



**Inventory and Assessment of Sidewalk
and Pedestrian Facilities
-Summary of Findings-
*October 2025***

Prepared by:





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1. Introduction

The City of Raleigh is a vibrant community located in Eastern North Carolina. It has a population of over 468,000 people, and the City takes pride in providing access to its many community assets not only through vehicular access, but also through its connected sidewalk network, pedestrian and bike trails, and an extensive transit system. In an effort to improve access for all, the City has performed an inventory and assessment of sidewalk and curb ramps within its public rights-of-way to determine the physical barriers that may restrict access for people with disabilities. The information gathered from this inventory and assessment will allow the City to further the City's ongoing commitment to all residents, employers, businesses, and visitors for creating an inclusive and accessible place to live, work and play.

Future phases may be deemed appropriate to complete or update any necessary evaluation of remaining public right-of-way features within the City of Raleigh.

2. Report Overview

This report provides an overview of the inventory and assessment process and a high-level review of findings. The Table of Contents provides an outline of the content included in the process and this Summary of Findings Report. This data produced during the inventory and assessment will assist the City of Raleigh staff in understanding physical barriers to accessibility and in developing barrier removal solutions that will facilitate the opportunity of improved access to all individuals within the City of Raleigh over time.

3. Project Scope Summary

The scope of the inventory and assessment included review of select physical assets within the City's Rights-of-Way. For physical asset review, existing City sidewalks, island refuges, and curb ramps were assessed to identify potential barriers that might reduce their use by people who have disabilities. The information collected will better inform decision makers on how to plan and budget for improvements throughout the City for years to come.

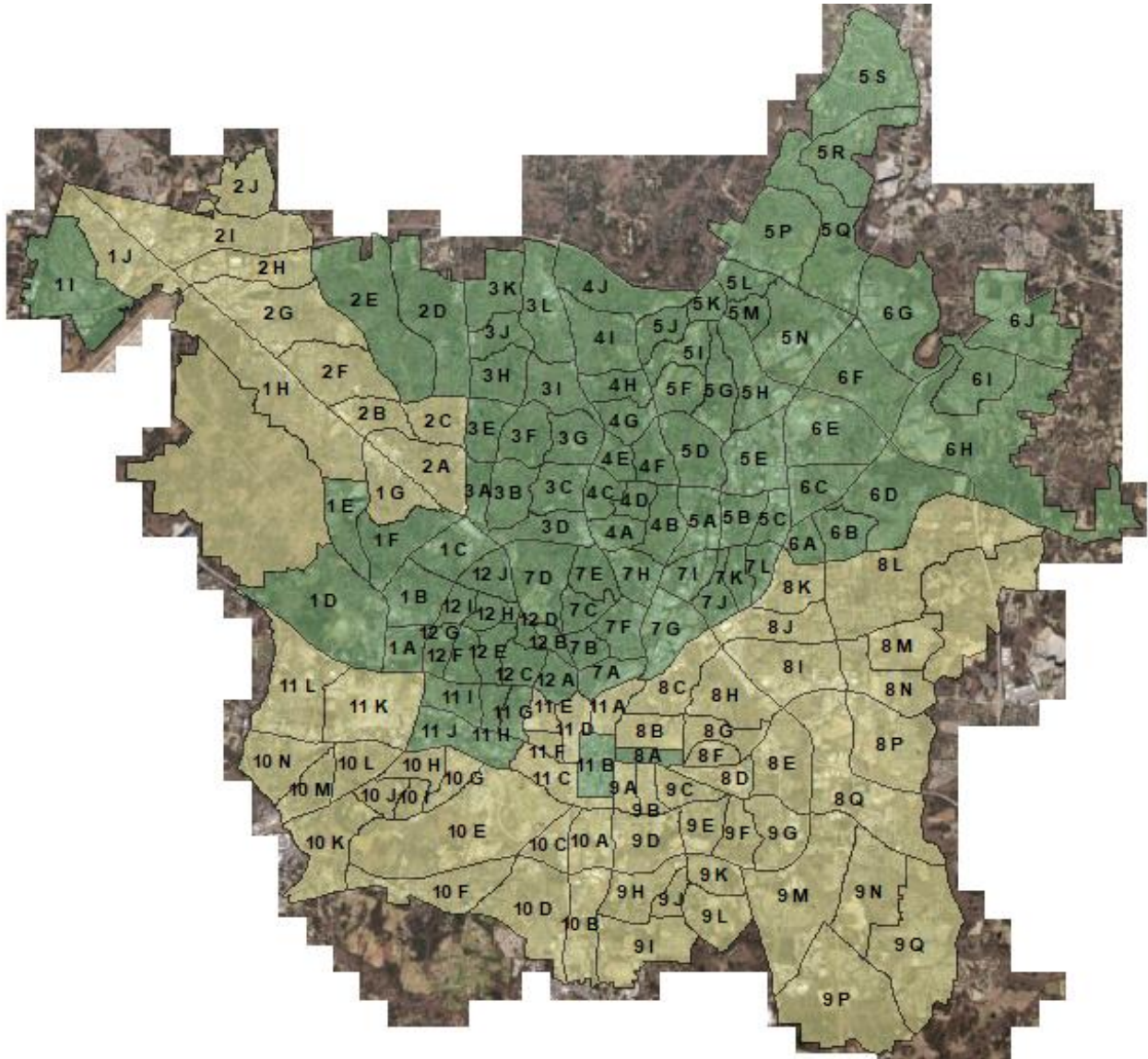
In 2021 & 2022, Cole, along with Wetherill Engineers, performed a thorough physical assessment of sidewalks, island refuges and curb ramps within the public right-of-way. These amenities are being evaluated per the applicable ADA regulations and guidelines. The inventory portion of the project also included providing geospatial points, or inventory points, for City curb ramps which did not receive a thorough physical assessment.

