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1.0 Introduction

S&ME, Inc. has prepared this Construction Best Management Practices Plan (CBMPP) for the Cecil Ashburn Drive and Sutton Road Widening project in Huntsville, Madison County, Alabama. CBMPPs are required by the Alabama Department of Environmental Management (ADEM) National Pollutant Discharge Elimination System (NPDES) Construction General Permit. A copy of the certified electronic Notice of Intent for coverage under General Permit ALR100000 is included in Appendix D. The plan was prepared in general accordance with the contract between the City of Huntsville and Littlejohn Engineering Associates, Resolution 15-183, dated March 12, 2015. Littlejohn Engineering Associates was acquired by S&ME in December of 2014. Contract Resolution 15-183 was formally assigned to S&ME on February 23, 2017.

The BMPs addressed in this plan include Erosion Control, Storm Water Management, Sediment Controls, and Good Housekeeping Practices. BMPs are discussed herein in terms of BMPs currently planned for the subject site and additional BMPs that can be employed to supplement or augment the currently planned BMPs.

S&ME utilized information from the following documents in preparing this plan:

- Project Plans prepared by S&ME, dated April 2, 2018

1.1 Project Information

The subject project consists of the widening of approximately 3.4 miles of Cecil Ashburn Drive and Sutton Road from Donegal Drive to L&A Drive in Huntsville, Madison County, Alabama. The widening project will expand the existing two-lane road to four 11-foot lanes with 8-foot paved shoulders. A portion of Old Big Cove Road, south of Sutton Road, will also be widened. The project includes the construction of additional lanes, turn lanes, shoulders, drainage swales and flumes, retaining walls, sidewalks, and associated storm sewer.

The ultimate receiving waters for the subject site are Aldridge Creek, the Flint River, and Big Cove Creek. The disturbed area is expected to total approximately 44 acres. Construction is expected to begin in May 2018 and end in December 2020.
1.2 Site Description

The subject site consists of approximately 3.4 miles of Cecil Ashburn Drive and Sutton Road in southeast Huntsville, Madison County, Alabama. The project starts at 34.66831° north latitude and -86.532778° west longitude and ends at 34.659973° north latitude and -86.489492° west longitude. See Appendix A for the Site Location Map.

The site is located along the south side of Huntsville Mountain and is currently a two-lane roadway connecting the Bailey Cove/Jones Valley area to the Hampton Cove area. The road name transitions from Cecil Ashburn Drive to Sutton Road at the intersection with Old Big Cove Road. Cecil Ashburn Drive intersects the Blevins Gap Nature Preserve between Stations 111+00 and Station 142+00.

The existing roadway consists of two 12-foot lanes with 8-foot paved shoulders. Concrete flumes and drainage swales border the existing road.

1.3 Receiving Waters

Storm water from approximately Station 51+00 to Sta. 66+00 (Outfalls 1 and 2) is generally directed south and west via existing storm sewer and natural conveyances to an unnamed tributary of Esslinger Cove Branch (Receiving Water 1).

Storm water from approximately Station 66+00 to Sta. 122+00 (Outfalls 3 to 11 and 23) is generally directed south and west via existing storm sewer and natural conveyances to Esslinger Cove Branch (Receiving Water 2). Esslinger Cove Branch is a tributary to Aldridge Creek, and storm water from the subject site enters Aldridge Creek approximately 1.22 miles southwest of the construction site.

Storm water from approximately Sta. 122+00 to Sta. 155+00 (Outfalls 12 to 16) is generally directed south and east via existing storm sewer and natural conveyances to an unnamed tributary of the Flint River (Receiving Water 3). Storm water from the subject site enters the Flint River approximately 2.98 miles southeast of the site boundary.

Storm water from approximately Sta. 155+00 to Sta. 181+00 (Outfalls 17, 18, 20, and 21) is generally directed south and east via existing storm sewer and overland flow to an unnamed tributary of Big Cove Creek (Receiving Water 4).

Storm water from approximately Sta. 181+00 and Sta. 192+00 (Outfall 19) is generally directed north and east via overland flow and existing storm sewer to a second unnamed tributary of Big Cove Creek (Receiving Water 5).

Storm water from approximately Station 192+00 to Station 215+00 (Outfall 22) is directed southeast via existing storm sewer to an unnamed tributary of Big Cove Creek (Receiving Water 6). Storm water from the proposed project enters Big Cove Creek approximately 0.83 mile from the east end of the project.

