site review in this sheet. That option is provided in the Refinement Interface.
- **Preliminary Scoring** – The right side of the table provides the preliminary scoring and a summary of the preliminary scoring by framework prioritization groups. This information is provided at the group level to help inform the user as to why certain locations are or are not prioritized. For example, it may show that a given location that ranks higher on Land Use and Connectivity metrics may score lower overall because of a low score on the Demographic Metrics.

2.3.2 Refinement Interface - Scoring Refinement

The Refinement Interface is where users review and refine the scoring of individual metrics for scoring locations. Refinement of scoring allows the user to review and correct scoring for locations where the screening methodology (which includes some assumptions to facilitate County-wide screening) or imperfection in spatial data lead to incorrect metric results. Users work in this part of the tool to review and validate scores for individual locations and ultimately select locations for proposed treatments.

In the Refinement Interface, locations are ordered in a table by their preliminary screening score. The table is organized into six parts, left to right: Location Information, Demand, Connectivity and Accessibility, Crossing Risk and Safety, Scoring and Ranking, and Site Notes.

Location Information and Review

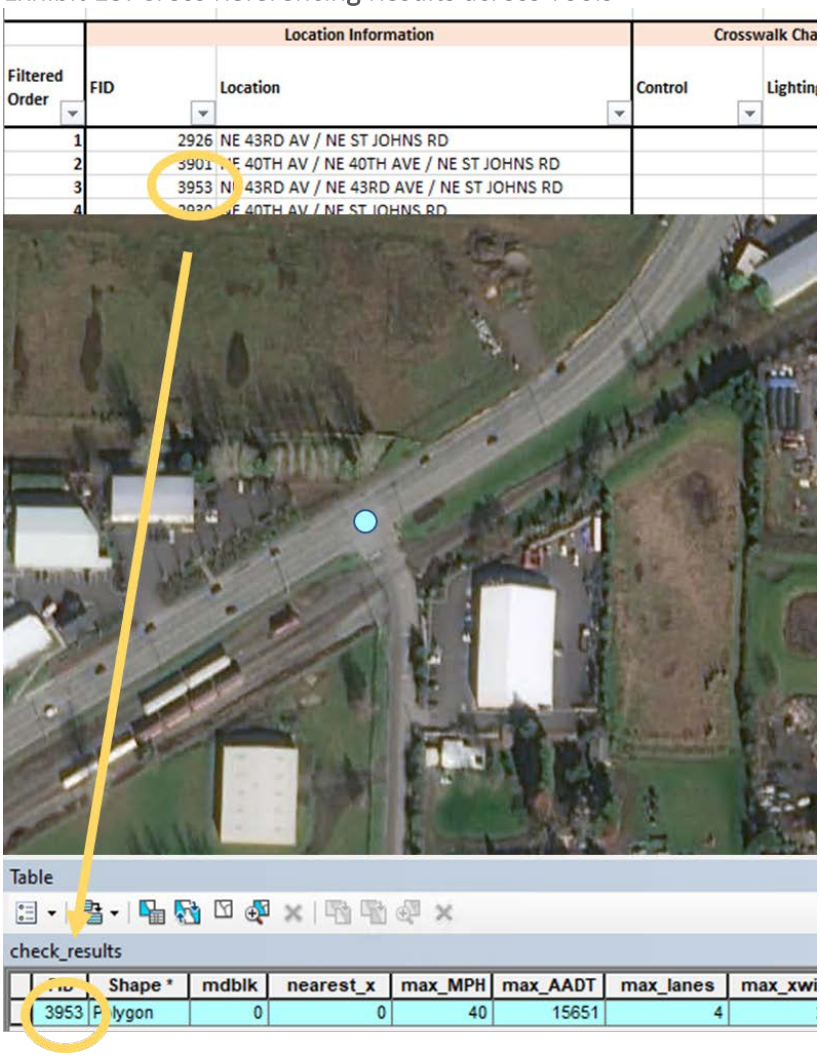
Information about the screened location is included at the left side of the table. It includes geographic information, description of crosswalk characteristics, if a crossing is present, and roadway context as shown in Exhibit 12. If the crosswalk characteristics cells are blank, then there is no data regarding a crossing treatment at that location.