In Exhibit A, areas of the City where thorough physical assessment of sidewalks, island refuges, and curb ramps took place are shaded green. The areas shaded yellow represent locations where thorough physical assessment of sidewalks took place and inventory points for curb ramps were developed in lieu of physical assessment.



**Raleigh
Exhibit A**

Public Rights-of-Way Collection Map



The assets inventoried and assessed during this project included:

- 1,137.3 miles of sidewalk
 - 1,431.78 miles of “No Sidewalk” were identified along corridors within project scope
 - 132.39 miles of “Missing Sidewalk” (gaps in sidewalk connectivity)
- 19,098 curb ramp & refuge islands locations
 - 14,550 curb ramp & refuge island inventory points

An overview of the data collected, and the cost summaries of the inventory analyzed for ADA compliance within the public right-of-way in Section 5 and 6 of this report.



4. Methodology of the Assessment

4.1 Accessibility Standards and Guidelines

Methodology of assessment for the City of Raleigh is broken into two components:

- a. Review of physical assets within the public right-of-way.
- b. GIS processing for unique City requirements

The method of conducting the inventory and assessment for the City of Raleigh's physical assets included field data collection to determine compliance with the following standards and guidelines:

1. Proposed Public Right-of-Way Accessibility Guidelines, 2013 (PROWAG)
2. Federal Highway Administration Manual on Uniform Traffic Control Devices for Streets & Highways
3. U.S. Department of Transportation Regulations for transit and sidewalks.

4.2 Approach to Sidewalk, Curb Ramp, and Island Refuge Inventory Collection

The traditional accessibility inventory process in public rights-of-way can be labor-intensive. Many public entities rely on collection methods that provide limited information or assess barriers intermittently. This does not offer comprehensive data or allow for adequate cost estimates for the planning of barrier removal. The City of Raleigh indicated an interest in utilizing a technology that would quickly and adequately document more information, such as the type, severity, and location of sidewalk, curb ramp, and island refuge barriers within the scope boundary. The City contracted with Cole Design Group, Inc. to utilize an exclusive technology called the ULIP-ADA (shown in below Exhibit B) to allow for an efficient and effective process to complete the City's assessment for pedestrian infrastructure within the public rights-of-way.

