



Project Application

Instructions: All fields within the application are expandable as needed. Please be as thorough as possible in your explanations.

Call or email questions to: **Mitigation Department**
South Carolina Office of Resilience
 Mitigation@scor.sc.gov
 803-832-8004

Note to Applicants: *ASIP grant recipients must comply with all applicable federal, state and local procurement laws that are consistent with the standards outlined in §2 CFR 200 et seq., including §2 CFR 200.317 through §2 CFR 200.327.*

Applicant Information			
<input type="checkbox"/> Municipal Government	<input type="checkbox"/> County Government	<input type="checkbox"/> Tribal Government	Unique Entity Number:
Name of Government Entity:		County:	
Project Title:			
Are you applying to be a Subrecipient? (If yes, the Subrecipient Application must be completed.) <input type="checkbox"/> Yes <input type="checkbox"/> No			

Project Information	
Description of problem to be solved:	
INSERT GIS map here.	Attached
Describe the proposed project scope of work and the level of community support:	
Percent Project Plans Completed to Date:	
ATTACH Plans, Permits, Environmental Documents, Specification and/or Estimates if developed:	Attached

Funding	
Total SCOR ASIP Funds Requested: <i>(Construction Only)</i>	Total Project Cost: <i>(including Engineering, Construction Administration, and Permitting)</i>
Additional Funding Source:	Amount: <i>(This includes Engineering, Construction Administration, and Permitting)</i>
Additional Funding Source:	Amount:
ATTACH a total project cost breakdown for Design Engineering, Permitting, Construction Engineering Inspection, and Construction here. Attached	

Infrastructure Prioritization Criteria- The South Carolina Office of Resilience is soliciting applications from UGLGs located in the South Carolina to disperse Infrastructure funds. Infrastructure Project Applications will be evaluated on the following Prioritization Criteria.

Benefit-Cost Ratio: Projects must have a Benefit-Cost Ratio greater than or equal to 1 to qualify for funding. If the community is unable to complete this step prior to the application process, SCOR will perform the necessary calculations as per the South Carolina CDBG-MIT Action Plan located here:

[https://scor.sc.gov/sites/scor/files/Documents/Mitigation/HUD-required%20docs/South%20Carolina%20Mitigation%20Action%20Plan%20\(May%203%202020\)%20-%20TEST.pdf](https://scor.sc.gov/sites/scor/files/Documents/Mitigation/HUD-required%20docs/South%20Carolina%20Mitigation%20Action%20Plan%20(May%203%202020)%20-%20TEST.pdf)

Benefit-Cost Ratio: *(See Attachment 8)*

Provide the % Low to Moderate Income (LMI) within the Service Area: *(See Attachment 4)*

Define and INSERT a map of the Service Area here.

- Service projects, such as a hospital, have a boundary drawn around the urbanized communities immediate surrounding the hospital. However, it can be argued that the hospital serves a larger extent such as people from rural parts or even people from neighboring cities or states. The line will be drawn at rural areas because LMI should be based on people and income and not land. Rural areas have an unfair weight that skews LMI percentage due to land size. Other cities or any extent further also was not reasonable as the LMI percentage would be skewed as few people from further away cities attend the hospital.
- Infrastructure, such as a storm water network in a neighborhood, will be drawn primarily based on the infrastructure's watershed boundary. A watershed is defined by topology, or in other words, how the ground slopes to drain water. Any area where rain runs off into the storm water network is included as part of the watershed area.
- At times, the watershed boundary will be shortened, as many watersheds can elongate hundreds of miles downstream or upstream. In other cases, a watershed boundary may be extended as storm drain networks often connect multiple watersheds conveying runoff through pipes underground which cannot be obtained from the topology.

ATTACH map of Service Area: Attached

Nature Based Solutions (Green Infrastructure): Describe any nature-based solutions that are proposed. Quantify the percentage of the overall proposed project that consists of nature-based solutions.

Scheduling and Permitting Requirements: Provide a project schedule and [attach here](#). Demonstrate ability to acquire permits timely and meet overall schedule. Projects must be completed prior to December 2026 to be eligible.

ATTACH Project Schedule: **Attached**

Flood Risk Reduction - Level of Protection: Describe flooding and provide pictures:

The proposed project is located on flood buy-out property that was previously acquired by the County to reduce flood losses throughout its jurisdiction. This project leverages the property acquired to reduce flood losses to also provide ecosystem services and general resilience within the Reedy River watershed. Although it is expected to result in minimal flood reduction above and beyond the initial buyouts, a slight increase in storage area within the stream channel, increased floodplain roughness achieved through riparian restoration, and stabilized banks will create a more resilient and functional stream corridor.

Identify the cause of flooding (Local Rainfall, Riverine, etc):

Identify the level of flood risk reduction achieved by the proposed project:

- Minimal increase in flood protection
- 25-year, 24-hr storm event level of protection
- Above a 25-yr, 24-hr storm event level of protection

**Actions have already been taken to eliminate the flood risk through flood buy-outs. See next section.*

ATTACH photographs of flooding: **Attached**

Flood Risk Reduction - Quantity of Protection: Quantify the number of structures benefiting from flood risk reduction and provide a map of impacted structures.

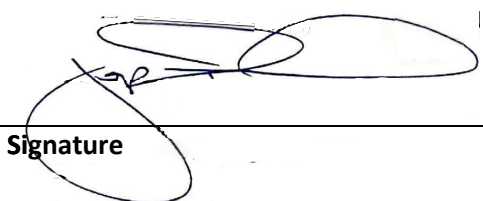
ATTACH map of impacted structures: **Attached**

Mobility Improvement: Demonstrate improved mobility for emergency responders and the public during storm events.

Environmental Impact/Benefit: Demonstrate environmental benefits and/or contributions to improving environmental conditions.

Application Contact	
Name:	Company/Title:
Phone:	Email:

Authorized Signature: *By signing this funding proposal, I hereby certify that the information being submitted is complete and correct, and that the local government has authorized this submission and the commitments implied within.*



Typed Name and Title of Chief Executive/Administrative Official	Signature	Date
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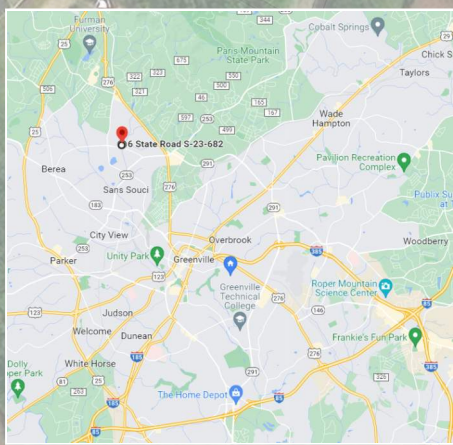
To submit the completed application via email to mit_infrastructure@scor.sc.gov click the submit button below:

To submit the completed application hardcopy via mail to:





SCOR Mitigation Department
632 Rosewood Drive
Columbia, SC 29201

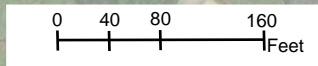
ATTACHMENT 1

General Location and Conceptual Drawings



LEGEND

-  Riparian Improvement
-  Stream Restoration
-  Cross Vane
-  Contour Line



ATTACHMENT 2

*Community Support:
The Reedy River Water Quality Group*

Reedy River

Water Quality Group



2019 PROGRESS REPORT





WHAT IS THE REEDY RIVER WATER QUALITY GROUP?