Exhibit 12: Location Information

	Location Information		Crosswalk Characteristics (if present within 150 feet)				Context				
Filtered Order	FID	Location	Control	Lighting	Refuge Island	School Crossing	Highest Functional Class	Urban / Rural	Signal (w/in 300ft)	Midblock	School Area
1	2926	NE 43RD AV / NE ST JOHNS RD					Arterial	Urban	0	1	
2	3901	NE 40TH AV / NE 40TH AVE / NE ST JOHNS RD					Arterial	Urban	0	0	
3	3953	NE 43RD AV / NE 43RD AVE / NE ST JOHNS RD					Arterial	Urban	0	0	
4	2930	NE 40TH AV / NE ST JOHNS RD					Arterial	Urban	0	1	
5	3808	NE 72ND ST / NE HIGHWAY 99	Traffic Signal	Present	None	No	Arterial	Urban	1	0	Hazel Dell Elem.

Users identify the exact location of the intersection on midblock location by referencing the results layer generated by the Crosswalk Screening Tool. This is done by cross-referencing between the two files using the FID of the screened location as shown in Exhibit 13. This number is used in both the Network Screening Tool result layer and in the “Locations Information” section of the tab. Users may consider converting the shapefile into a KML or their preferred visualization format to visualize in Google Earth or another program.

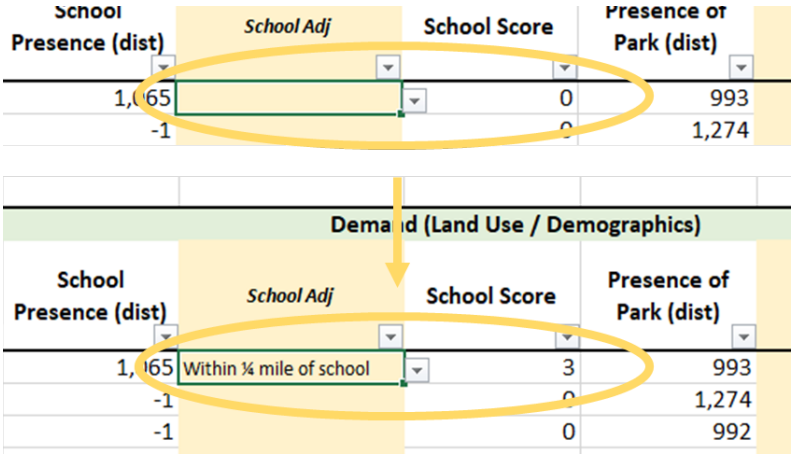
Exhibit 13: Cross Referencing Results across Tools



Refining Score for Locations

To the right of the location information is the preliminary scoring information for each metric in the framework. The user can review the information and, as necessary, update the scoring. To update the scoring for a metric, the user selects the yellow shaded cells that are labeled *Metric* “Adj”. When a user updates the cell, the tool overrides the preliminary screening score and rescores based on the updated input as shown in Exhibit 14.

Exhibit 14: Scoring Refinement - Updating Example



School Presence (dist)	School Adj	School Score	Presence of Park (dist)
1,065		0	993
-1		0	1,274

		Demand (Land Use / Demographics)	
School Presence (dist)	School Adj	School Score	Presence of Park (dist)
1,065	Within ¼ mile of school	3	993
-1		0	1,274
-1		0	992

At the far right, the tool includes four summary columns to track the prioritization as the users makes updates to the sheet. **Note:** Updates completed in the sheet will not reorder the locations on the sheet or in the Exploration Interface. Instead, the updates will result in changed rank.

- **Refined Score** calculates the segment score based on the characteristics included in the table, adjusting based on refinements to Network Screening results and field characteristics.
- **Intersection Rank / Midblock Rank** -
- **Updated Rank** recalculates the rank of the segment based on the refined score.

The "Updated Rank" provides the final scoring of the segments based on the PCPP Framework.

Exhibit 15: Scoring and Ranking

Scoring and Ranking			
Refined Score	Intersection Rank	Midblock Rank	Updated Rank
51.7		1	1
51.1	1		2
49.1	2		3
47.5		2	4

2.3.6 Record of Scoring

The Record of Scoring is a detailed record of the preliminary scoring results for each location. For each location screened, the tab provides the individual scoring for each scoring criteria. Users can use the data provided to review the initial results and understand how changes to the refinement scoring alter the overall ordering on potential locations. This portion of the tool is not interactive, except for basic filtering on column headers.

