

DIX EDGE AREA STUDY

Environmental Sustainability
Report and Recommendations

EXECUTIVE SUMMARY

This report is a supplement to the Dix Edge Area Study final report focused on issues of environmental sustainability. Throughout the study efforts, concerns over environmental impact and protection have been raised by community members, developers, and stakeholders. This high-level report focuses on 4 “Focus Areas” defined by their close proximity to ecologically sensitive natural features such as streams and wetlands. Recommendations for this area include improving connections to and from greenways and key locations within the study area, protecting sensitive ecologies, placemaking, and providing educational opportunities. Recommendations, while tailored to this area, are rooted in policies set forth in the City of Raleigh Comprehensive Plan and Climate Action Plan.

I. FOCUS AREA WALKTHROUGHS

i. Focus Area Summaries

- a. Map
- b. Summary

ii. Focus Area 1

iii. Focus Area 2

iv. Focus Area 3

v. Focus Area 4

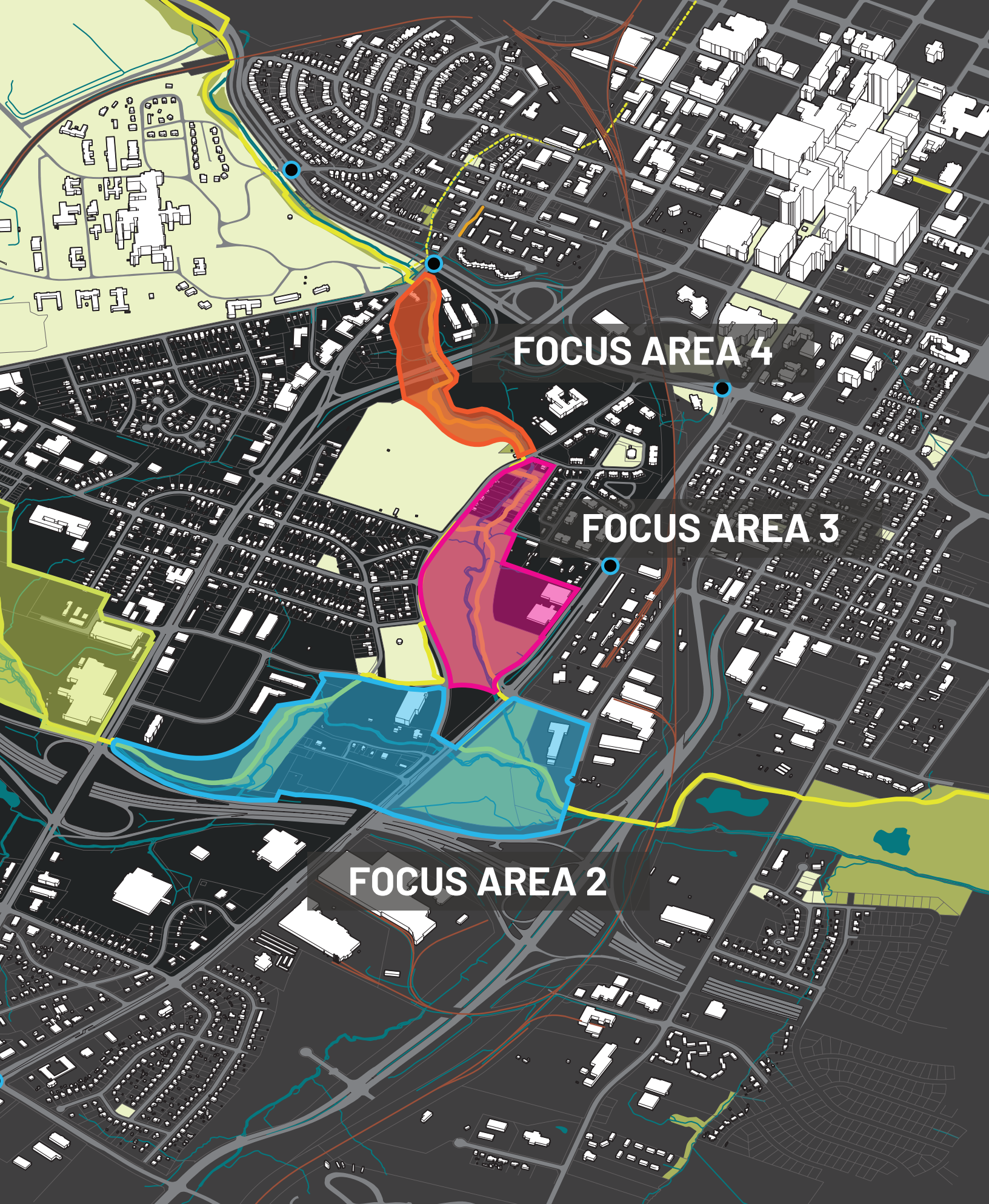
II. SUMMARY RECOMMENDATIONS



FOCUS AREA 1

FOCUS AREAS

The four Focus Areas, highlighted on this map, are organized by unique environmental features such as creeks and wetlands. Each of these Focus Areas have some similarities but are, overall, unique from one another. These are areas where, as growth evolves, natural systems need to be protected and enhanced to maintain ecological balance. This section looks at these Focus Areas one-by-one with an accounting of existing conditions and areas for intervention centered around connectivity, stormwater management, development, placemaking, and educational opportunities.



FOCUS AREA 4

FOCUS AREA 3

FOCUS AREA 2

1.1

FOCUS AREA 1

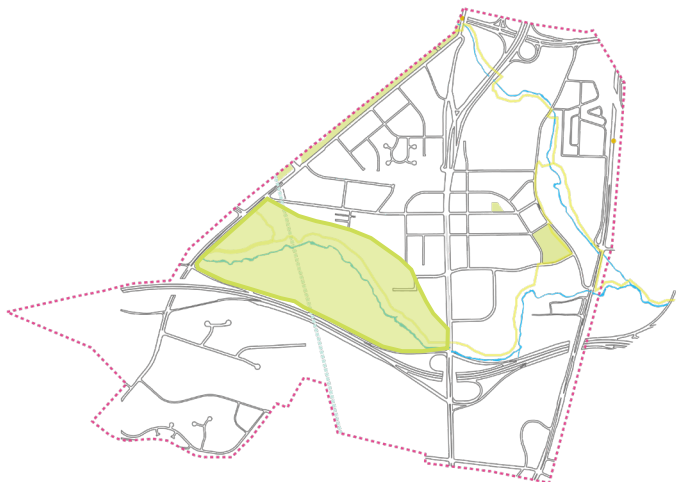
Focus Area 1 runs along the Walnut Creek and trail area, west of South Saunders Street and north of Interstate 40. This trail section extends over a mile from S Saunders St. to Lake Wheeler Rd. The trail is north of Interstate 40 and to the south of residential and industrial areas along Maywood Ave, and primarily consists of wooded wetlands. A section of the creek is channelized as it meets S. Saunders St.

BEAVER HABITAT

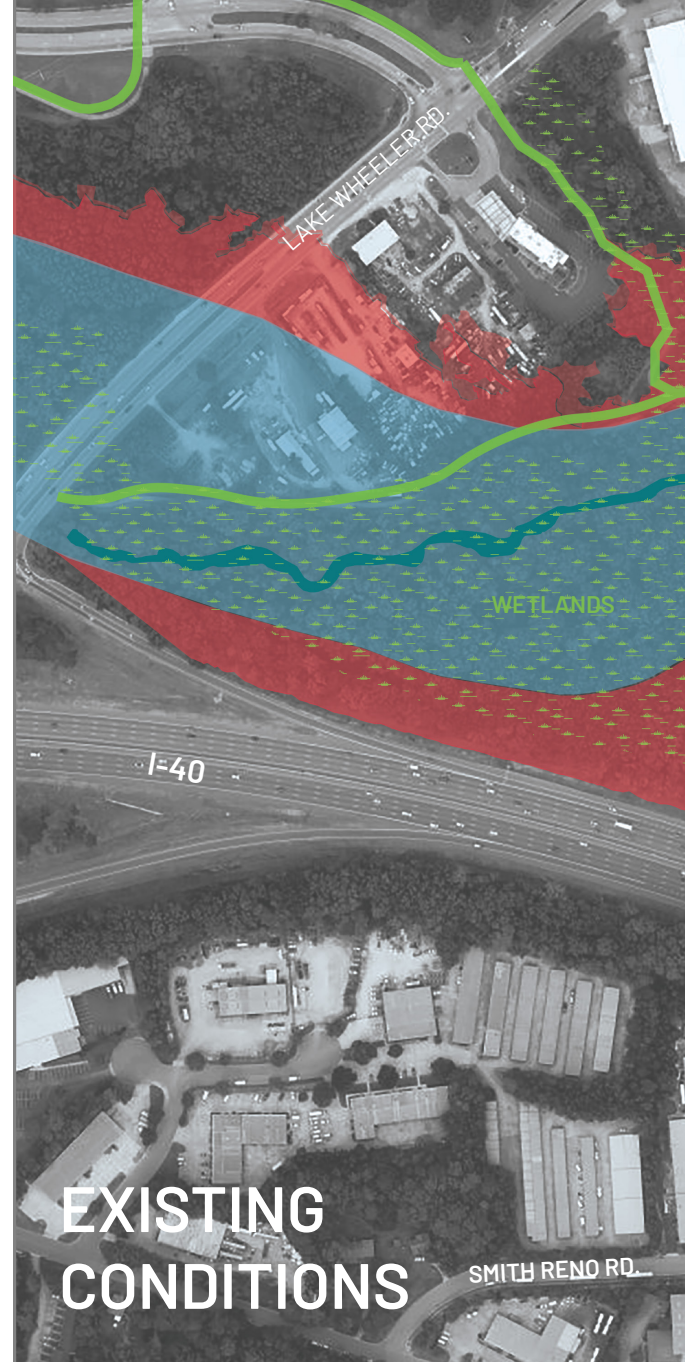
This Focus Area has approximately 75 acres of wetlands. These are Freshwater Forested/Shrub Wetlands which are characterized by a mix of tall and short woody vegetation. Wetlands offer unique and rich ecologies and serve as great focal points for an evolving parks and greenway system.