The Reedy River Water Quality Group (RRWQG) has one mission. We want to protect, preserve, and improve water quality in the Reedy River and its tributaries, known as the Reedy River watershed. Since 2015, local city and county agencies, the regional water resources recovery facility, homeowners groups, conservation groups, business organizations, and area citizens have worked together under the umbrella of the RRWQG toward reducing the amount of nutrients flowing into the river. More than 30 entities are all stakeholders in the water quality of the Reedy River watershed, from its headwaters in Travelers Rest to the mouth of Lake Greenwood. They all have a stake in reducing the amount of nutrients entering the river and complying with a section of our nation's Clean Water Act whose intent is to identify and restore impaired waters. There are hundreds of impaired water bodies around the country, but the approach that the RRWQG is taking to restore the Reedy River watershed is exceptional, shared by a handful of watersheds.



What activities are going on TODAY?
Check our website www.cleanreedy.org

LOCAL ENGAGEMENT, TAILORED WATER QUALITY APPROACH

For most impaired water bodies, the State or Federal governments write a prescriptive watershed plan requiring actions for compliance. For the Reedy River, the State is a partner and representatives from the local stakeholder organizations are developing the water quality plan by actively engaging in the process. This means that the Reedy River watershed plan is being crafted by people who live and work close to the Reedy River, the people who best understand the river environment, its uses, its potential, and its impact on the local economy.

The process is hands-on and sleeves rolled up. The multi-year work is being done by committees whose participants represent the stakeholders and who bring technical expertise, knowledge of the watershed, resources, or just a commitment to a better Reedy River. The committees work together to deliver work products, and to make sure that the work is aligned and the plan stays on schedule. Since the RRWQG was created in 2015, the committees have worked to achieve milestones that mark progress toward improved water quality.

The three executive sponsors—the City of Greenville, Greenville County, and Renewable Water Resources-- oversee the process, and a facilitator, WQR, manages the committee work.

Community & Conservation Groups

- Boyd Mill Pond HOA
- Conestee Foundation
- Connect Lake Greenwood
- Friends of the Reedy River
- Greater Greenville Association of Realtors
- Greenville Chamber of Commerce
- Home Builder's Association of Greenville
- Preserving Lake Greenwood
- United Utilities
- Upstate Forever
- Waterloo Water Wizards

City, County & University Partners

- City of Greenville
- City of Mauldin
- City of Simpsonville
- City of Travelers Rest
- Greenville County
- Greenwood County
- Laurens County
- Renewable Water Resources
- Greenville County Soil & Water Conservation District
- Laurens County Water & Sewer Commission
- Clemson Extension Service Greenville County

State, Regional & Federal Partners

- Appalachian Council of Governments
- Greenville Area Development Corporation
- South Carolina Department of Transportation
- SC Department of Health & Environmental Control
- South Carolina House of Representatives
- South Carolina Senate
- US Environmental Protection Agency Region IV

COLLABORATION TO SUPPORT THE CLEAN REEDY VISION

Since its formation, a hallmark of the watershed planning process has been the collaboration of the diverse stakeholders: environmental and business groups and government agencies all working toward the goal of the restored watershed. During 2019, that stakeholder collaboration strengthened:

- Greenville County, Laurens Water and Sewer, the City of Greenville, Greenwood County, and Renewable Water Resources are funding additional river monitoring stations, a weather monitoring station, and a monitoring buoy in Lake Greenwood to extend the dataset available for the water quality model and watershed-based plans.
- City of Greenville, EPA Region IV, Greenville County, Home Builders Association, ReWa, SCDHEC, Upstate Forever, and Greenville County are collaborating on the water quality model setup and calibration.
- Upstate Forever, ReWa, Clemson University Center for Watershed Excellence, Greenville Soil and Water Conservation District, Greenville County, City of Greenville, Friends of the Reedy River, and citizens developed a report card for health of the Reedy River. You can see the grades at reedyreportcard.org
- Fourteen organizations engaged consulting engineers and economists to conduct a study of the economic impact of riparian buffers and watershed-scale water quality improvements in the Reedy River watershed. The organizations included City of Greenville, Clemson Extension Service, Clemson University Center for Watershed Excellence, Conestee Foundation, Friends of the Reedy, Greater Greenville Association of Realtors, Greenville Chamber, Greenville County, Home Builders Association of Greenville, ReWa, Trees Greenville, Upstate Forever, and citizens
- The entire Reedy River Water Quality Group celebrates the water quality improvements that have been confirmed on the SCDHECs list of impaired waters. Boyds Millpond and the Reedy River Arm of Lake Greenwood are no longer impaired for total phosphorus or chlorophyll a, which is a measure of algae. These water quality improvement demonstrate the current effectiveness and future potential of the Reedy River Water Quality Group and USEPA's Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program.

COMMITTEES WORK TOWARD A WATERSHED PLAN

During the November 2019 Big Tent meeting, all stakeholders have an opportunity to see the progress gained toward greater water quality as the Committees present their work reports.

Public Outreach Committee

The Public Outreach Committee (POC) continues to touch a growing number of residents with its water quality education and engagement activities. It maintains a current website, www.cleanreedy.org, for the public and for internal communications, and has broadened awareness through its social media posts and photos.

The POC created and managed three separate “Keep it Clean” public outreach campaigns that encouraged the public to use best practices in washing cars, maintaining vegetated buffers, and adding fertilizer, all to reduce nutrients entering streams. The campaigns reached out with



billboards, television, newspaper ads, T-shirts, and mobile signage on field trucks and sanitation trucks. The POC sponsored a booth at the County Earth Day celebration that distributed soil testing kits to reduce the occurrence of unneeded and harmful fertilizer that can runoff and enter streams. The future campaign will educate residents to prevent fats, oil, and grease from entering the drain, and from flushing disposable wipes (which are not flushable) in order to reduce sanitary sewer overflows.



The POC recently created a “report card” for the Reedy River that interprets water quality metrics into descriptive uses for the River and charts its health in categories of water quality, recreation, and wildlife.

The POC stays in contact with the other committees in order to distribute information on their activities to the public.

Economic Impact Committee

The economic impact committee is working with the best management practices committee to gauge the costs and benefits of the proposed County ordinance to widen the riparian buffers, one of the effective best management practices to reduce runoff of nutrients and sediment. The two committees studied eight scenarios of existing, planned, and proposed developments to value seven criteria, such as home values, water quality, flood mitigation, and tax revenue. The consultant Earth Economics analyzed the data and summarized it in a fact sheet that provides a bottom-line valuation for the proposed widening of the riparian buffers.