Raleigh
Exhibit B
ULIP-ADA



The technology was originally developed through a pilot program funded by the Federal Highway Administration. The Ultra-Light Inertial Profiler (ULIP) is mounted on a Segway. The device's displacement laser, three accelerometers, optical trigger, distance measurement instrument, and gyroscope are designed to measure the sidewalk surface at a rate of 10,000 records per second. Together, these devices capture detailed information about cross and running slope and small surface variations. A mounted computer offers an interactive display during data collection. The technical approach offered by this technology was identified as a best practice in *ADA Compliance at Transportation Agencies: A Review of Practices* (NCHRP 20-07 Task 249), a National Cooperative Highway Research Program study.

Guidance for public rights-of-way facilities in defining the method with which to assess the data was found in *Designing Sidewalks and Trails for Access* (FHWA, 1999). This report advises that grade and cross-slope "should be measured over 2 ft. intervals, the approximate length of a wheelchair wheelbase, or a single walking pace."

Adherence to FHWA's interpretation of features in the data set provided quality assurance in the attributes of the resulting database.

Field Data Specialists from Wetherill Engineering also collected the required information for the curb ramps, and island refuge throughout the defined project area. Based on inspection and measurements of the existing features, Field Specialists entered data directly into the data collectors, ensured that all relevant characteristics were recorded, and that photos and videos were properly linked with location data logged into the database.



For efficient data collection, Cole developed with the City an Early Validation Approach to be implemented for the inventory and assessment of curb ramps and island refuge assets. This process allowed for consistent collection of asset features, while recognizing that if certain attributes fail, the only solution for remediation would be a total removal and replacement of the ramp or island system. Attributes collected within the early validation approach included:

• Ramp Run Slope • <i>Failing Criteria</i>	• Ramp Cross slope • <i>Failing Criteria</i>	• Ramp Width • <i>Failing Criteria</i>	• Ramp Length	• Ramp Type & Surface Condition
• Curb Slope	• Gutter Lip Height	• Intersection Stop condition	• Obstruction Presence	• Utility Presence

Throughout the collection process, data collection, data validation, and linking to location and digital photo files happened automatically as the Field Data Specialists entered data and moved from point to point. The Field Data Specialists then accessed the data entry, validation forms, and aerial orthophoto images along with rights-of-way, utility, topographic, or other feature data sets that were preloaded and appeared on the data collectors for easy reference in the field. Digital photos were automatically logged for location and linked to the database, based on synchronized time and date stamps.

4.3 Geographic Information System (GIS) Database Analysis

The Consultant team created and utilized a geodatabase using the ESRI ArcGIS system. The customized fields for Geodatabase include location, directions, size, features, and obstruction size. The data structure was pre-programmed for data collection, as described above. Data was then logged into a project database and analyzed for compliance.

City of Raleigh's pedestrian rights-of-way data provides staff geographic data with:

- Positional information: the digital representation of a barrier conforms to the location found in the field.
- Attribute information: the digital representation of a barrier is represented in a manner that best represents the conditions found in the field (% running slope, % cross-slope, inches of vertical separation, etc.).

Once the field data collection and validity checks were performed, the raw data was processed so it could be stored in the City's centralized GIS database for analysis and reporting. Unique GIS processing that Cole executed on behalf of the City for this project included:

- Segmenting sidewalk collection lines by parcel boundaries
- Development of an asset management feature class based on City specifications
- Unique nomenclature utilizing existing City identifiers and Cole produced identifiers

GIS played a pivotal role in the project from data acquisition (organizing the millions of data points generated during the study) to creating an ArcPad user interface for asset management and compliance monitoring. Additional available data point attributes can be used for compliance tracking. Compliance reporting capabilities are available to deploy and to track progress.