The area south of Maywood Avenue, behind the residential development, is distinctly marked with signs of beaver habitats. Culverts, with hardened embankments, are attractive to beavers as foundation for their dams. The beavers, when damming, often obstruct drainage systems that are in place to relieve flooding in this area. While a nuisance for maintenance staff, beavers play important roles in wetland ecologies and create habitat for other animals and plant life when damming.

The distinct natural features of Focus Area 1 provide an educational opportunity for programming or signage along the trail by this beaver habitat and the adjacent wetlands. **ESA-P1** Consideration should also be given to increasing drainage infrastructure to account for beaver obstruction. Products, such as Beaver Deceivers allow the animals to construct habitat in a way that isn't obtrusive to drainage systems. **ESA-S1** Incorporation of these or similar products could alleviate damming issues while providing additional education opportunities.



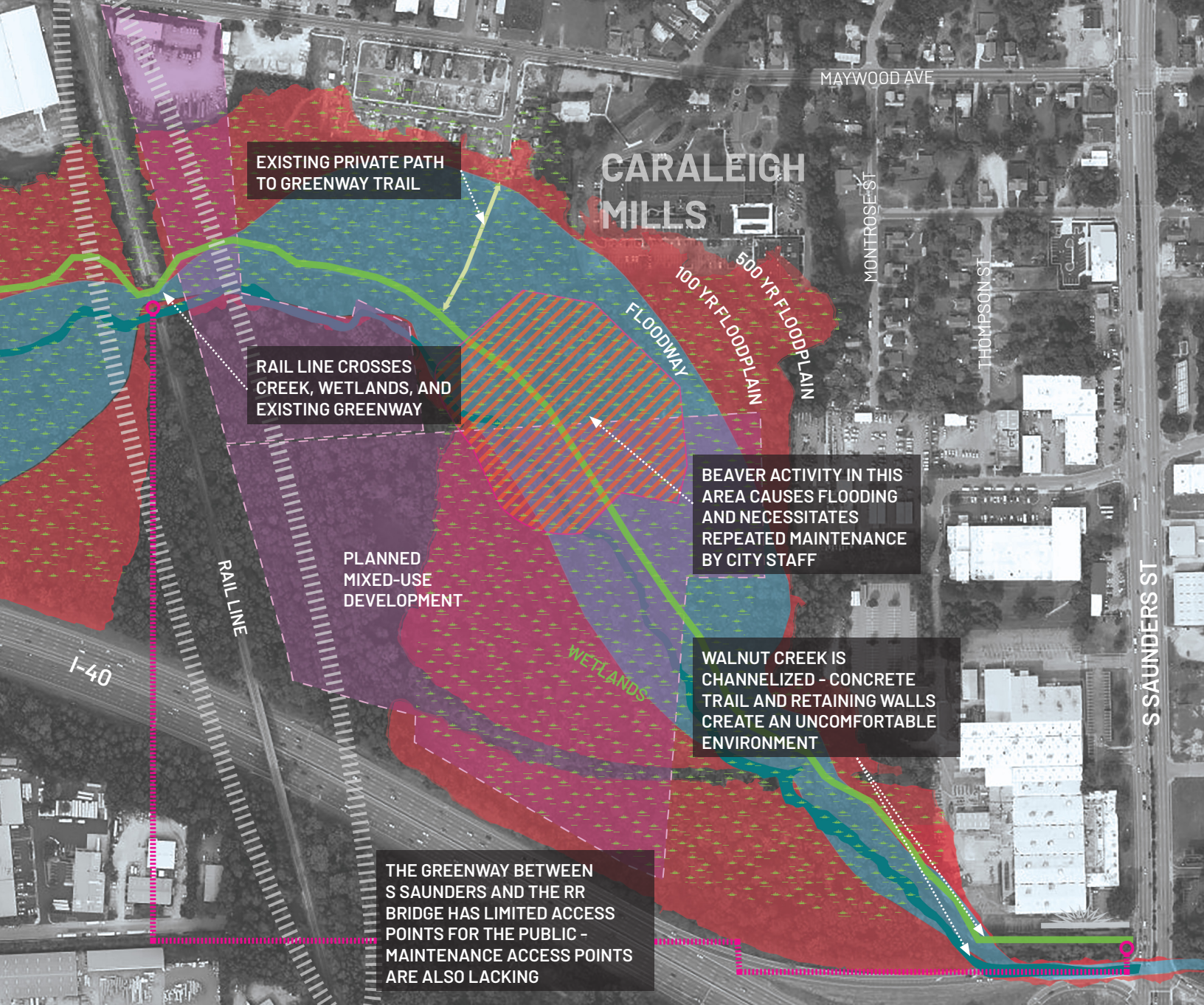
Key Map:
Focus Area 1



Map 2: Focus Area 1 Existing Conditions
(Credit: Raleigh Urban Design Center)



Debris is arranged by beavers around the pipe which prevents proper drainage in the section of wetlands.



Large sections do not have street access and may cause some concerns with alternate paths and navigation.



Shown is the channelized portion of Walnut Creek with concrete trail and retaining wall. This portion of the trail occurs by South Saunders Street.

TRAIL ACCESS

This portion of the Walnut Creek Trail is a long stretch with few access points due to obstacles posed by adjacent land use and the presence of wetlands. There are only two entrances/exits onto the greenway in this Focus Area, one behind a convenience store and another is a private path that connects to Maywood Ave. This private trail is not part of the greenway system and is not maintained by the City of Raleigh so it may not always be accessible to the public.

Alternate routes are essential in this section to create redundancy in the bike /pedestrian/trail network with new formalized greenways or multi-use paths. During public outreach efforts, many residents indicated that they currently use the trails primarily for recreation and don't feel safe at times. Creating a higher level of redundancy reinforces connectivity and positions the greenway to also serve as a transit facility.

More access points are needed to service this portion of the trail. As shown in the proposed conditions map, several alternate trails are being proposed for adoption in the Dix Edge Study. A planned trail that tunnels under I-40 and connects with the existing greenway was adopted during the 2017 Southern Gateway Study. This recommendation is being reinforced in this study. As part of the Wake BRT: Western Boulevard Corridor Study, new trails are proposed along the rail corridor to allow elevated access to Lake Wheeler Rd., Dix Park, and Western Blvd. The proposed rail trail provides an alternate route from the Downtown South Development that runs street-side to Penmarc Dr. and crosses S. Saunders St.. Future trails developed collaboratively with private property owners could also improve connectivity. **ESA-C1**