Best Management Practices Committee

The Best Management Practices (BMP) Committee continued its activities to identify the most effective practices to reduce the entry of nutrients into the waters and to promote those practices for private land owners and public agencies. As noted above, the BMP committee worked with the economic impact committee to estimate the costs and benefits of the proposed ordinance to widen the riparian buffers.

The committee followed the USEPA “Handbook for Developing Watershed Plans to Restore and Protect Our Waters” to identify: existing best management practices in the watershed, critical areas where additional management efforts are needed, and possible management practices and their efficiencies to reduce nutrients. Through its research, the Committee found that

THE ECONOMIC IMPACT OF GREENVILLE COUNTY'S PROPOSED BUFFER EXPANSION

EARTH ECONOMICS REEDY RIVER WATERSHED

The proposed buffer ordinance aims to improve water quality in the Reedy River watershed by increasing buffers around streams, rivers, and wetlands. Earth Economics conducted an analysis of the economic impacts of the proposed ordinance across eight different existing, planned, and proposed neighborhood development sites. Seven economic impacts were valued at each site related to environmental and community-based benefits from the expanded buffers and lost economic activities tied to changes to real estate development in buffer areas:

- WATER QUALITY** impacts were measured as the reduction in nitrogen and phosphorus attributed to the proposed buffer. The value of these reductions is derived from the North Carolina Nutrient Offset rate schedule and is based on the actual avoided cost of water quality treatment within the local region.
- HOME VALUE** impacts were estimated using property sales prices history at the zip code level. Home values are estimated to increase for properties within 250 meters of the buffer, due to the desirability of publicly accessible open space.
- ECONOMIC DEVELOPMENT** Economic development impacts were estimated at each case study site according to the number of homes that would be built with and without the proposed buffer ordinance, based on local sales data and research from the Home Builders Association.
- NEIGHBORHOOD DEVELOPMENT** Impacts were estimated using average subdivision development costs from research on a North Carolina county, adjusted for local conditions.
- TAX REVENUE** was estimated using local property tax rates. Both positive and negative revenue impacts were estimated. Revenue gains were estimated based on the projected home value increase for homes within 250 meters of the buffer, and revenue losses were estimated when the proposed buffer would decrease the number of homes built on a development site.
- FLOOD PROTECTION VALUE** was calculated as the avoided damage to homes and property from flood events, per square foot of buffer, using an aggregate national average value for flood protection from wetlands.
- RECREATION VALUE** was estimated based on modeled trail usage of trail extensions installed within the proposed buffer, based on adjusted use statistics from existing trails in Greenville County.

Some of these factors—such as home value increases or lost economic development activity—will be one-time impacts; others—such as property tax revenue, flood protection, and recreation—will occur every year. In order to compare these impacts, all values were estimated over a 30-year time period and presented in net present value, using a 2.5% discount rate.

BENEFITS	COSTS
\$3,852,408	-
-	\$4,030,000
-	\$273,108
-	\$25,261
\$778,449	-
\$1,523,624	-
\$1,731,287	-

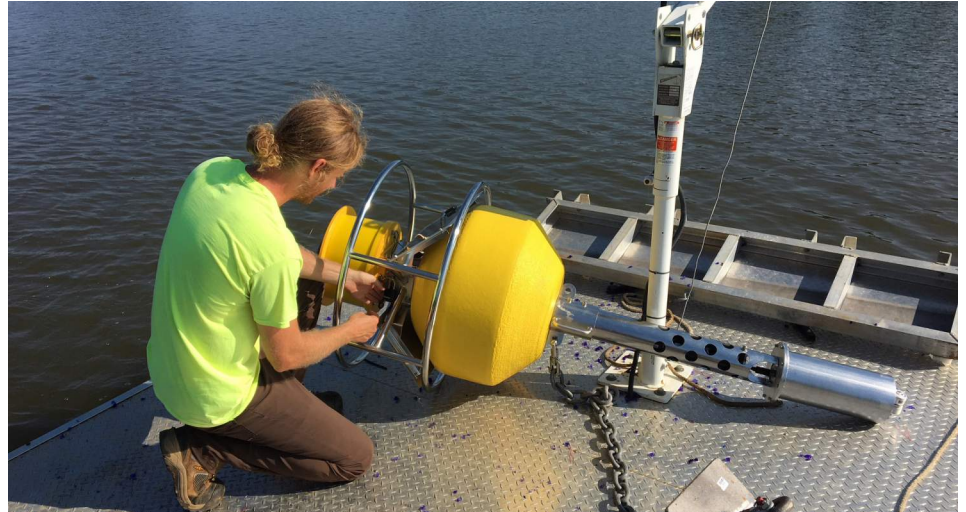
Earth Economics works to quantify and value the benefits nature provides - our work drives effective decisions and systemic change through a combination of education, natural capital analysis, and policy recommendations. earth@earthconomics.org | info@earthconomics.org
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riparian buffers, streambank stabilization, and ending illicit sanitary sewer connections are among the most cost effective for the results.

The committee is evaluating the pre- and post-projects for streambank stabilization for nutrient reduction performed by the City in Cleveland Park and McPerson Park. With the streambank stabilization and the riparian buffer data, the BMP committee is compiling an impressive local inventory of BMP effectiveness.

Monitoring Committee

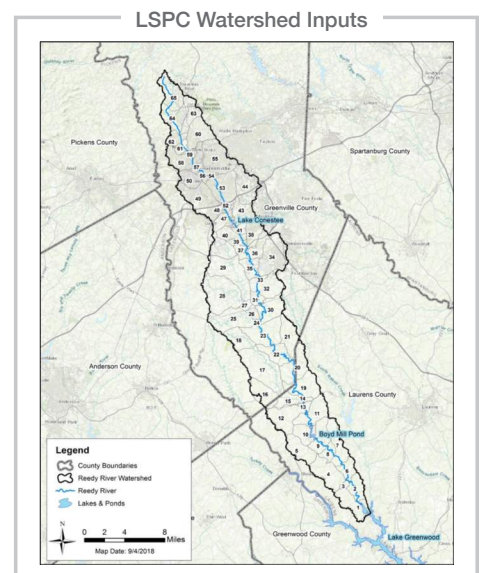
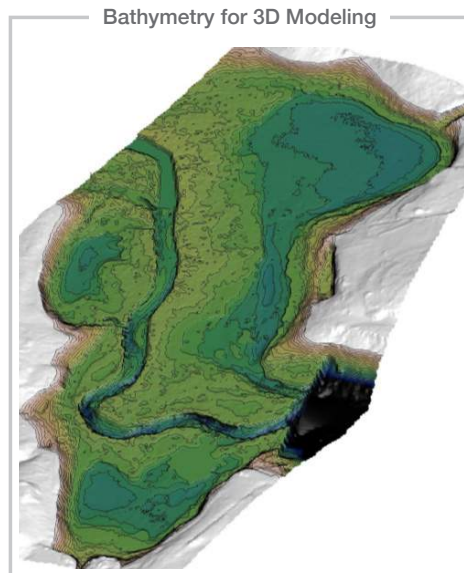
The goal of the monitoring committee is to identify the point and nonpoint sources causing the impairment in the Reedy River watershed. The committee began the year working with the modeling committee to identify data gaps in the model that needed to be filled to improve its accuracy. The committee completed its sampling plan and data analysis of the samples and transmitted the data to the modeling committee for its work.