5. Inventory and Assessment - Summary of Findings

5.1 Introduction

The Summary of Findings provides a high-level overview of the results of the inventory and assessment with the City's public rights-of-way. Please see Section 3 for information regarding the scope included please see Section 4 for details on the methodology used to complete the assessments for ADA compliance. Each rights-of-way amenity has detailed compliance reports with all of the data collected for that facility. Due to the magnitude of the reports and data, this Summary of Findings provides an overview of the results evaluated. The detailed reports will be delivered to the City upon project completion.

5.2 Public Rights-of-Way Inventory

The City of Raleigh's public rights-of-way assessment generated a significant amount of information regarding the accessibility within the defined boundaries. A total of 1,137.3 miles of sidewalk (including 156.4 miles of uncollectable sidewalk) and 19,098 curb ramps were evaluated. An additional 14,550 curb ramp points and island refuge points were collected as inventory points.



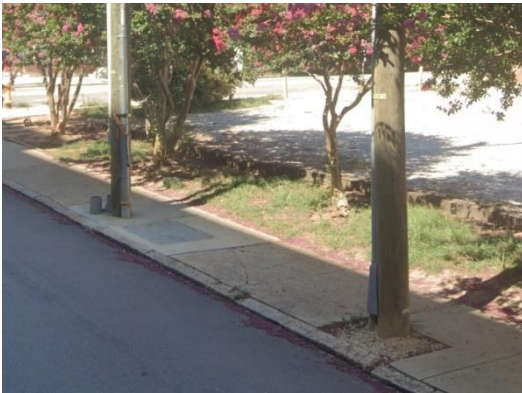
5.3 Sidewalk Inventory Data

The sidewalk corridors were evaluated for:

- run slope
- cross slopes
- obstructions
- joint heaving
- driveway crossings
- driveway cross-slope
- gaps in connectivity
- missing sidewalk

Observations showed that although many sidewalks comply with the accessibility standards and guidelines, some common issues are outlined throughout the report. For each of these elements assessed, findings are summarized in tables on the following pages.

a. Sidewalk Obstructions



Sidewalk Obstruction – Utility Obstruction



Sidewalk Obstruction – Overhead Vegetation Protrusion

Utility Obstruction	296
Power Pole Obstruction	33
Sign Obstruction	54
Temp/Private Obstruction	70
Low Vegetative Obstruction	1,811
Overhead Vegetative Obstruction	2,106
Other Obstruction*	426

**"Other Obstructions" could include: Bollards, Benches, Signposts, Landscaping Elements, or Mailboxes. This list is not exhaustive.*

Common Issues:

- Vegetation growing overhead or alongside the sidewalk represent the two highest factors in barriers to the sidewalk.
- Utilities and Power Poles represent 329 locations combined. These types of obstructions are costly to relocate and/or require challenging design solutions. In some cases, obstruction removal may be the responsibility of other agencies (such as NCDOT, a utility company, etc.) and require more coordination and time to correct.

b. Sidewalk Changes in Levels (Heaves)

$\leq 1''$	72,155
$>1''$	1,581



Sidewalk Heave

Notes on Heaving:

- Changes in level, or heaves, are common issues found in sidewalks for every community.
- Heaves are caused by many factors, including but not limited to tree root growth and changing soil conditions over time.
- Uneven heaving in the sidewalk concrete is a common occurrence of obstruction counts, as previously reported.
- Heaves of a certain dimension can often be addressed by cutting or grinding sidewalks.
- Only 2% of heaves are 1" or higher.
- Over 72.3% of the heaves measured fall between $\frac{1}{4}''$ and $\frac{1}{2}''$, which often represent an opportunity for remediation without replacing an entire sidewalk segment. While not compliant, these are also found to be far less severe.