The Construction General Permit defines a Priority Construction Site as any site that discharges to a waterbody which is listed on the most recently EPA approved 303(d) list of impaired waters for turbidity, siltation, or
sedimentation, any waterbody for which a Total Maximum Daily Load (TMDL) has been finalized or approved by EPA for turbidity, siltation, or sedimentation, any waterbody assigned the Outstanding Alabama Water use classification in accordance with ADEM Admin. Coder. 335-6-10-.09, and any waterbody assigned a special designation in accordance with ADEM Admin. Coder. 335-6-10-.10.

Approximately 2.3 miles of the subject project lies within the Aldridge Creek watershed. A Total Maximum Daily Load was established for Aldridge Creek in 2002 due to low dissolved oxygen concentrations and organic enrichment; therefore, the subject site is considered a Priority Construction Site as defined by the Construction General Permit.
1.4 Contact Information / Responsible Parties

Owner:
City of Huntsville, Alabama
320 Fountain Circle
Huntsville, AL 35801
256-427-5300 (office)

Registered Responsible Official:
Tommy Battle, Jr., Mayor
City of Huntsville, Alabama
320 Fountain Circle
Huntsville, AL 35801
256-427-5300 (office)
contact@huntsvilleal.gov

Authorized Representative:
Kathy Martin, P.E., City Engineer
City of Huntsville, Alabama
320 Fountain Circle
Huntsville, AL 35801
256-427-5300 (office)
256-427-5325 (fax)
kathy.martin@huntsvilleal.gov

Operator:
Name: ____________________________
Company: __________________________
Address: ____________________________
Office: ______________________________
Fax: ________________________________
Cell: ________________________________
Email: ______________________________

Qualified Credentialed Professional (QCP):
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256-837-6931 (fax)
syeldell@smeinc.com

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Operational QCP:
Name: ____________________________
Company: __________________________
Address: ____________________________
Office: ______________________________
Fax: ________________________________
Cell: ________________________________
Email: ______________________________
2.0 Pre-Construction Planning

Pre-construction planning is essential for the effective implementation of a CBMPP. The following sections identify site characteristics, potential pollution sources, construction phasing, and other elements necessary for BMP implementation.

2.1 Proposed Construction Activities

The subject project consists of the widening of approximately 3.4 miles of Cecil Ashburn Drive and Sutton Road, as well as a portion of Old Big Cove Road south of Sutton Road. The widening project will expand the existing two-lane road to four 11-foot lanes with 8-foot paved shoulders. The project includes the construction of additional lanes, turn lanes, shoulders, drainage swales and flumes, retaining walls, sidewalks, and associated storm sewer. The disturbed area is expected to total approximately 44 acres. Construction is expected to begin in May 2018 and end in June 2020.

The following activities associated with construction are expected at the subject site:

- The washout of concrete trucks will take place on-site.
- Portable toilet facilities will be located on-site.
- Equipment washing is not planned to take place on-site.
- Equipment fueling and maintenance will take place on-site.
- Blasting will take place on portions of the site.
- Water may be used for dust control.

Should the scope of operations be altered, the CBMPP shall be revised prior to the onset of the potentially impacting activity.

2.2 Allowable Non-Storm Water Discharges

The Construction General Permit authorizes several non-storm water discharges, provided that effective pollution prevention measures are designed, installed, implemented, and maintained to minimize the discharge of pollutants. Non-storm water discharges resulting from the proposed construction will be managed by on-site BMPs.

The following table lists the allowable non-storm water discharges and indicates the non-storm water discharges currently expected at the subject site.
### Table 2-1 Allowable Non-Storm Water Discharges

<table>
<thead>
<tr>
<th>Cecil Ashburn Widening Between Donegal Road and L&amp;A Road</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Discharges from fire-fighting activities</td>
</tr>
<tr>
<td>☐ Fire hydrant flushings</td>
</tr>
<tr>
<td>☐ Waters used to wash vehicles where detergents are not used</td>
</tr>
<tr>
<td>✔ Water used to control dust</td>
</tr>
<tr>
<td>☐ Potable water including uncontaminated water line flushings not associated with hydrostatic testing</td>
</tr>
<tr>
<td>☐ Routine external building wash down associated with construction that does not use detergents</td>
</tr>
<tr>
<td>✔ Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used</td>
</tr>
<tr>
<td>☐ Uncontaminated air conditioning or compressor condensate associated with temporary office trailers and other similar buildings</td>
</tr>
<tr>
<td>✔ Uncontaminated ground water or spring water</td>
</tr>
<tr>
<td>☐ Foundation or footing drains where flows are not contaminated with process materials such as solvents</td>
</tr>
<tr>
<td>☐ Landscape irrigation</td>
</tr>
</tbody>
</table>