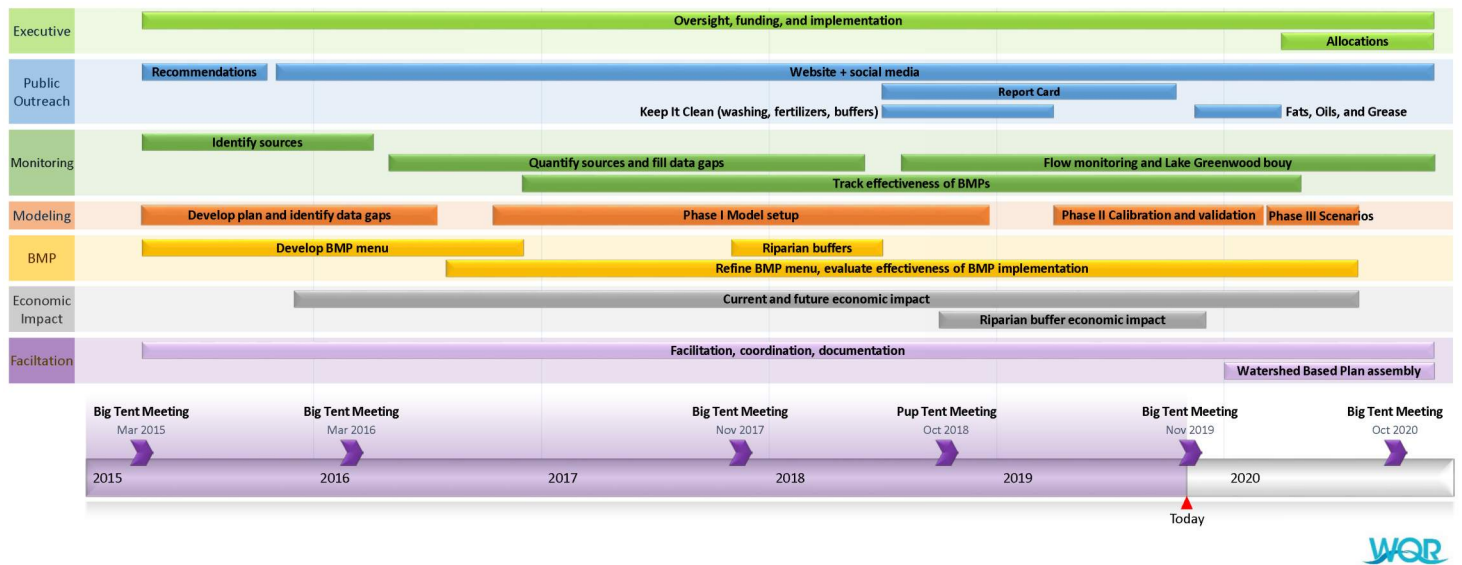
Subsequently, the Monitoring Committee developed a monitoring plan to obtain additional water quality information in Boyd's Millpond and in Lake Greenwood. Four group members funded a weather station, a Reedy River flow station, and a Lake Greenwood water quality monitoring bouy to extend the data set available for the modeling committee and watershed based plans. The committee also worked with a sampling crew from the US EPA to provide additional data.

Modeling Committee

Using samples obtained from the monitoring committee, the modeling committee is close to calibrating the model. With that milestone, the committee will be able to run allocation scenarios using best management practice variables.



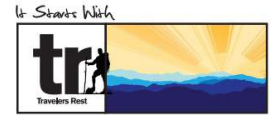
WATERSHED BASED PLANS DEVELOPMENT SCHEDULE



OUR VISION

The Reedy River Water Quality Group participants share a vision for clean water and are invested in the quality of life and economic development of the Upstate region.

www.cleanreedy.org



Join Us: www.cleanreedy.org



ATTACHMENT 3

Project Estimate

	ITEM	TYPE	QTY	UNIT ESTIMATE	BID AMOUNT	
Requested SCOR ASIP Funding	Mobilization	LS	1	\$59,138.00	\$59,138.00	Approximately 72% Total Funding Requested
	Sediment and Erosion Control	AC	3	\$4,890.21	\$14,670.63	
	Clearing and Grubbing	AC	3	\$20,000.00	\$60,000.00	
	Survey and As-Builts	AC	3	\$4,800.00	\$14,400.00	
	Vegetation Management	AC	3	\$2,480.00	\$7,440.00	
	Excavate/Move	CY	2,174	\$63.48	\$138,005.52	
	Matting	SY	1,467	\$39.96	\$58,621.32	
	Boulders	CY	50	\$235.86	\$11,793.00	
	Cross Vane	EA	2	\$9,175.17	\$18,350.34	
	Native Plant Plugs	EA	3,200	\$5.93	\$18,979.55	
	Specialty Seeding and HECP	AC	3	\$5,331.00	\$15,993.00	
	Tree Planting	EA	100	\$396.00	\$39,600.00	
	Live Stakes	BN	95	\$197.65	\$18,776.75	
	Contingency	%	25	-	\$115,730.59	
SUBTOTAL					\$591,498.69	
Proposed County Funding	Initial Survey	AC	6	\$2,000.00	\$12,000.00	Approximately 28% Total Funding Provided
	Engineering and Design	-	-	-	\$88,724.80	
	Construction Admin.	-	-	-	\$59,149.87	
	Permitting	-	-	-	\$23,659.95	
	Contingency	-	-	-	\$45,883.66	
	SUBTOTAL					
TOTAL					\$820,916.97	

If the cost to acquire the flood buy-out properties (\$922,300) were included, the projected percent of total funding provided by Greenville County exceeds 66%, not including the costs incurred updating the flood model, evaluating alternatives, valuating the properties, and structure removal.