c. Poor Surface Condition



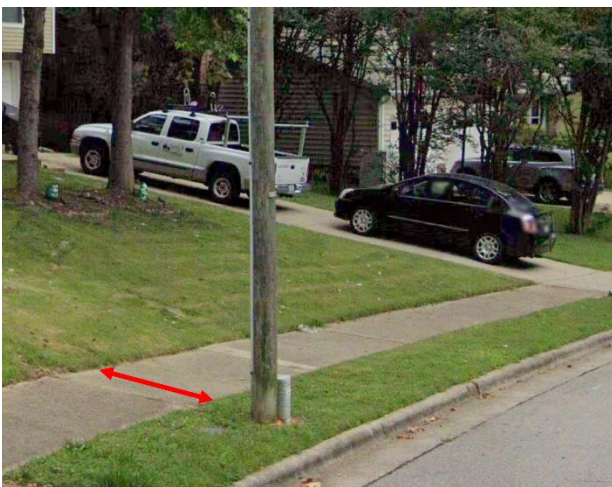
Poor Surface Condition

Poor Surface Condition	4,652

Common Issues:

- Poor Surface Condition is multiple measurements of vertical displacement in close proximity, consistent with broken/cracked panels, spalling, or other surface roughness.
- Heaving clusters are distinguished from panel joint heaves, where remediation can be grinding.
- Remediation of this type of accessibility issue is typically sidewalk replacement.
- Locations with other issues requiring sidewalk replacement are not counted in this total.

d. Sidewalk Cross Slope



Sidewalk Cross Slope, as depicted by arrow

% Cross Slope	Miles	Status
0.00 – 2.00	140.94	Compliant
2.01 – 3.00	455.36	ADA Concerns
3.01 – 4.00	237.50	ADA Concerns
4.01 – 5.00	87.04	ADA Concerns
5.01+	60.06	ADA Concerns
Total	980.90	

e. Sidewalk Run Slope



Sidewalk Run Slope, as depicted by arrow

0-5.00	979.28	
5.01-8.33*	1.32	
8.34-10.00*	0.19	
10.01-12.00*	0.08	
12.01-25.00*	0.03	

Common Issues for Slope:

- 46.4% of the cross slope issues fall in the 2-3% range and many of these fall to just above the 2% maximum allowable standard. This is considered a less severe violation unless additional compliance issues are present.
- 24.2% of cross slope issues fall in the 3-4% range, and 15% of the remaining violations are above 4% cross slope, where the slope may become very visible.
- Sidewalk cross-slope violations are a common issue at driveway crossings.
- Run slope issues were less common compared to cross slope.
- Only .3 miles fell above 8.33% run slope grade, which is considered more severe than the 1.32 miles at 5.01-8.3% grade.

***Where the Sidewalk is contained within the street or highway rights-of-way, Sidewalk Run Slope is permitted to match the general grade of the adjacent street or highway, according to PROWAG 302.5.**

PROWAG 302.4.1 - Except as provided in R302.4.3, where a *pedestrian access route* is contained within a *highway* right-of-way, the *grade* of the *pedestrian access route* shall not exceed 1:20 (5.0%).

EXCEPTION: Where the *grade* established for the adjacent *street* exceeds 1:20 (5.0%), the *grade* of the *pedestrian access route* shall not exceed the *grade* established for the adjacent *street*.

f. Sidewalk Connectivity



Sidewalk Connectivity

Connectivity Gaps-Missing	132.39
Buried Sidewalk	22.24
Narrow Sidewalk (less than 48")	1.72

g. Driveways



Sidewalk built through a driveway

Commercial	13.65
Residential	65.78

Common Issues:

- Sidewalk Connectivity represents a gap in service (missing sidewalk between two unconnected sections / buried sidewalks, bus stops) or inadequate service (buried, narrow). It is important to note that these gaps in service have possible solutions for remediation outside of installing new sidewalk.
- Driveway Crossings: Cross slopes of driveway crossings often exceed the 2% maximum allowable per the standards for cross slope; this can present a challenge if sidewalk connectivity utilized the driveway to continue the sidewalk path.



5.4 Curb Ramp Evaluation

The consultant teams evaluated 18,836 existing curb ramp locations.