2.4 PRELIMINARY BENEFIT-COST ANALYSIS

The final part of the Scoring and Prioritization Tool is a sheet that conducts a planning-level benefit cost analysis for input locations. The "benefit_cost" sheet is populated from the Refinement Interface. Users can select to bring locations to the cost benefit sheet be selecting "Yes" under the column "Implement" at the right end of the sheet. Selecting "Yes" prompts the tool to load the location into the benefit cost analysis sheet of the tool. The sheet evaluates information in the Refinement Interface to recommend appropriate pedestrian crossing treatments at non-signalized locations and calculate a preliminary benefit-cost rate for locations where pedestrian-involved crashes have been recorded.

Users interact with the sheet in three ways:

- **Treatment Information** – Stored on a separate sheet, "treatment_list", is a list of potential treatments and information about the treatments. The user should update this sheet if they wish to add new treatments or update cost or CMF estimates. The benefit-cost sheet draws from this tab for populating potential treatment options.
- **Crash Characteristics** – At the top of the sheet, users confirm parameters for crash severity valuation and years of crash data used in the Network Screening Tool.
- **Treatment** – The treatment portion of the sheet includes two columns. The first column provides the recommended treatment. This cell is filled automatically based on the location characteristics and County guidance for non-signalized intersections. If the location is signalized, the no recommendation is made, and cells states that the location is signalized. In the second column, the user has the option to override the treatment based on further consideration. If a selection is made in this cell it prompts the tool to calculate benefit-cost ratio on the user defined characteristics. **Note:** If user adds choices for implementation, it may alter the order of locations in the sheet (locations are added based on their scores). User must review that any manual treatments are moved to match with the appropriate locations in the sheet.
- **Lighting** – The sheet separates crossing treatment costs from lighting treatment costs at a location for added flexibility. When the user reviews a location, they will determine if lighting must be added and choose the appropriate selection from the dropdown. Choosing "yes" will increase the estimated project cost by $20,000 based on an assumption of two new lights and a controller at the location.

Exhibit 16: Benefit Cost Estimate Example

Planning Level Analysis - Benefit Cost Considerations

Sheet is set up to support review of impact of pedestrian treatments at locations identified in the Refinement Interface. Sheet provides recommended treatment for non-signalized locations based on County Guidance. Users can alter treatment based on site review using the "Select Alterntative" column. Treatment options and characteristics are saved in the sheet "treatment_list".

Review crash characteritics to the right to ensure treatment benefits are calculated appropriately.

Location Information										
FID	Location	School Area	Urban / Rural	Crosswalk Presence	*0*	CMF	*Adjust CMF*	Design Life	Benefit	BC Ratio
5627	NE 122ND ST / NE HIGHWAY 99		Urban	Greater than 600 feet	0	Unknown		10	NA	0
3418	/ NE ST JOHNS RD		Urban	Greater than 600 feet	0	0.68		10	NA	0
4207	NE 100TH AV / NE 100TH AVE / NE COVINGTON RD		Urban	Greater than 600 feet	0	0.68		10	4,655,824	150.19
5949	NE 29TH AV / NE 148TH ST / NE 29TH AVE	Washington State Universit	Urban	Greater than 600 feet	0	Unknown		10	NA	0

Appendix B: Updating Files

The tool is packaged with a set of starting base data files for running the tool. These files will need to be updated periodically to reflect changes based on recent crash history, new projects, and other changes in conditions. For example, it is appropriate to update demographic information as new Census data is released. The screening process may also be rerun when County staff determine that there have been substantive roadway characteristics (e.g., data stored in the County Road Log) or pedestrian facilities changes. This section describes the process for updating the files.

TRANSPORTATION DISADVANTAGED POPULATION (TDP) INDEX

This section describes how the TDP Index is calculated. The methodology is a slight modification of the Transportation Disadvantaged Population Index the Oregon Department of Transportation Developed for its Active Transportation Needs Inventory.

The Transportation Disadvantaged Population Index is an index of Census data characteristics, designed to help prioritize improvements that serve areas with high numbers of transportation disadvantaged residents and environmental justice communities that have been traditionally underserved.

The index converts household statistics from the ACS to a per capita index. It is calculated at the Census block group level as the sum of people 65 and older, 17 and younger, non-white or Hispanic, speak English "not well" or "not at all", living in households without vehicle access, or with a disability. That sum is divided by total block population. People fitting into multiple vulnerability categories are counted multiple times. The higher the index number the more disadvantaged the population is with respect to transportation.