ATTACHMENT 4

Summary of Service Area

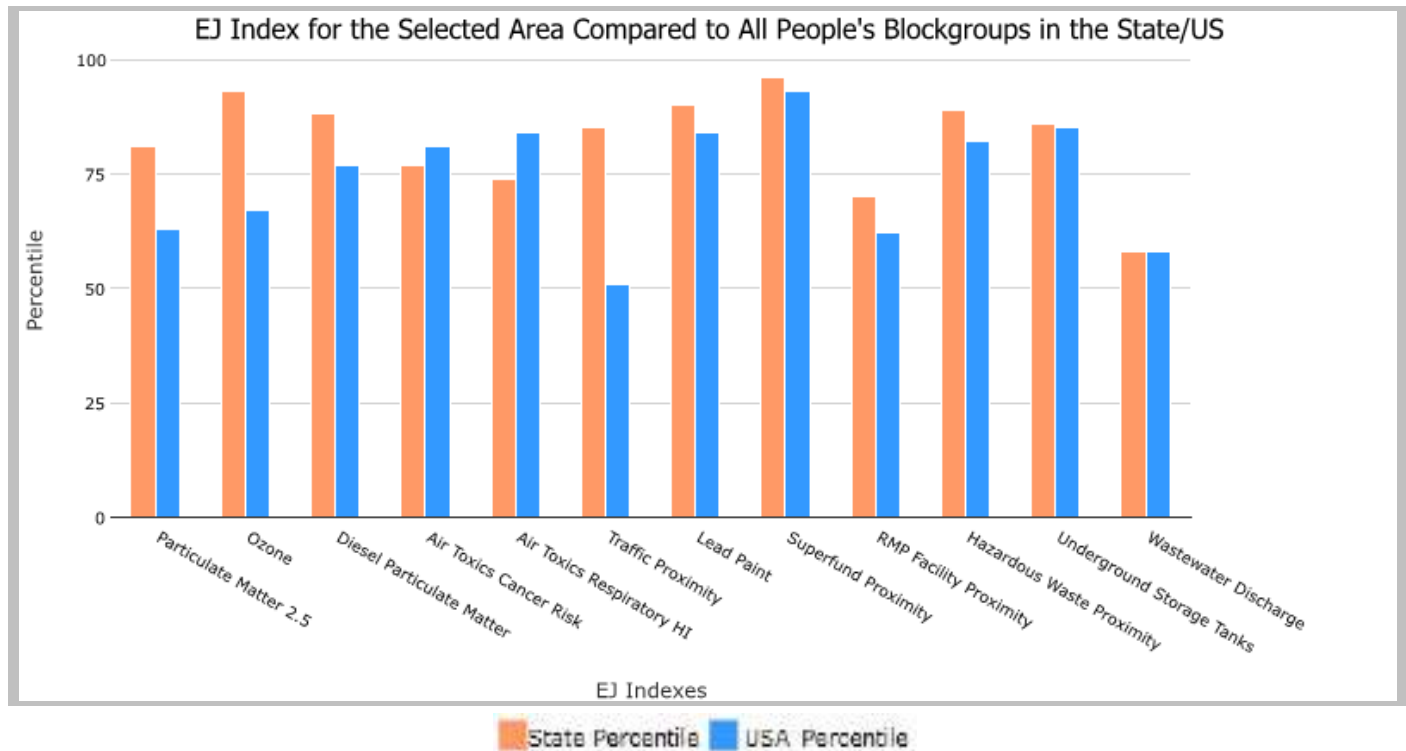
The following attachment is a summary report from EPA's EJScreen Tool. The summary includes multiple environmental justice components, and also includes demographics of the area. The third page of the report, under "socioeconomic indicators" includes a "low income" statistic, which was used as the LMI within the service area. Following guidance outlined in the application, the watershed boundary was deemed to be inappropriately large. Thus, the service area was defined using a quarter-mile buffer around the project and its drainage network to confluence with a larger river. The map of the service area is shown in the report.

0.25 miles Ring around the Corridor, SOUTH CAROLINA, EPA Region 4

Approximate Population: 1,786

Input Area (sq. miles): 0.91

Selected Variables	State Percentile	USA Percentile
Environmental Justice Indexes		
EJ Index for Particulate Matter 2.5	81	63
EJ Index for Ozone	93	67
EJ Index for Diesel Particulate Matter*	88	77
EJ Index for Air Toxics Cancer Risk*	77	81
EJ Index for Air Toxics Respiratory HI*	74	84
EJ Index for Traffic Proximity	85	51
EJ Index for Lead Paint	90	84
EJ Index for Superfund Proximity	96	93
EJ Index for RMP Facility Proximity	70	62
EJ Index for Hazardous Waste Proximity	89	82
EJ Index for Underground Storage Tanks	86	85
EJ Index for Wastewater Discharge	58	58