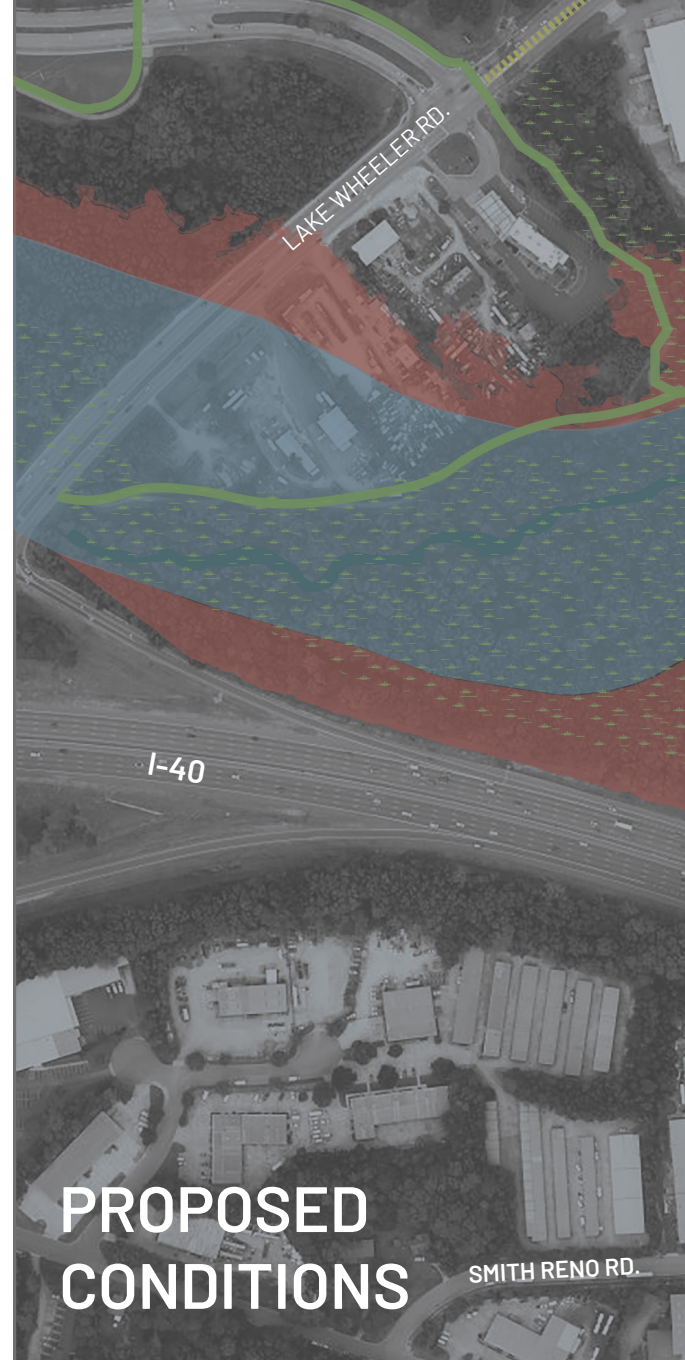
VALLEY OF CONCRETE

At S. Saunders Street, the trail and the creek pass through tunnels under the street, and there are large expanses of concrete pavement and walls that restrict movement of people and water. This prevalence of concrete, absence of trees, other vegetation, and shade make this location uninviting and in sharp contrast with the nearby natural setting of the creek, wetlands, and greenway trail. Removal of excess pavement and incorporation of new materials and plantings could help reduce stormwater runoff and soften the transition between harsh concrete and woodlands. Also, placemaking elements, such as art, lighting, and signage, could be incorporated to activate this area more. **ESA-P2**

DEVELOPMENT ISSUES

New development standards have been implemented by the City of Raleigh, restricting new construction in the floodplain. This regulation is intended to reduce property damage and stormwater runoff.

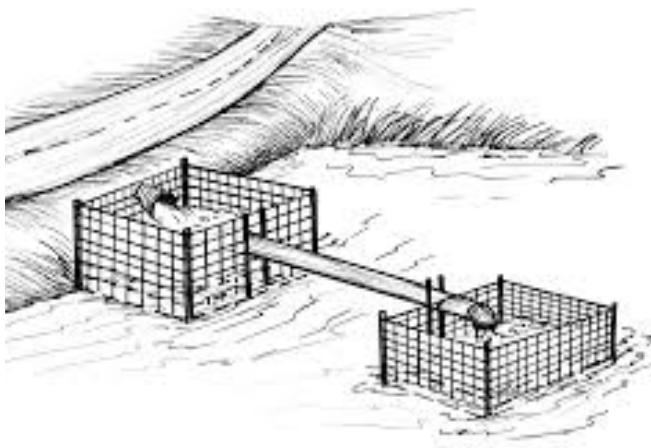
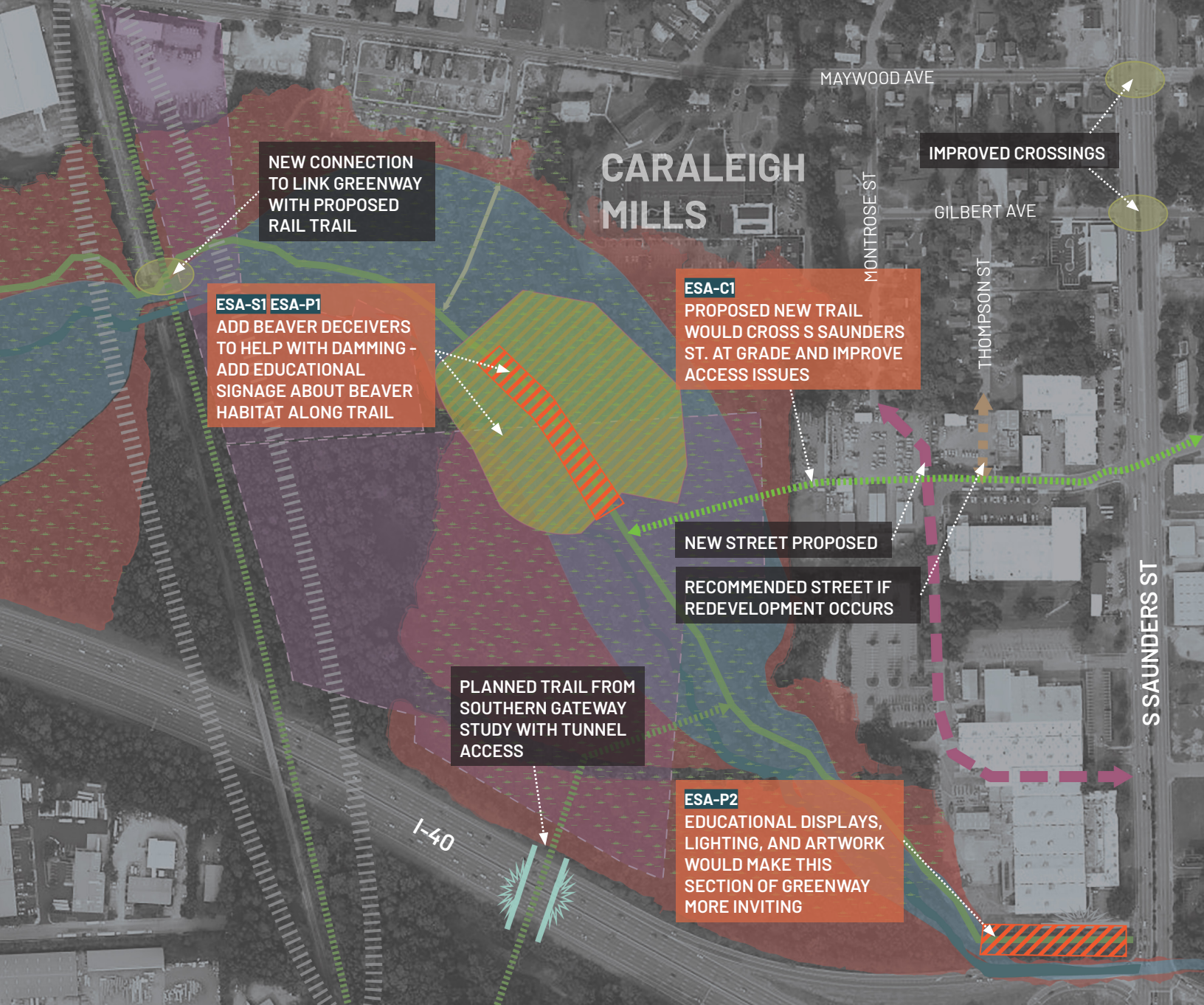
New developments and construction should be strongly encouraged to incorporate Green Stormwater Infrastructure (GSI) strategies to alleviate the increase of surface water runoff caused by new construction. **ESP-S1** It is also highly encouraged that any new development in this Focus Area embrace trail-oriented development design guidelines to create an active and accessible trail edge. **ESP-D1** Such standards do not exist in Raleigh today and would need to be developed. **ESA-D1**



Map 3: Focus Area 1 Proposed Conditions
(Credit: Raleigh Urban Design Center)



A rail-with-trail that could be implemented in this Focus Area. This example is from Pennsylvania.



An example of a "Beaver Deceiver" courtesy of the USDA Forest Service.



Placemaking elements at location near S Saunders St. Artwork, educational displays and lighting will create a more inviting atmosphere.

1.2

FOCUS AREA 2

Focus Area 2 is located along Walnut Creek and trail area, east of South Saunders Street and west of S. Blount St. This area touches several key portions of the Focus Area including the future Downtown South Development, the southern portion of the Wake BRT system, and the Cargill site.

WETLANDS

This Focus Area has several mapped wetlands totaling approximately 13 acres. Most of these wetlands are found east of S. Wilmington St. and south of the historic Cargill site.