If necessary, this checklist will be updated by the Operational Qualified Credentialed Professional (QCP) or the Permittee as construction progresses. If additional non-storm water discharges are added, appropriate BMPs will be implemented.

### 2.3 Potential Sources of Pollution

Potential sources of sediment to storm water runoff include:

- Demolition activities
- Clearing activities
- Topsoil stripping
- Soil stockpiles
- Grading activities
- Excavation activities
- Vehicle tracking
Potential sources of pollutants other than sediment include:

- Demolition activities
- Materials storage
- Blasting
- Equipment breakdowns
- Concrete washout
- Portable toilets
- Paving

2.4 Existing Topography and Drainage Characteristics

As previously discussed, the existing roadway is located on the south slope of Huntsville Mountain. Steep slopes are present on both sides of the road, descending towards the road on the north side and sloping away from the road on the south side. Elevations at the subject site range from 635 to 1,195 feet above mean sea level.

Storm water is generally directed to the south via existing drainage swales, concrete flumes, and storm sewers. Runoff from the mountain slope above the road is directed to roadside swales or flumes, then piped under the existing road and discharged on the south side. Additional runoff is collected in swales along the south side of the existing road and discharged.

Storm water from approximately Station 51+00 to Sta. 66+00 is generally directed south and west via existing storm sewer and overland flow to an unnamed tributary of Esslinger Cove Branch (Receiving Water 1).

Storm water from approximately Station 66+00 to Sta. 122+00 is generally directed south and west via natural conveyances and existing storm sewer to Esslinger Cove Branch (Receiving Water 2). Esslinger Cove Branch is a tributary to Aldridge Creek, and storm water from the subject site enters Aldridge Creek approximately 1.22 miles southwest of the construction site.

Storm water from approximately Sta. 122+00 to Sta. 155+00 (Outfalls 12 to 15) is generally directed south and east via existing storm sewer and natural conveyances to an unnamed tributary of the Flint River (Receiving Water 3). Storm water from the subject site enters the Flint River approximately 2.98 miles southeast of the site boundary.

Storm water from approximately Sta. 155+00 to Sta. 181+00 (Outfalls 16, 17, 19, and 20) is generally directed south and east via existing storm sewer and overland flow to an unnamed tributary of Big Cove Creek (Receiving Water 4).

Storm water from approximately Sta. 181+00 and Sta. 192+00 (Outfall 18) is generally directed north and east via overland flow and existing storm sewer to a second unnamed tributary of Big Cove Creek (Receiving Water 5).

Storm water from approximately Station 192+00 to Station 158+00 (Outfall 21) is directed southeast via existing storm sewer to an unnamed tributary of Big Cove Creek (Receiving Water 6). Storm water from the proposed project enters Big Cove Creek approximately 0.83 mile from the east end of the project.
2.5 Existing Soils

Based on the USDA Web Soil Survey, the majority of the site is underlain by Rockland limestone. Other soil types in the project area are the Abernathy-Emory fine sandy loams, the Allen clay loam, Allen fine sandy loam, Allen stony fine sandy loam, Jefferson fine sandy loam, Muskingum (Gorgas) stony fine sandy loam, Ooltewah fine sandy loam, Stony rolling land with Talbott and Colbert soil materials, and Tyler very fine sandy loam.