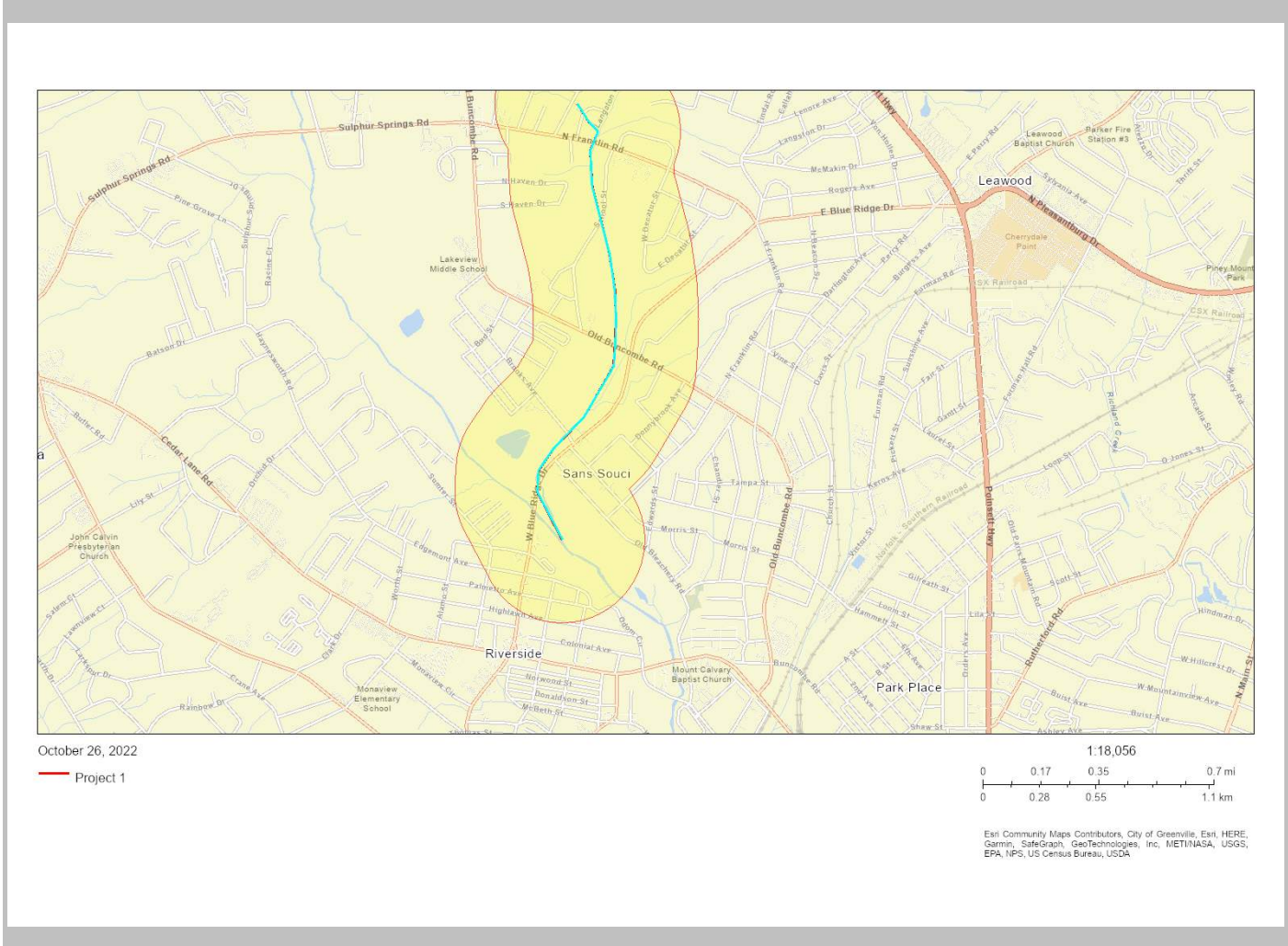


This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

0.25 miles Ring around the Corridor, SOUTH CAROLINA, EPA Region 4

Approximate Population: 1,786

Input Area (sq. miles): 0.91



Sites reporting to EPA	
Superfund NPL	1
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	0

EJScreen Report (Version 2.1)



0.25 miles Ring around the Corridor, SOUTH CAROLINA, EPA Region 4

Approximate Population: 1,786

Input Area (sq. miles): 0.91

Selected Variables	Value	State Avg.	%ile in State	USA Avg.	%ile in USA
Pollution and Sources					
Particulate Matter 2.5 ($\mu\text{g}/\text{m}^3$)	7.98	7.73	55	8.67	33
Ozone (ppb)	40.4	37.3	81	42.5	34
Diesel Particulate Matter* ($\mu\text{g}/\text{m}^3$)	0.274	0.207	74	0.294	50-60th
Air Toxics Cancer Risk* (lifetime risk per million)	30	31	84	28	80-90th
Air Toxics Respiratory HI*	0.4	0.42	75	0.36	80-90th
Traffic Proximity (daily traffic count/distance to road)	59	55	75	760	26
Lead Paint (% Pre-1960 Housing)	0.39	0.13	87	0.27	65
Superfund Proximity (site count/km distance)	1.1	0.091	99	0.13	98
RMP Facility Proximity (facility count/km distance)	0.18	0.47	42	0.77	33
Hazardous Waste Proximity (facility count/km distance)	1.7	1	79	2.2	67
Underground Storage Tanks (count/km ²)	6.7	2.9	85	3.9	82
Wastewater Discharge (toxicity-weighted concentration/m distance)	6.4E-05	1	32	12	28
Socioeconomic Indicators					
Demographic Index	55%	37%	78	35%	79
People of Color	51%	37%	69	40%	67
Low Income	60%	34%	84	30%	88
Unemployment Rate	6%	6%	66	5%	68
Limited English Speaking Households	8%	1%	95	5%	81
Less Than High School Education	28%	12%	90	12%	89
Under Age 5	9%	6%	82	6%	81
Over Age 64	10%	18%	20	16%	28

*Diesel particulate matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: <https://www.epa.gov/haps/air-toxics-data-update>.

For additional information, see: www.epa.gov/environmentaljustice

EJScreen is a screening tool for pre-decisional use only. It can help identify areas that may warrant additional consideration, analysis, or outreach. It does not provide a basis for decision-making, but it may help identify potential areas of EJ concern. Users should keep in mind that screening tools are subject to substantial uncertainty in their demographic and environmental data, particularly when looking at small geographic areas. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJScreen documentation for discussion of these issues before using reports. This screening tool does not provide data on every environmental impact and demographic factor that may be relevant to a particular location. EJScreen outputs should be supplemented with additional information and local knowledge before taking any action to address potential EJ concerns.

ATTACHMENT 5

Project Schedule

ATTACHMENT 6

Flood Map of the Immediate Area



ATTACHMENT 7

Supplemental Information on Stream Restoration

A Primer to Stream Restoration

Stream restoration is necessary in many streams because of changes in landcover in the watershed. This changes flood event frequency and duration. As the duration and magnitude of flooding increases, the stream begins to change to accommodate to its new normal. A common flood event in a pristine or unchanging stream will likely occur at the top of the bank, or the point where the water begins to spill into the floodplain. Oftentimes this event is called *bankfull* or *channel-forming event* and its essentially the large event that occurs frequently enough that it effectively sizes the channel. Many studies typically have this fall somewhere between a 0.5-year and 2-year recurrence interval, or twice a year to once every 2 years, respectively. In the stream reaches chosen much of the build-out in the watershed has already occurred. Since most of the development is old, peak flowrates were not attenuated and receiving streams bore the brunt of the hydrologic changes. This results in a series of changes outlined in the example below:

A stream is in a completely forested watershed. The bankfull event is 50 cfs. A shopping mall is added in the upper portion of the watershed. Without detention, the same frequency event results in a 200 cfs peak flow and the original 50 cfs flow occurs much more often.

These much higher flows bring much higher shear stress on the stream. With little time between events that previously saw 6 months or more between, the channel has little time to normalize or heal, and inevitably, the channel will progress through what is known as the Channel Evolution Model (originally popularized by Schumm, 1984). This model illustrates how a stream acclimates to these increases over time. In unconfined areas (like those not between hillslopes or utilities), the stream deepens (incises) and widens over time and eventually results in the establishment of a new floodplain bench or “quasi-equilibrium.” An adaptation of this model is shown below:

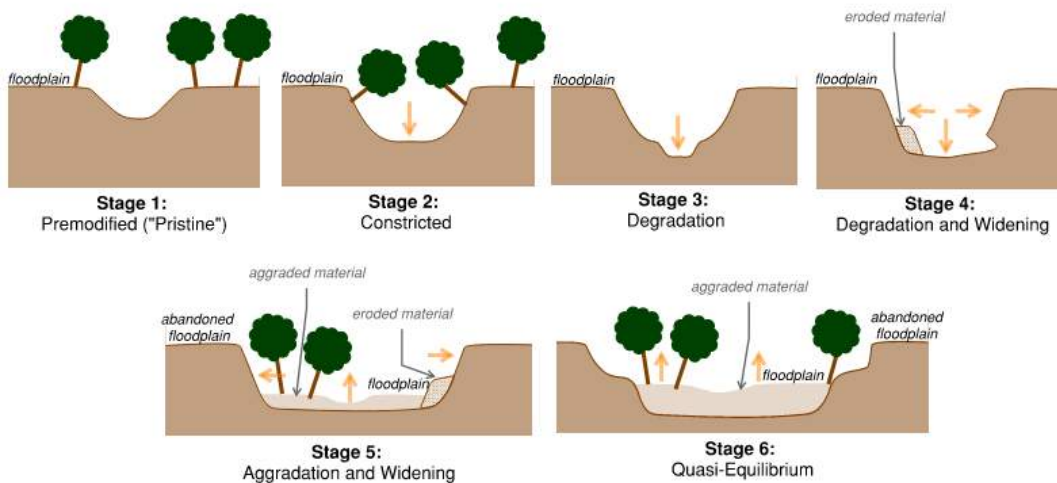


Figure A6.1 - Channel evolution model adapted from Simon and Rinaldi, 2006.