These wetlands serve an important ecological function by providing storage for floodwaters and habitat for both plants and animals. Any development in the area should prioritize protecting these wetlands. Regulations prevent development on or near the wetland, but, surrounding development should also incorporate sustainable design principles to reduce strain on the wetlands. **ESP-D2**

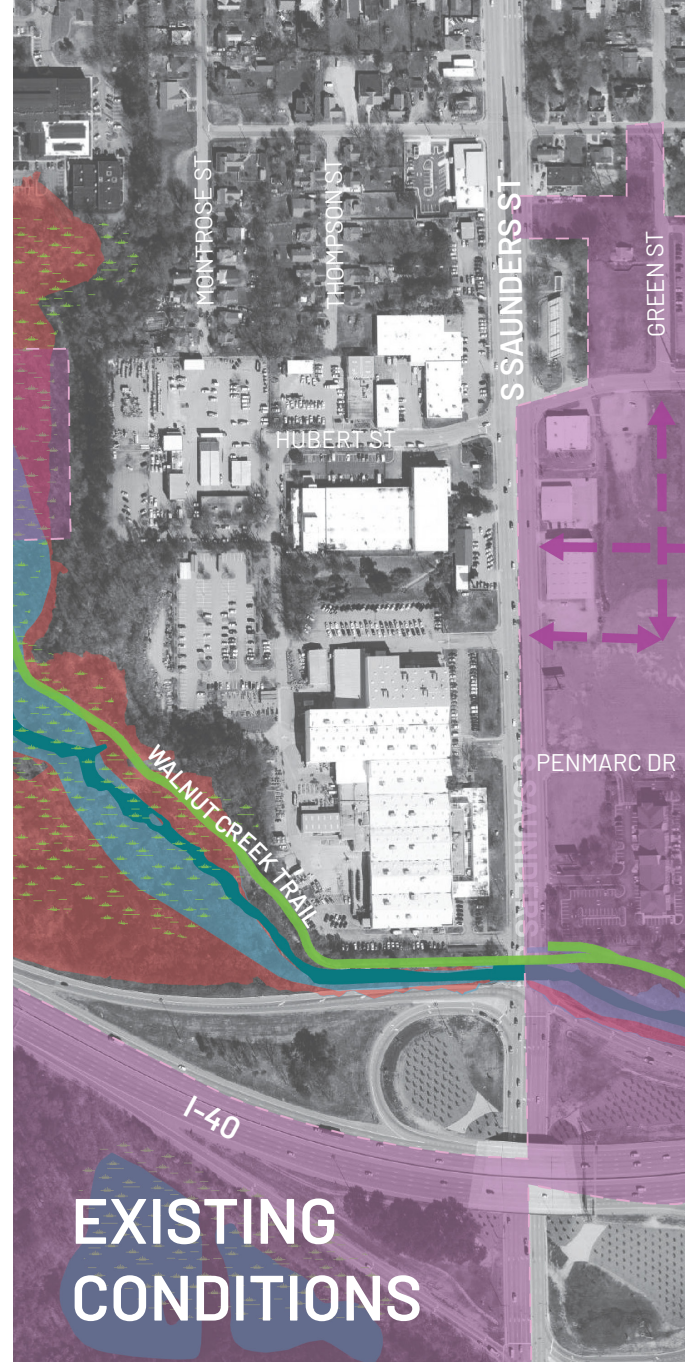
These wetlands also offer a great opportunity for environmental education. Signage about the relationship between land and water, stream dynamics and morphology, and sedimentation could educate trail users about this key environmental feature. Educational signage should also talk about City strategies to protect natural systems. **ESA-P3**

GREENWAYS

An existing greenway trail runs through most of this area continuing connections from southwest Raleigh to the east. Residents also pointed out feelings of not being safe in this area as well. During storm events, these trails get flooded and are covered with sediment in the aftermath. In order to maintain the trails, city staff must repeatedly remove sediment. Some of this removed sediment is collected and distributed



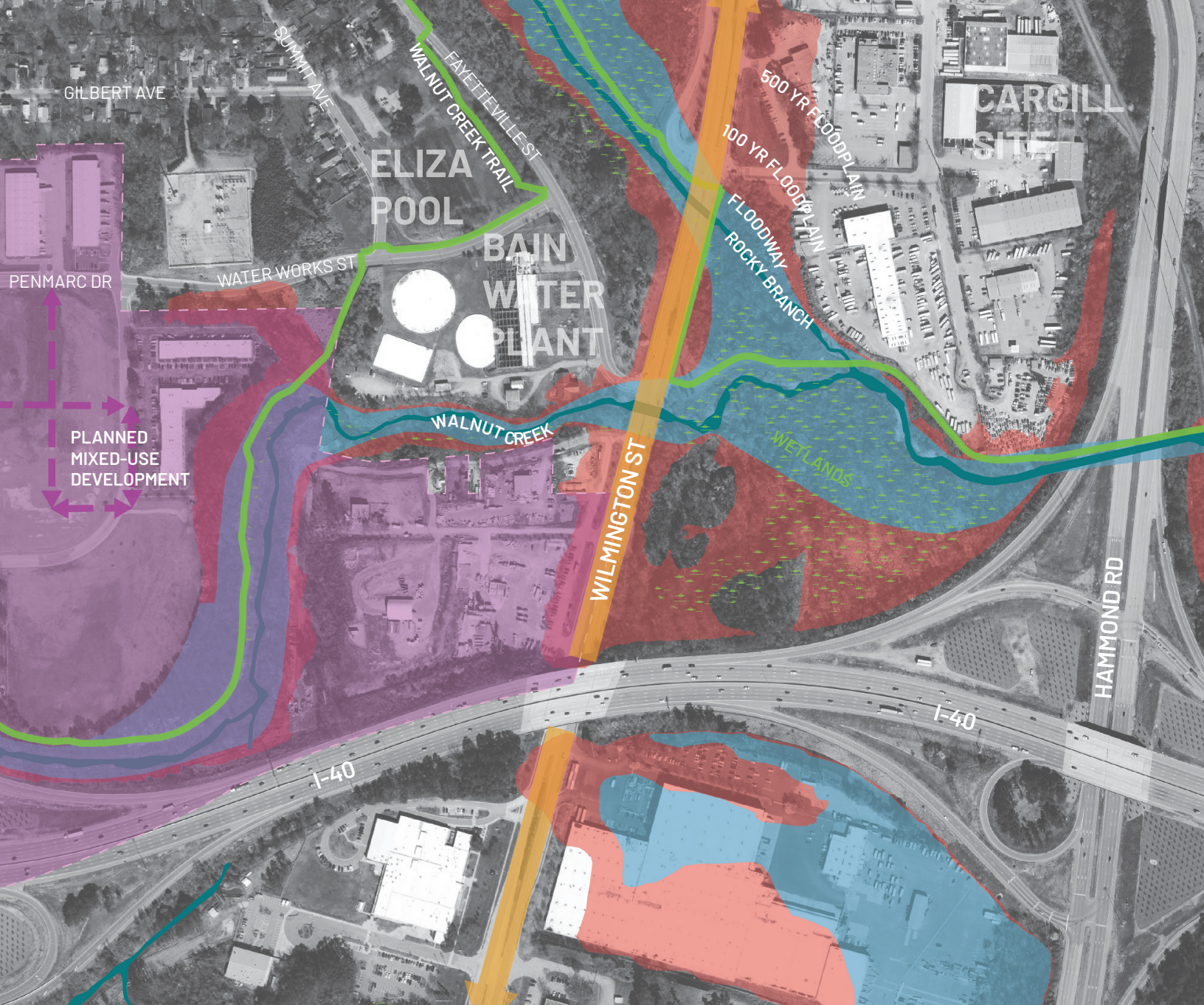
Key Map:
Focus Area 2



Map 4: Focus Area 2 Existing Conditions
(Credit: Raleigh Urban Design Center)



Sedimentation seen after a recent storm event along the Walnut Creek Trail.



Evidence of stream bank erosion and a lack of healthy stream bank ecology.



Expanses of boardwalk trails along this area offer views of natural features.

to baseball fields throughout Raleigh's parks. Inclusion of signage about these efforts could educate citizens more about post-flood sedimentation as well as the City's efforts to use this material. **ESA-P4**