The TDP Index should be recalculated each year the PCPP process is run using the most recent ACS data. To create the index, use the most recent available American Community Survey Five-Year estimates at the block group level to calculate the following attributes:

1. Elderly populations (65 and older)
2. Youth populations (17 and younger)
3. Non-white and Hispanic populations
4. Limited English proficiency population (aggregate of census populations who speak English "not well" or "not at all")
5. Households without access to a vehicle
6. People with a disability (severe or non-severe disability) – *only available at census tract*

To create the index:

1. Navigate to the Census Bureau data portal at https://data.census.gov/cedsci/
2. Search for and download the following tables for Clark County:
    - B01001 – Sex by Age, Elderly and Your Populations
    - B03002 – Hispanic or Latino Origin by Race
    - B16002 – Limited English-Speaking Household
    - B25044 – Tenure by Vehicles Available
    - B18101 – Sex by Age by Disability Status
3. Open the files in Excel and as necessary, create the desired fields by calculating across columns. For example, Youth population is created by adding the separate fields that estimate population for age groups 17 and younger.
4. Combine the files into a single table using the block group number to merge the calculated variables from each table into a single tab.
5. Calculate the index using the following formula:

$$\text{TDP Index} = \frac{(\text{Eld} + \text{Yth} + \text{NH} + \text{LEP} + \text{Veh} + \text{Dis})}{\text{Pop}}$$

where:
Eld = # of residents over 65
Yth = # of residents under 18
NH = # of residents who identify as non-white or Hispanic
LEP[1] = # of residents that speak English "not well" or "not at all"
Veh[1] = # of residents with 0 vehicles
Dis = # of residents with a disability
Pop = Total population
[1]Number of residents that speak English "not well" or "not at all" and number of residents with zero vehicles is provided in the census at a household level and estimated by multiplying the data at the household level by the average household size for each block group.

6. Join the data to a Census TIGER/Line shapefile for Census block groups.

DENSITY OF LOW-INCOME JOBS

This section describes how the low-income job density metric is calculated. The measure is used to identify areas where more workers are low-income and therefore are more likely to walk as part, or all, of their trip to work. The measure is calculated using data from the Census Longitudinal Employment-Household Dynamics Origin-Destination Employment Statistics. New data is released annually on the Census website. It is most easily identified using the Census website: https://onthemap.ces.census.gov/.

The data provided with the tool was created using the most recent released data from 2017. When new data is released, users can update the layer using the following steps:

1. Go to the Website, and search for Clark County, Washington.
2. For Analysis Settings, select
    a. **Home/Work Area:** Select "Work"
    b. **Analysis Type**: Select "Area Comparison" then choose "Census Block Groups" for the area of comparison and "Earnings: $1,250 per month of less" for the labor market segment
    c. **Year:** Select most recent
    d. **Job Type:** Select "Primary Jobs" to include the highest paying job for each person employed in Clark County.
3. Under display settings, changes the number of results from top 10 to all.
4. Download the data by clicking "Export Geography" as a shapefile.
5. Create the measure of the density of jobs by opening the shapefile in ArcGIS, then creating a new column and dividing the field "ce01", which is the number of jobs with earning $1,250/month or less by the area of the census block.

NUMBER OF LOW- AND MEDIUM-INCOME HOUSEHOLDS

This section describes the source for the low- and medium-income households count measure. The measure is used to identify areas where there are more households that are low or medium income and therefore are more likely to walk as part of regular travel. The measure is calculated using data from the Census Longitudinal Employment-Household Dynamics Origin-Destination Employment Statistics.

This data is generated relatively less frequently than the Census data used for the TDP index and low-income job metrics. The most recent data released by the US Department of Housing and Urban Development representing data collected through the American Community Survey between 2011 – 2015. To check for the most recent data see the HUD data exchange: https://www.hudexchange.info/programs/acs-low-mod-summary-data/.

See Exhibit 17 for the link to the dataset. The dataset is provided by HUD as an Excel worksheet. To create the shapefile for the tool, the user should join the data with a Census TIGER/Line block group shapefile.