This process occurs longitudinally, like a wave moving downstream. This means as *degradation and widening* occurs somewhere upstream, *aggradation and widening* is occurring downstream. It also occurs in place, over time. A stream reach may be in Stage 3 today and Stage 6 ten years from now. Conversely, continued changes in the watershed could mean that a Stage 6 today is Stage 4 ten years from now. Further still, a stream can remain in a single stage for a long time or even indefinitely. Although this process occurs naturally in most streams, what occurs in an urban stream is a caricature version of its natural counterpart; the scale can be an order of magnitude higher. One of the primary goals of many stream restorations is to short-circuit this process or bypass it all together. The type of stream restoration, or *Priority*, demonstrates which stage of the Channel Evolution model the stream is being short-circuited to (or in some cases what condition is being frozen in time). Figure A6.2 demonstrates these concepts in greater detail.

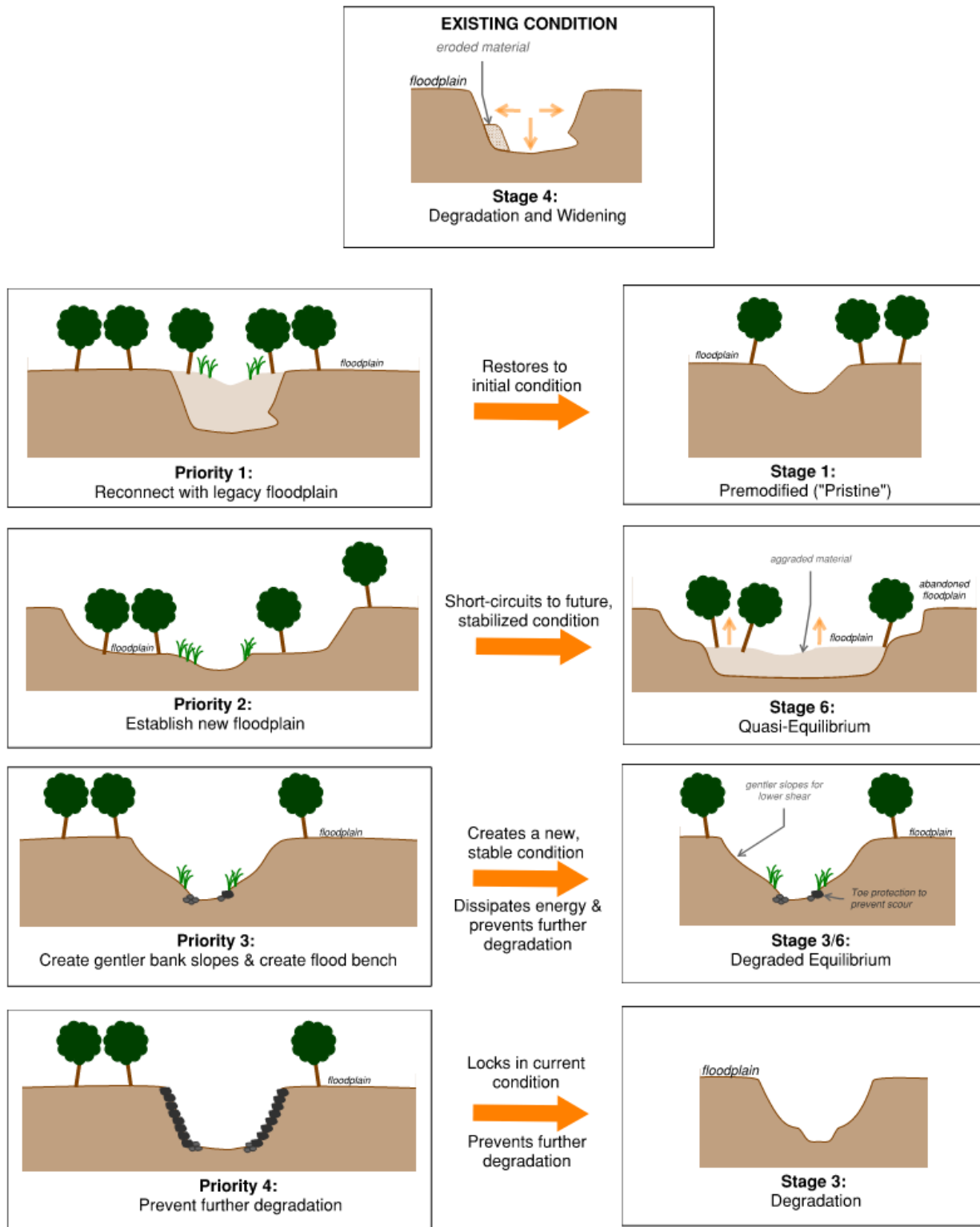


Figure A6.2 - Example of how stream restoration and Channel Evolution Model relate

Stage 4 illustrates the condition of most of the streams with proposed projects in this application and most of these restorations will be either Priority 2 or 3. These will be the most cost-effective strategy in reducing future pollutant inputs into the Reedy River from bank failures without increasing current flood-levels or passing momentum downstream (like armoring does). Effectively, the total cut shown in the cost estimation tables may have otherwise been a direct input to the Reedy River watershed over time. This amount is significant. For context, the total estimated cut proposed in just Projects 2 and 3 are enough to fill an Olympic swimming pool 30 times over. These pollutant-laden sediments will be removed from the flux of instream material, resulting in an immediate and prolonged decrease in pollutants in the to the Reedy River watershed.

Additionally, this same cut also increases stream capacity and storage and will likely reduce flooding in adjacent areas and potentially even downstream, through some of the most densely populated areas in the upstate.

If more detailed information is required for review, an excellent source is NC State's [*Stream Restoration: A Natural Channel Design Handbook*](#).