The curb ramps were evaluated for many different elements of compliance. The following highlights the major elements evaluated:

- run slope
- cross-slope
- length
- width
- curb slope
- obstructions
- surface conditions
- landing measurements
- gutter slope/gutter lip
- detectable warning surface (DWS)
- flare slope

Observations showed that many of the curb ramps that do not comply with the accessibility standards share some common issues. The following tables summarize the findings for curb ramps.

a. Curb Ramp Type and Compliance

*Non-compliance represents any deviation from applicable PROWAG Standards. Minor deviations, while non-compliant, do not always represent barriers to access for the disability community. The severity ranking system applied to collected Curb Ramp data will allow the City to prioritize remediation efforts where deviations create significant barriers to access.

** Excludes 790 Missing Ramp locations

b. Curb Ramp Run Slope



Run Slope, as depicted by arrow

Run Slope Range	Count	Severity
0.00 - 5.00	2,984	Green
5.01-8.33	7,411	Green
8.34-10.00	3,855	Yellow
10.01-12.50	2,685	Red
12.50+	2,154	Red

Common Issues:

- The quantity of run slopes collected does not correlate directly to the number of ramp locations collected, as ramp systems can be comprised of multiple ramp runs.
- 20.2% of the run slope issues fall in the 8.34-10% range and many of these falls to just above the 8.3% maximum allowable standard. This is considered a less severe violation unless additional compliance issues are present.
- 45.5% of all curb ramps had run slope issues

***Maximum Ramp Run Slopes of 8.33% is permitted for a length of fifteen feet per PROWAG.**

c. Curb Ramp Cross Slope



Cross Slope, as depicted by arrow

Cross Slope Range	Count	Severity
0.00 - 2.00	3,322	Green
2.01 - 3.00	3,216	Yellow
3.01 - 4.00	3,418	Yellow
4.01 - 7.00	5,603	Red
7.01+	3,530	Red

Common Issues:

- The quantity of cross slopes collected does not correlate directly to the number of ramp locations collected, as ramp systems can be comprised of multiple ramp runs.
- 17.4% of Curb Ramps met cross slope requirements.
- 15,767 of Curb Ramps had cross slope issues. Of these, 20.4% fell into a 2-3% cross slope range, generally considered less severe than higher ranges.

d. Detectable Warning Surfaces (DWS)



Curb Ramp Detectable Warning

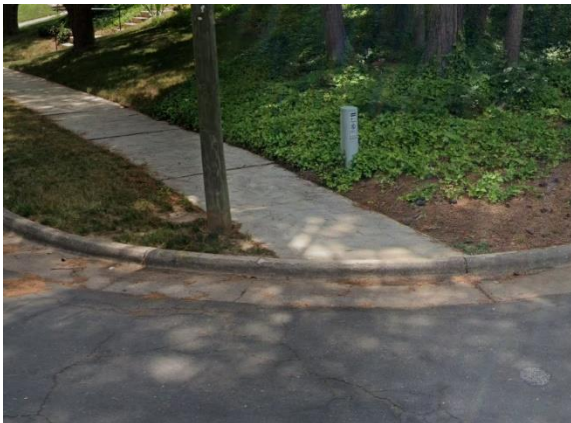
Compliant	306
Non-Compliant	265
Missing	119
Failed Initial Test	18,028*

Common Issues:

- DWS falling in the non-compliant count were most often due to the DWS not extending for the full width of the ramp

*Of the 18,028 which failed at the Early Validation Approach, the ramps failed due to other non-compliant ramp components, and there is most often some degree of reconstruction necessary. For these ramps, any DWS concern will be addressed when the ramp is corrected for compliance.

e. Missing Curb Ramp



Missing Curb Ramp

Missing Ramp	Non-Compliant
Missing Ramps	790

Common Issues:

- Missing Curb Ramps are ramps that are not present in locations where they are required.
- T-Intersections can sometimes be the cause of a report of missing curb ramps. These locations most often must be reviewed closely by the City to determine if an alternate approach can be taken to rectify the concern.