Exhibit 17: HUD File Location

Source: Department of Housing and Urban Development, https://www.hudexchange.info/programs/acs-low-mod-summary-data/

LAND USE DEMAND CODES

Parks and recreational facilities, and locations zoned for high density commercial and residential uses are expected to generate pedestrian activity. Based on a review of land use descriptions and locations, the following land use zoning codes were selected for prioritization in consultation with County staff:

PARKS AND RECREATIONAL FACILITIES

- Bathing Beaches (Improved Beaches)
- Improved Walkways Used by The Public
- Improved Forest or Park Campgrounds (Tent or Trail)
- Outdoor Sports Arenas, Stadiums, Coliseums
- Outdoor Swimming Pools
- Parks with Playgrounds, Ball Fields, and Picnic Areas
- Private Park (Usually Associated w/ HOA)

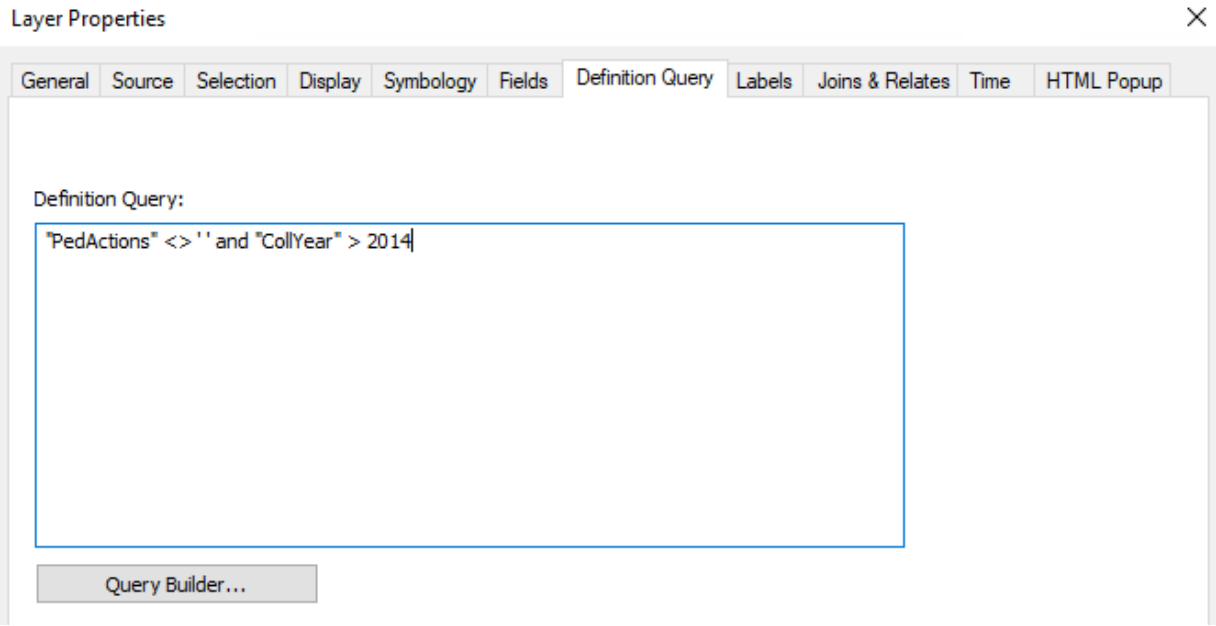
COMMERCIAL / HIGHER DENSITY AREAS

- Residential (R-12)
- Residential (R-18)
- Residential (R-22)
- Office Residential (OR-15)
- Office Residential (OR-18)
- Office Residential (OR-22)
- Residential (R-30)
- Residential (R-43)
- Office Residential (OR-30)
- Office Residential (OR-43)
- Mixed Use (MX)
- Neighborhood Commercial (NC)
- Community Commercial (CC)
- General Commercial (GC)
- Business Park (BP)
- Public Facility (PF)
- University (U)
- Parks/Open Space (P/OS)
- Parks/Wildlife Refuge (P/WL)
- RC-1
- RC-2.5
- CR-1
- CR-2

COLLISION DATA

Users update the file by requesting new data from WSDOT. Kittelson recommends using the "definition query" function in ArcMap as shown in Exhibit 18 to parse out pedestrian-involved crashes. The query shown parses the data based on the location of first impact for a crash.

Exhibit 18: Definition Query for Selecting Pedestrian-Involved Crashes



TRAIL DATA

The County Trail data includes existing trails and conceptual trails. Kittelson recommends using the "definition query" function in ArcMap as shown in Exhibit 19 to use only existing trails. The query shown parses the data based on the field titled "Status" and excludes proposed trails.

Exhibit 19: Definition Query for Selecting Pedestrian-Involved Crashes