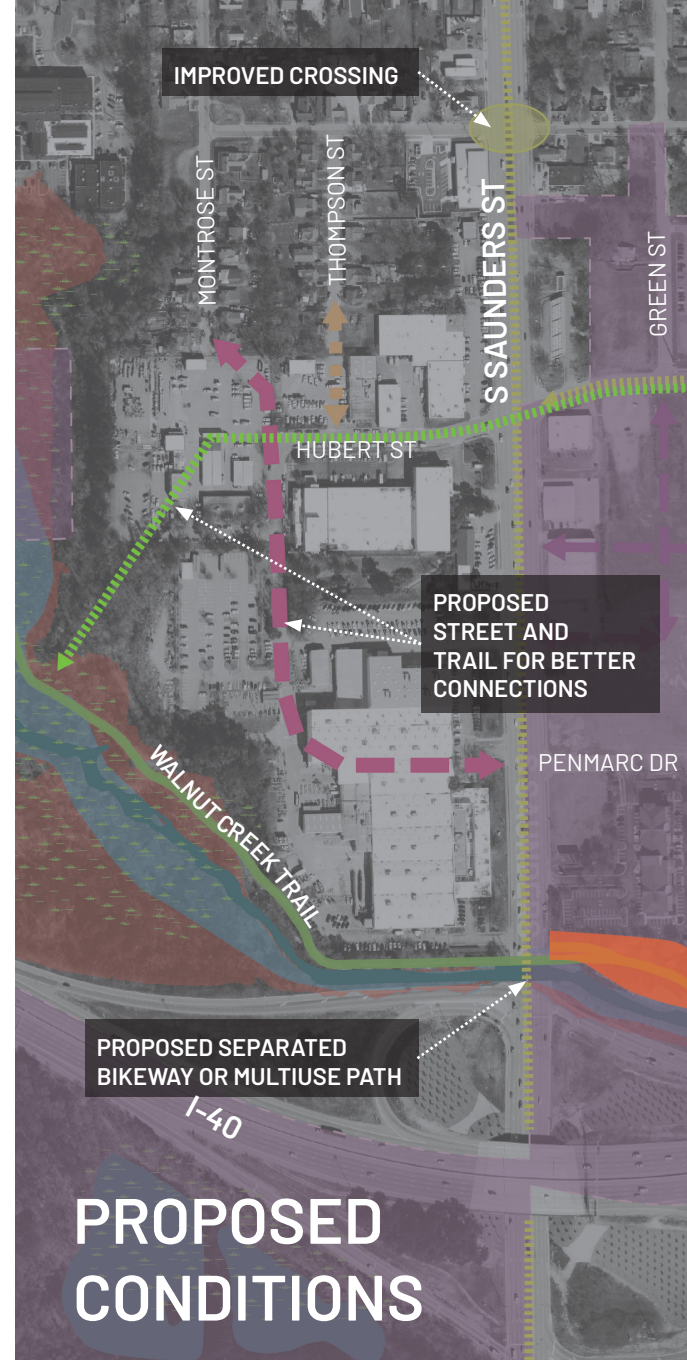
The sedimentation onto greenways does pose some potential safety concerns for greenway users. When wet, the sediment can become slippery and pose a fall hazard for walkers or runners. It also creates an uneven surface which can cause issues for cyclists. Solutions beyond continuing existing maintenance patterns include raising the trail in place or relocating it to higher ground. **ESA-C2**

DEVELOPMENT

This Focus Area is adjacent to a lot of active development projects, primarily the large development referred to as Downtown South. This development is planned to be a high-density mixed-use development. The development will greatly increase the impervious surface coverage in Focus Area 2 and, as such, a great deal of care should be taken in both the public and private investments to incorporate GSI and reduce the strain on Walnut Creek posed by increased stormwater runoff. Inclusion of terraced retention systems as you approach the creek or on site constructed wetlands would be appropriate to accommodate the amount of stormwater runoff a project of this magnitude might create.

The Downtown South Plan approved by the Raleigh Planning Commission and Raleigh City Council, included zoning conditions to treat the first 1.34" of runoff from the proposed impervious surfaces. This is a commitment to capture and treat that volume of water on site and not allow it to runoff into the creek. The plan also references "embracing" Walnut Creek and calls out restoration opportunities to further safeguard the resource.

The Historic Cargill site and surrounding areas also offer a redevelopment opportunity in the future. These sites are just north of the confluence of Rocky Branch and Walnut Creek. Because this is a confluence area, the floodway and floodplain are much wider. Care should be taken to reduce stress on the confluence areas and their floodplains. Floodplains are important in these areas to alleviate flooding stress on the streams. Any development should incorporate on-site treatment of runoff to reduce strain. **ESP-S3** These on-site treatment methods could include bioretention cells, stormwater wetlands, and/or a combination of the two.



Map 5: Focus Area 2 Proposed Conditions
(Credit: Raleigh Urban Design Center)



Boardwalks through or adjacent to wetlands provide an opportunity for education .



Stream restoration efforts could include restoration to the banks and floodplains and offer educational opportunities.



Signage in this area should explain the natural aspects of flooding and stream mechanics and highlight the City's efforts in maintaining healthy streams.

1.3

FOCUS AREA 3

Focus Area 3 runs parallel from the lowest elevation of Fayetteville Street south to the Wilmington Street intersection. This section of the greenway system is where the Rocky Branch Trail ends and intersects with the Walnut Creek Trail. Large sections of land in this area and adjacent are owned by public entities.

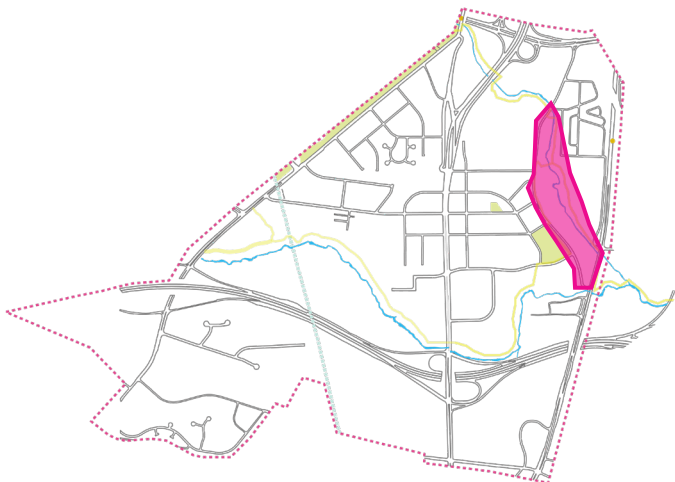
FLOOD + EROSION MANAGEMENT

The land to the east of Fayetteville St. moves sharply downhill toward the creek. Fast-moving stormwater runoff from the street and rising floodwaters has destabilized the creek's banks causing major erosion.

To address this issue, residential and curbside GSI strategies should be implemented in this area. **ESA-S2** In addition to GSI strategies, erosion control efforts could be initiated by the City of Raleigh to alleviate the problem. **ESA-S3** If current conditions persist, future structural weaknesses in the area may need more intensive interventions.

The segment of Walnut Creek Trail that connects to Fayetteville St. is too steep for a paved path making the current gravel path just before the intersection of Fayetteville St. and Prospect Ave. the most feasible solution. Area around the descending path could be re-engineered to a more acceptable slope. Terraces and retaining walls could be used to help reinforce the creek banks. Certain properties along Fayetteville Street overlap the floodplain and/or floodway and may experience nuisance flooding or erosion. Where necessary and feasible, strategies to manage destabilization and flow volume should be explored. Diversion strategies could also be explored to either bank the topography to protect the properties or to divert the stream.

Sections of this trail have boardwalks and bridges that allow access to the trail during times of flooding. Most of these structures work well, however, the bridge that connects Walnut Creek Trail to Fayetteville



Key Map:
Focus Area 3



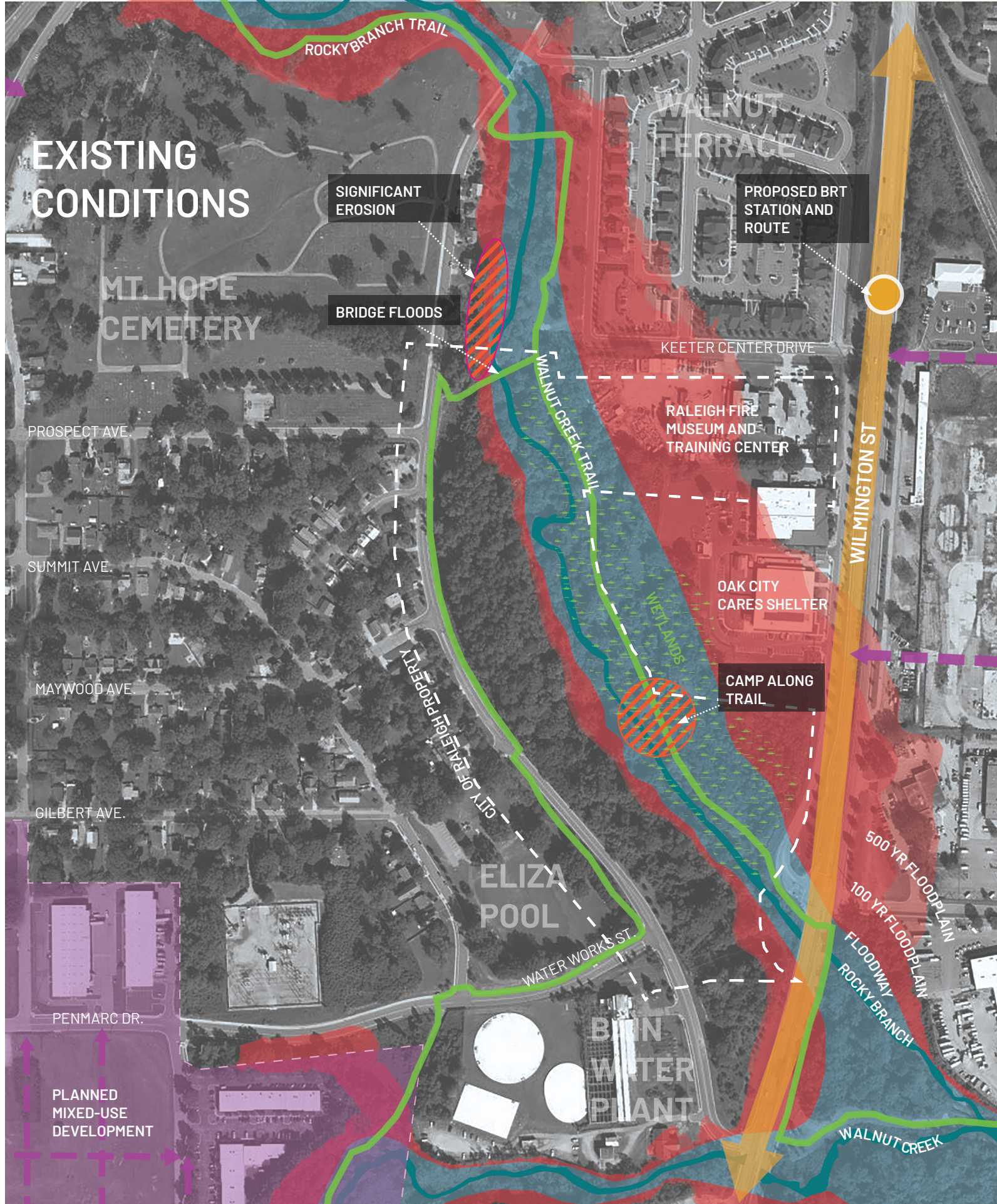
Walnut Creek Trail goes from the streetside to the creek side.