5.5 Island Refuge Evaluation

The consultant teams evaluated 262 existing island refuge locations.

Island refuge locations were evaluated for many different elements of compliance. The following highlights the major elements evaluated:

- Run slope
- Cross slope
- length
- width
- gutter slope
- detectable warning surface (DWS)
- Road slope

Observations showed that of the 262 island refuge locations evaluated, only 3 were found to be fully compliant.



**Refuge Island Ramps with Non-Compliant
Run Slopes**



**Refuge Island Ramps with Non-Compliant
Width**



5.6 Prioritizing the Findings

As depicted in this report, some compliance issues are more severe than others. The sidewalks and curb ramps were reviewed in their entirety to determine the level of compliance and the degree of severity for all the data collected and analyzed. It is important to consider not only the number and severity of issues with a pedestrian facility but also the level of use by persons with disabilities. For the project, the City implemented a sophisticated quantitative ranking system to review the severity of each of these locations. If desired, the severity ranking system may be enhanced in future project phases to include level of activity, or use, factors based on City demographics and pedestrian generators.

The below table depicts the severity ranking system applied to curb ramps that failed the Early Validation Approach. A similar system was applied to curb ramp and pedestrian refuge island facilities which passed the Early Validation Approach and Sidewalk (ULIP) collection.

a. Curb Ramp Severity Score – Early Validation

1) Missing Curb Ramp*

Grade	Severity Category	Value	Weighting
A	-	-	100
B	-	-	
C	-	-	
D	-	-	
F	No Ramp	100	

*If there was a Curb Ramp present, the Ramp was evaluated for "Early Validation" level of compliance.

1) Running Slope

Grade	Severity Category	Value	Weighting
A	0 – 8.3%	0	25
B	-	-	
C	8.4 – 12%	50	
D	-	-	
F	>12.1%	100	

2) Cross Slope

Grade	Severity Category	Value	Weighting
A	0 – 2.0%	0	25
B	2.1 – 5.0%	5	
C	-	-	
D	5.1 – 7%	50	
F	> 7%	100	

3) Curb Ramp Width

Grade	Severity Category	Value	Weighting
A	48+ in.	0	35
B	36 – 47 in.	25	
C	32-36in.	50	
D	-	-	
F	< 32 in.	100	

4) Surface Condition

Grade	Severity Category	Value	Weighting
A	Good	0	15
B	-	-	
C	-	-	
D	-	-	
F	Poor	100	



6. Planning Level Cost Estimates

Planning level cost estimates can be utilized by the City for scheduling barrier removal. It is not financially feasible to immediately remove all barriers to access. The City may choose to modify barrier removal priorities to allow flexibility in accommodating community requests, petitions for reasonable modifications from persons with disabilities, and funding constraints and opportunities. The primary goal for remediation is to ensure access to the programs, activities, and services provided by the City. The development, or implementation, of programs that monitor proposed alteration projects (including all maintenance projects) will be critical to ensure review of data collected during this project takes place and upgrades of pedestrian facilities are to PROWAG standards.

Where technical infeasibility exists, the City may design and construct pedestrian facilities to the maximum extent feasible, as is allowable per the ADA. The City plans to remove barriers within the sidewalk corridors and intersections through programs such as WalkRaleigh and SeeClickFix. Sidewalk corridors and barriers can be addressed based on their priority, as established by the City through the severity ranking system developed for this project, or through any future enhancements of the prioritization methodology which may include pedestrian activity factors.

a. Cost Summary

Facility Type	Preliminary Cost Barrier Estimate
Sidewalk – ULIP Collection	\$ 314,679,462
Sidewalk – Missing	\$ 46,619,644
Sidewalk – Buried	\$ 4,744,220
Sidewalk – Narrow	\$ 296,865
Curb Ramps	\$ 43,783,850
Refuge Islands	\$ 1,058,600
Total	\$ 411,182,641