ATTACHMENT 8

FEMA Benefit-Cost Analysis Report



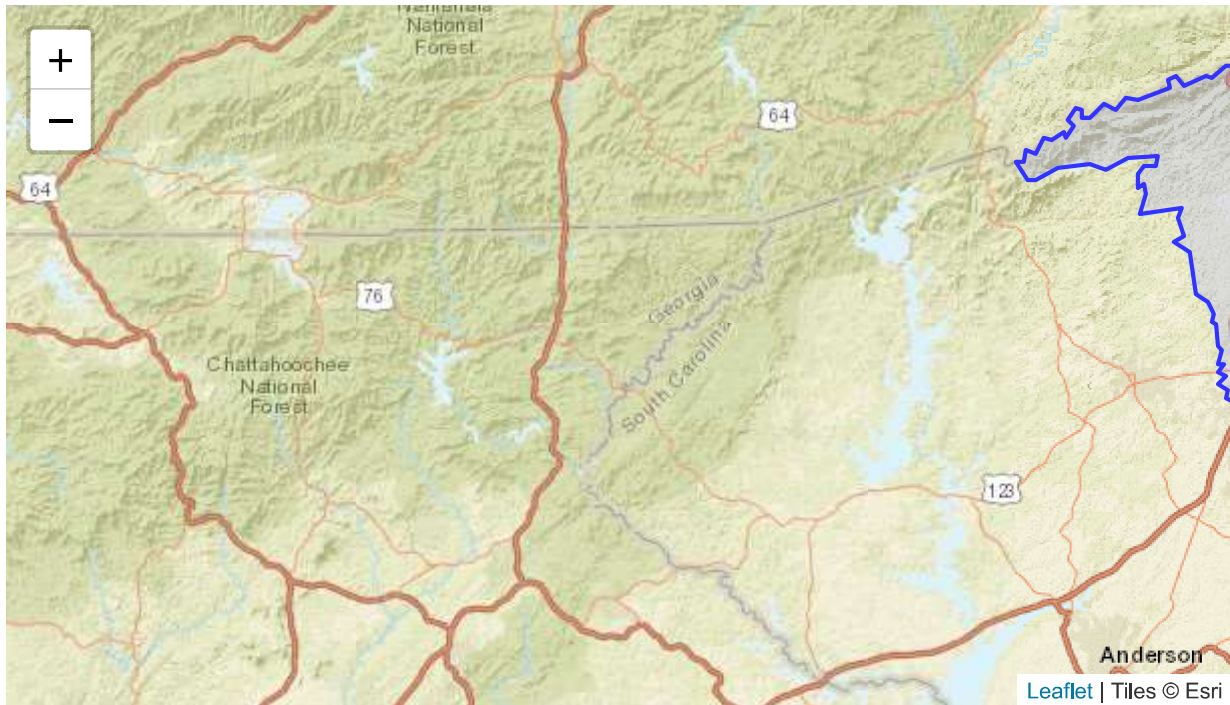
FEMA

Benefit-Cost Calculator

V.6.0 (Build 20221001.0249 | Release Notes)

Benefit-Cost Analysis

Project Name: North Chastain Stream Restoration and Riparian Area Reclamation



Map Marker	Mitigation Title	Property Type	Hazard	Benefits (B)	Costs (C)	BCR (B/C)
▲						
1	Floodplain and Stream Restoration @ N Chastain Dr, Greenville, South Carolina, 29617_copy		DFA - Riverine Flood	\$ 2,769,624	\$ 945,007	2.93
TOTAL (SELECTED)				\$ 2,769,624	\$ 945,007	2.93
TOTAL				\$ 2,769,624	\$ 945,007	2.93

Property Configuration

Property Title: Floodplain and Stream Restoration @ N Chastain Dr, Greenville, South Carolina, 29617_copy

Property Location: 29617, Greenville, South Carolina

Property Coordinates: 34.89393999096655, -82.42628001255275

Hazard Type: Riverine Flood

Mitigation Action Type: Floodplain and Stream Restoration

Property Type: Other

Analysis Method Type: Historical Damages

Cost Estimation

Floodplain and Stream Restoration @ N Chastain Dr, Greenville, South Carolina, 29617_copy

Project Useful Life (years): 30

Project Cost: \$820,917

Number of Maintenance Years: 30 Use Default:Yes

Annual Maintenance Cost: \$10,000

Damage Analysis Parameters - Damage Frequency Assessment

Floodplain and Stream Restoration @ N Chastain Dr, Greenville, South Carolina, 29617_copy

Year of Analysis was Conducted: 2022

Year Property was Built: 0

Analysis Duration: 10 Use Default:Yes

Historical Damages Before Mitigation

Floodplain and Stream Restoration @ N Chastain Dr, Greenville, South Carolina, 29617_copy

Damage Year	Recurrence Interval (years)	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL		
		Damages (\$)	Category 1 (\$)	Category 2 (\$)	Category 3 (\$)	Number of Volunteers	Number of Days	Damages (\$)	Current Dollars?	Inflated Damages (\$)
0	0	0	0	0	0	0	0	0	No	0

Annualized Damages Before Mitigation

Floodplain and Stream Restoration @ N Chastain Dr, Greenville, South Carolina, 29617_copy

Annualized Recurrence Interval (years)	Damages and Losses (\$)	Annualized Damages and Losses (\$)
	Sum Damages and Losses (\$)	Sum Annualized Damages and Losses (\$)
	0	0

Expected Damages After Mitigation
 Floodplain and Stream Restoration @ N Chastain Dr, Greenville, South Carolina, 29617_copy

Recurrence Interval (years)	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
	Damages (\$)	Category 1 (\$)	Category 2 (\$)	Category 3 (\$)	Number of Volunteers	Number of Days	Damages (\$)
0	0	0	0	0	0	0	0

Annualized Damages After Mitigation
 Floodplain and Stream Restoration @ N Chastain Dr, Greenville, South Carolina, 29617_copy

Annualized Recurrence Interval (years)	Damages and Losses (\$)	Annualized Damages and Losses (\$)
	Sum Damages and Losses (\$)	Sum Annualized Damages and Losses (\$)
	0	0

Standard Benefits - Ecosystem Services
 Floodplain and Stream Restoration @ N Chastain Dr, Greenville, South Carolina, 29617_copy

Total Project Area (acres):	6
Percentage of Urban Green Open Space:	0.00%
Percentage of Rural Green Open Space:	0.00%
Percentage of Riparian:	100.00%
Percentage of Coastal Wetlands:	0.00%
Percentage of Inland Wetlands:	0.00%
Percentage of Forests:	0.00%
Percentage of Coral Reefs:	0.00%
Percentage of Shellfish Reefs:	0.00%
Percentage of Beaches and Dunes:	0.00%
Expected Annual Ecosystem Services Benefits:	\$223,194

Benefits-Costs Summary
 Floodplain and Stream Restoration @ N Chastain Dr, Greenville, South Carolina, 29617_copy

Total Standard Mitigation Benefits:	\$2,769,624
Total Social Benefits:	\$0
Total Mitigation Project Benefits:	\$2,769,624
Total Mitigation Project Cost:	\$945,007
Benefit Cost Ratio - Standard:	2.93
Benefit Cost Ratio - Standard + Social:	2.93