Wetland areas around the trail boardwalk, adjacent properties can be seen through the vegetation.



Tents and litter are scattered along portions of the creek, which are indicators of a housing crisis.



Map 6: Focus Area 3 Existing Conditions
(Credit: Raleigh Urban Design Center)

St. near Prospect Ave., is often waterlogged due to steep slopes and a low bridge elevation. This issue could be addressed by regrading the slope of the access trail and raising the bridge to connect to the path at a higher elevation. **ESA-C3** This would provide an alternative, paved path from the street and raise the bridge to reduce impacts of flooding and associated maintenance.

DEVELOPMENT STRATEGIES

Extreme topographical differences pose challenges to establishing successful greenway connections. Additional greenway trail connectors are being proposed in this section to better connect to communities adjacent to the trail. This is important as a future Bus Rapid Transit Station is being proposed on Wilmington Street adjacent to the Walnut Terrace community. Water Works Street could extend across this greenway area and connect to S. Wilmington St., allowing for pedestrian, bike, and vehicular connections to occur. **ESA-C4** Additional pedestrian bridge connections around Maywood Avenue or Gilbert Avenue should be explored further. **ESA-C5**

Other development considerations for this Focus Area concern the 3 properties adjacent to the trail, south of the Walnut Terrace. Two of these parcels are owned by Wake County and provide services to the persons experiencing homelessness communities of Raleigh. These properties are encouraged to provide access to the trail or active uses trail-side for trail-oriented designs concepts. A cluster of tents set up by persons experiencing homelessness is consistently seen on the trail. This is unsafe for those using the tents and creates an adverse safety perception for users. It is recommended that these service centers provide spaces that persons experiencing homelessness could utilize such as defined campground areas or a tiny home village for longer term boarding. This provides a location adjacent to already existing services that would eliminate the unauthorized camping and provide people with a thoughtful solution. The third property at the most northern location, is a fire training facility owned by the City of Raleigh Fire Department. This parcel is divided into two distinct areas. One section is for the training facility which is located closer to Keeter Center Drive and the other section houses storage units, trailers, abandoned vehicles, and construction material. A small portion of this Focus Area has single-family housing adjacent to Fayetteville Street. Around Prospect Avenue, the Zoning changes from RX-3 to R-6. A recent text change (TC-5-20) now allows R-6 zoning districts to include single-family homes and attached houses, and duplexes. All these sites should be studied for potential redevelopment that includes affordable housing and/or Missing Middle. **ESA-D3**



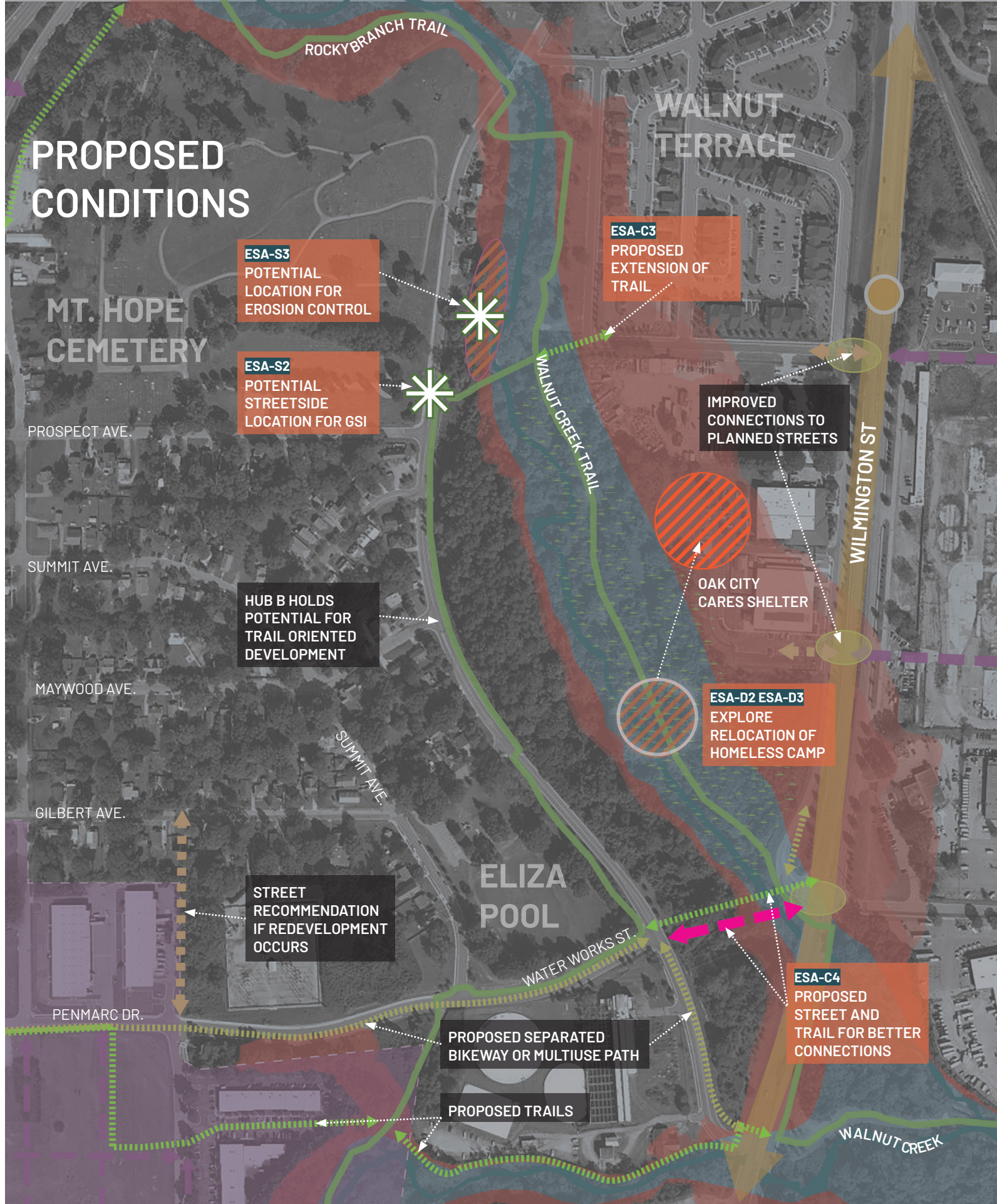
An example of an erosion control method that could be implemented in Focus Area 3.



Conceptual rendering to illustrate a Trail-oriented development project could look along Fayetteville St.



This City of Raleigh bridge is an example of infrastructure that can increase access across streams.



Map 7: Focus Area 3 Proposed Conditions
(Credit: Raleigh Urban Design Center)

1.4

FOCUS AREA 4

This area touches planned, mixed-use development, interfaces with important City of Raleigh properties, and weaves behind Washington Elementary School. Rocky Branch and its floodplain could become valuable assets for all of these private and public property owners by incorporating placemaking, wayfinding and educational opportunities that build upon green stormwater strategies.

TRASH, DEBRIS AND INVASIVE GROWTH

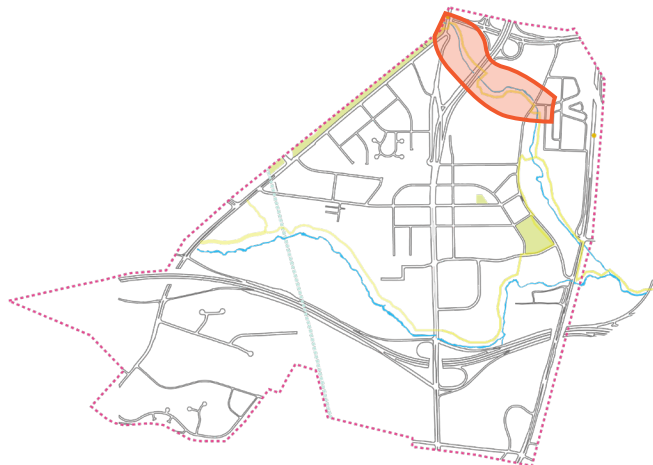
When Rocky Branch spills over its banks, it carries trash, tree limbs, and silt that creates an unkempt and inaccessible environment next to the stream and greenway. Trash and debris build-up is most visible behind Gateway Park, and near Washington Elementary/Mt. Hope Cemetery. Trees and other growth not suited to floodplain conditions contribute to debris and build-up. As vegetation becomes unhealthy, it is more prone to dropping limbs and foliage, leaving space and light for opportunistic and invasive species to take over.

DEVELOPMENT ORIENTATION

Development in this area is often oriented in such a way that its back is facing Rocky Branch. Access points and openings to the creek and greenway are limited. Providing additional spaces for the public to learn and engage with Rocky Branch would create opportunities for public amenities and educational tools that could be used and embraced by new development, nearby parks, and Washington Elementary.

INTERACTION WITH THE STREET

Rocky Branch Trail crosses over and under several major thoroughfares, including Lake Wheeler Road/S. Saunders Street, Dawson/McDowell Streets, and Fayetteville Street. Crossings and entrances aren't well marked and could be better branded, particularly near the school.



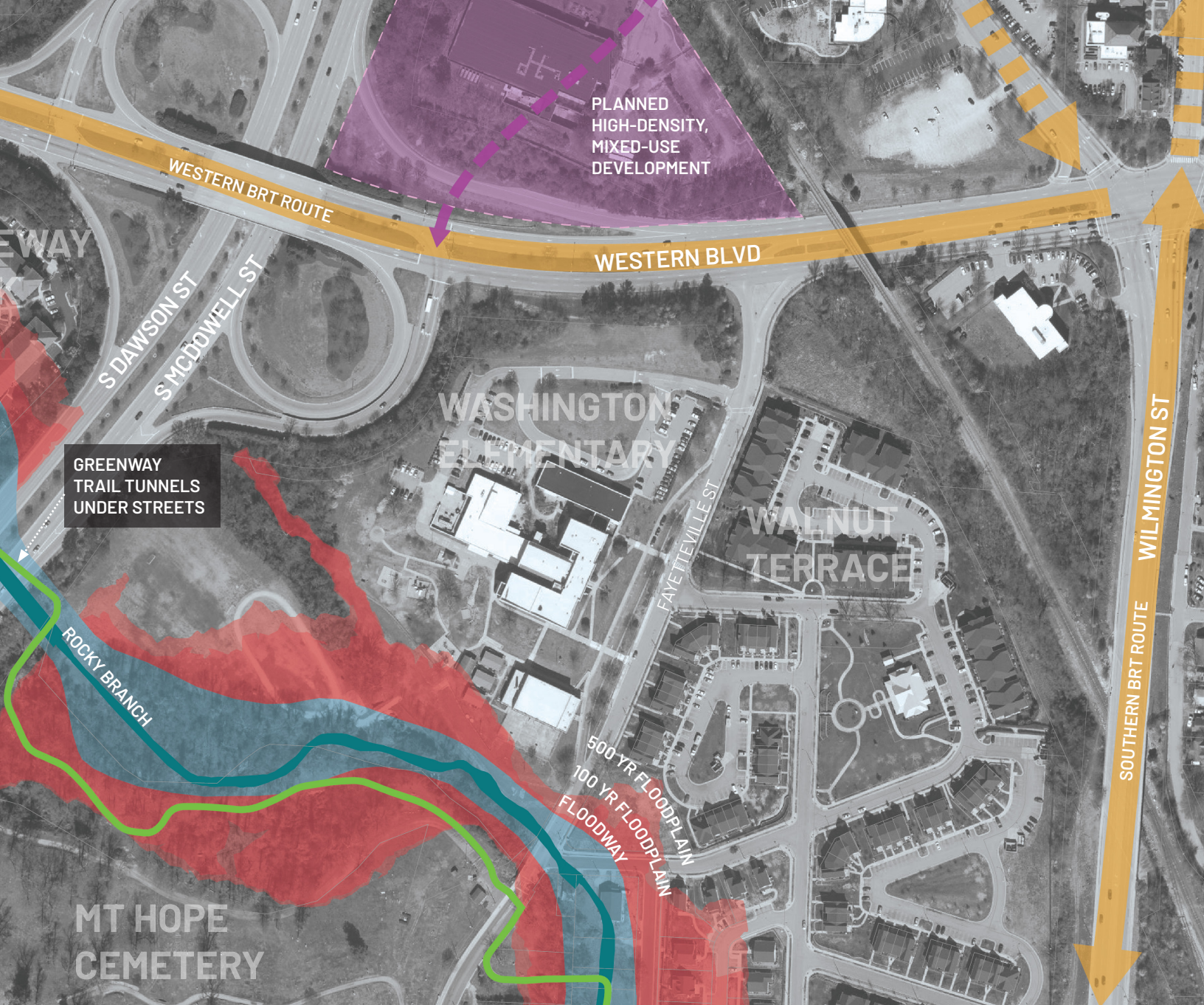
Key Map:
Focus Area 4



Map 8: Focus Area 4 Existing Conditions
(Credit: Raleigh Urban Design Center)



Invasive growth flourishes along the creek near the Rocky Branch Trail behind Gateway Park.



Water pools in a natural retention area next to the trail. Mt. Hope Cemetery appears in the background.



The greenway trail crosses Fayetteville St. at the base of a hill. The downhill slope and curve of the road increase vehicular speed and decrease visibility.

INVASIVE REMOVAL

Along much of Rocky Branch and beside the greenway trail, invasive growth has prevailed. These non-native, aggressive plants threaten and degrade the riparian ecosystem by shading out native plant seedlings and smothering trees. The area's river banks, birds, and other fauna rely on the success of native plants. Invasive plants along Rocky Branch include: English Ivy, Johnsongrass, Asian Wisteria, Kudzu, and Privet.

Raleigh Parks, Recreation, and Cultural Resources manages a program called Habitat Heroes with the goal of partnering with individuals or groups to remove and map invasive species at parks and along greenway trails. Communication about this program should be spread to nearby businesses, neighborhoods and schools.

The intersection of Lake Wheeler Rd. and S. Saunders St. will become a main greenway entrance into Dix Park. Clearing the overgrowth here will reveal the creek and make the entrance/trail to the park obvious and safe for users. [ESA-P5](#)

PARTNERSHIPS AND TRAIL-ORIENTED DEVELOPMENT

Focus Area 4 includes connections with Dix Park, planned mixed-use development, established residential development, Mt. Hope Cemetery, and Washington Elementary. These are major destinations that host, or will host, large numbers of people. As much as possible, adjacent development should provide direct access to and from the greenway trail. Ample wayfinding, travel amenities, and lighting where appropriate will help direct users and make the trail feel safe and welcoming. [ESP-P1](#)

There are natural wetlands located at the base of Mt. Hope Cemetery. This is a prime location for a more cultivated and engineered approach to green stormwater infrastructure. By removing invasive species and establishing wetland-friendly plants, a bioretention cell would compliment the views of the cemetery. [ESA-S4](#) The infrastructure would also provide an opportunity for education and partnership with nearby Washington Elementary.

INTEGRATING GSI INTO STREETS

Rocky Branch Trail crosses Fayetteville Street at the eastern end of this Focus Area. The crossing occurs in a valley with Fayetteville then continuing north towards Washington Elementary and Walnut Terrace. The crosswalk's proximity to these sites necessitates visibility and its location at the base of a hill necessitates traffic calming measures. Streetscape enhancement measures with incorporated GSI features that improve safety and capture and filter runoff from the sloping street before it enters Rocky Branch should be explored. [ESA-S5](#)

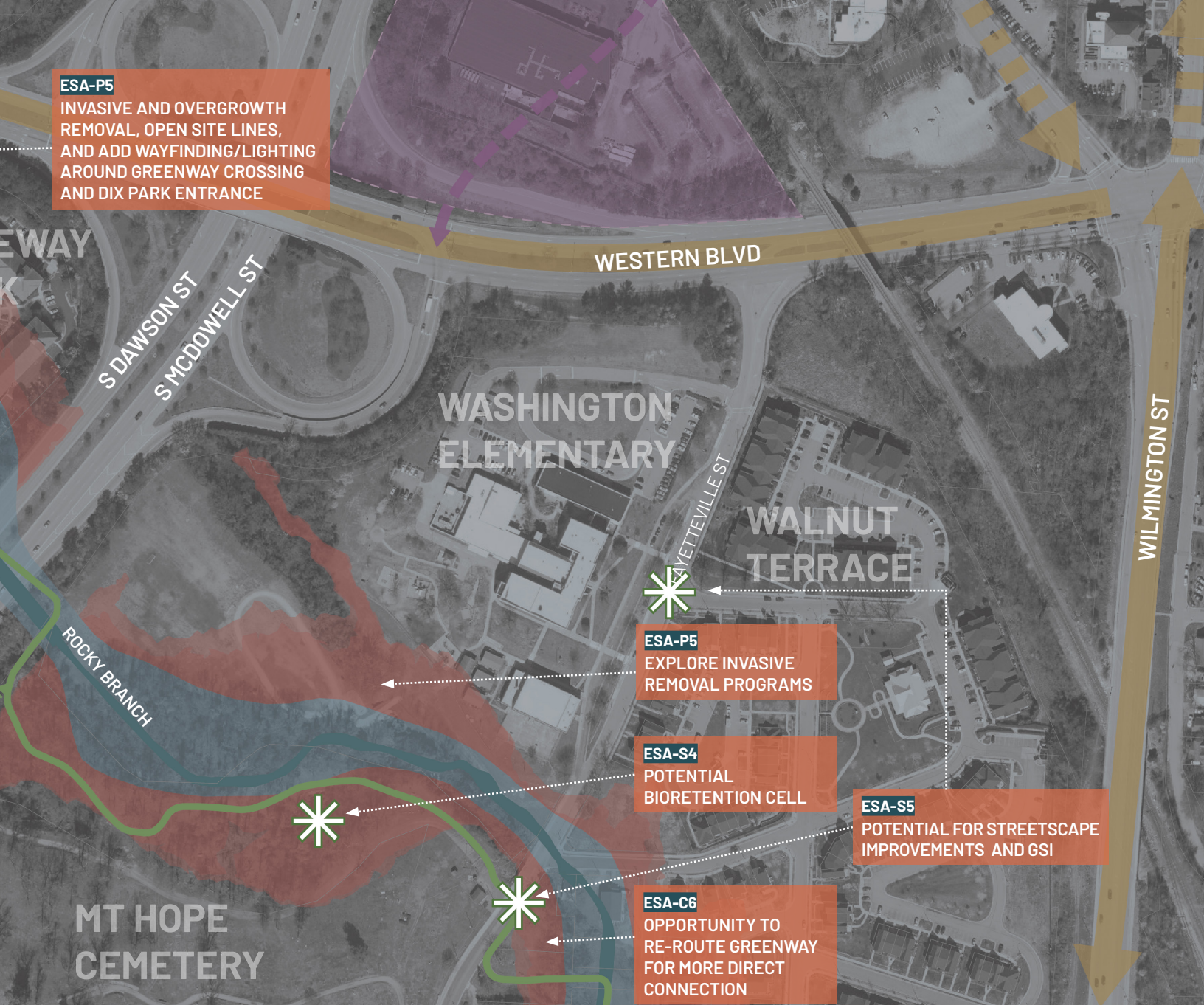
The greenway trail crossing maneuvers awkwardly along the southeastern side of Fayetteville Street. Eliminating this jog and making a more direct, diagonal connection to the greenway trail should be explored. [ESA-C6](#)



Map 9: Focus Area 4 Proposed Conditions
(Credit: Raleigh Urban Design Center)



Example of trail-oriented development where frontage on the greenway is inviting.



Example of what bioretention at Mt. Hope Cemetery might look like.



Example of what crossing curb bump outs with integrated GSI might look like.

2.1

ACTION ITEMS + POLICIES

STORMWATER

ACTION ITEMS

ID	ITEM	LIMITS	COMMENTS	DEPT.	FA	ALIGNMENT
ESA-S1	Install Beaver Deceivers or similar devices	Identified area behind Caraleigh Mills and as appropriate.	Allow for non-obstructive habitat construction	PRCR	1	EP2.2, EP 6.1
ESA-S2	Fayetteville Street curbside GSI	Fayetteville St. from Levister Ct. to S. Wilmington St.	Alleviates sheet flow runoff into Rocky Branch	Eng. Svcs, RDOT	3	EP 2.1, EP 3.18
ESA-S3	Further study erosion control along Rocky Branch	Portion of creek running parallel to Fayetteville St.	Alleviate current erosion issues and make land more suitable	Eng. Svcs	3	EP 2.1, EP 3.18
ESA-S4	Install bioretention devices alongside Greenway and Mt. Hope Cemetery	Identified area in Map 9		Eng. Svcs, PRCR	4	EP 2.1, EP 3.18
ESA-S5	Incorporate bioretention cells into streetscape where appropriate	Intersection of Fayetteville St. @ Rocky Branch Trail and W. Lee St.	Increases safety and provides stormwater treatment at a low point	Eng. Svcs, RDOT	4	T 3.2, T3.4, EP 3.18

POLICIES

ID	ITEM	LIMITS	COMMENTS	DEPT.	FA	ALIGNMENT
ESP-S1	New development should incorporate GSI strategies to offset impacts of new impervious surfaces	Areas in proximity to floodplains and stream corridors			1,2,3,4	EP 2.2
ESP-S2	New development should prioritize conservation of nearby wetlands and riparian corridors	Areas in proximity to wetlands and riparian corridors			1,2,3	EP 2.1, EP 2.2

CONNECTIVITY

ACTION ITEMS

ID	ITEM	LIMITS	COMMENTS	DEPT.	FA	ALIGNMENT
ESA-C1	Streetside Greenway trail along Penmarc Dr.	Along Penmarc Dr., across S. Saunders Sr. into existing Walnut Creek Trail	Improve access issues	PRCR, RDOT	1	EP 2.6, T 5.7
ESA-C2	Study sedimentation mitigation along Rocky Branch Trail	Along Walnut Creek Trail east of S. Saunders St	Improve sedimentation issues which pose safety hazards	PRCR	2	EP 2.6
ESA-C3	Regrade access trail and raise bridge	Rocky Branch Trail at Fayetteville St. Access and Keeter Center Dr.	Alleviate accessibility issues	PRCR	3	EP 2.6, T 5.7
ESA-C4	Install streetside greenway trail along Water Works St. Extension	Waterworks St. Extension	Improve connectivity to S. Wilmington BRT	PRCR, RDOT	3	EP 2.6, T 5.7
ESA-C5	Study additional pedestrian bridge connections	Maywood Ave. and/or Gilbert Ave.	Improve connectivity	PRCR, RDOT	3	T 5.13
ESA-C6	Study more direct greenway alignments	Across Fayetteville St. between Rocky Branch access points	Improve safety and make space for potential GSI implementation	PRCR, Eng. Svcs, RDOT	4	EP 2.6, T 5.7

DEVELOPMENT

ACTION ITEMS

ID	ITEM	LIMITS	COMMENTS	DEPT.	FA	ALIGNMENT
ESA-D1	Study and develop Trail Oriented Development guidelines		Incorporate guidance on how development should interact with greenways	Planning + Dev	1,2,3	PR 3.13
ESA-D2	Explore short and long term installments for persons experiencing homelessness			PRCR, Planning + Dev, Housing + Neighborhoods	3	H 3.2
ESA-D3	Study utilization of city owned sites for affordable housing and missing middle	Sites identified in Map 7		Planning + Dev	3	H 2.17

POLICIES

ID	ITEM	LIMITS	COMMENTS	DEPT.	FA	ALIGNMENT
ESP-D1	New development that fronts greenways should incorporate Trail Oriented Design				1,2,3	PR 3.13

PLACEMAKING

ACTION ITEMS

ID	ITEM	LIMITS	COMMENTS	DEPT.	FA	ALIGNMENT
ESA-P1	Install educational signage regarding wetlands and their ecology	Area identified in Map 3		PRCR	1,2	EP 9.1
ESA-P2	Incorporate placemaking elements along Walnut Creek channel	Channelized portion of Walnut Creek at S. Saunders St.	Elements could include art, lighting, and signage	PRCR, Arts	1	PR 3.11
ESA-P3	Install signage about streams	Along Walnut Creek in area south of Downtown South	Highlight relationship between land and water and City strategies to protect natural systems	PRCR, Arts, Eng. Svcs	2	EP 9.1
ESA-P4	Install signage about flooding and sedimentation	Along Walnut Creek in area south of Downtown South	Highlight natural aspects of flooding and City efforts to use sediment	PRCR, Arts	2	EP 9.1
ESA-P5	Invasive removal along Rocky Branch Creek	Connection between Dix Park and eastern portion of Rocky Branch Trail	Remove overgrowth making area more attractive and providing additional educational opportunities	PRCR	4	EP 9.1

POLICIES

ID	ITEM	LIMITS	COMMENTS	DEPT.	FA	ALIGNMENT
ESP-P1	Incorporate more greenway amenities		Ample wayfinding, amenities, and lighting	PRCR	1, 2, 3, 4	PR 3.11