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ac</td>
<td>Abernathy-Emory fine sandy loams, 0 to 2 percent slopes</td>
</tr>
<tr>
<td>Al</td>
<td>Allen clay loam, severely eroded, rolling</td>
</tr>
<tr>
<td>Am</td>
<td>Allen fine sandy loam, undulating</td>
</tr>
<tr>
<td>An</td>
<td>Allen fine sandy loam, eroded, undulating</td>
</tr>
<tr>
<td>Ar</td>
<td>Allen stony fine sandy loam, eroded, rolling</td>
</tr>
<tr>
<td>Jf</td>
<td>Jefferson fine sandy loam, eroded, undulating</td>
</tr>
<tr>
<td>Mv</td>
<td>Muskingum (Gorgas) stony fine sandy loam, 10 to 20 percent slopes, very stony</td>
</tr>
<tr>
<td>Oo</td>
<td>Ooltewah fine sandy loam</td>
</tr>
<tr>
<td>Rr</td>
<td>Rockland, limestone, hilly</td>
</tr>
<tr>
<td>Rs</td>
<td>Rockland, limestone, steep</td>
</tr>
<tr>
<td>Sv</td>
<td>Stony rolling land, Talbott, and Colbert soil materials</td>
</tr>
<tr>
<td>Ty</td>
<td>Tyler very fine sandy loam</td>
</tr>
</tbody>
</table>

The USDA soil maps and soil descriptions for the subject project are included in Appendix E.

2.6 Final Topography and Drainage

With the exception of the rock debris stockpile, the final topography for the proposed construction will generally match the existing grades. Rock debris from blasting will be stockpiled north of the existing North Alabama Land Trust entrance to be used as fill for proposed parking areas under a separate project.

All twenty of the existing outfalls will continue to discharge storm water from the project area. Two additional outfalls from the roadway (Outfalls 13 and 15) will be added during the course of the project. One outfall associated with the blasting debris stockpile will also be added (Outfall 23).
2.7 Precipitation

The average annual precipitation for the nearby Huntsville International Airport is approximately 54 inches per year. The two-year, 24-hour rainfall for the subject site is shown as 3.98 inches in NOAA Atlas 14, Volume 9.

2.8 NPDES Permitting Requirements

The electronic Notice of Intent (eNOI) for coverage under the NPDES Construction General Permit will be submitted to ADEM prior to initiating any disturbance at the subject site.

A copy of the submitted eNOI will be included in Appendix D. A copy of the letter granting coverage under the general permit and a copy of the permit will be included in Appendix C.

2.9 Planned Construction Phasing

2.9.1 Clearing

During the clearing phase, the existing vegetation within the proposed right-of-way will be removed. Debris from clearing activities will be removed from the site. Topsoil will be stockpiled off-site in a location selected by the Contractor.

Silt fences will be installed at the off-site stockpile area prior to the removal of topsoil. Following the completion of topsoil stripping, stockpiles will be covered or stabilized to prevent erosion.

2.9.2 Installation of BMPs

Planned BMPs will be installed immediately after clearing to minimize sedimentation. Planned BMPs are discussed in detail in Section 5.

The planned pre-construction activities shall include the installation of the following minimum BMPs:

1. Type A silt fencing will be installed in the locations shown in the Project Plans.
2. Inlet protection will be installed at existing curb and grate inlets, as shown in the Project Plans.
3. Sand bag ditch checks will be installed in the locations shown in the Project Plans.
4. Rock ditch checks will be installed in the locations shown in the Project Plans.
5. Wattle ditch checks will be installed in the locations shown in the Project Plans.
6. A visual and comprehensive inspection of installed BMPs will be conducted by the QCP or a qualified person under the supervision of the QCP prior to the start of construction activities.
2.9.3 Demolition

During the demolition phase, the existing guard rails, barriers, and pavement will be removed as noted in the Project Plans. Some of the demolition work may be conducted concurrently with the clearing phase, in order to provide access for equipment. Demolition debris will be removed from the site.

2.9.4 Grading

During the grading phase, the silt fencing and ditch checks will be monitored and repaired as necessary. BMPs to prevent sedimentation of existing inlets will be also maintained.

Blasting activities will be conducted at various locations between Station 76+00 and Station 165+00. Rock debris will be stockpiled north of the existing North Alabama Land Trust entrance to be used as fill for proposed parking areas. BMPs will be installed to prevent contamination of storm water with rock dust and to prevent tracking from equipment. Additional measures will be implemented during blasting to minimize the generation of dust.

2.9.5 Construction

During construction, the initial BMPs will be monitored and repaired as necessary. Care will be exercised to minimize the length of time soils will be exposed to storm water through prompt stabilization and restoration of completed areas.

As new drainage structures are constructed, BMPs will be installed to prevent siltation of the open pipes. Inlet protection will be installed at the locations identified in the Project Plans immediately following installation of the new storm sewer pipes.

The wattle drop inlet protection at inlets located in paved areas will be removed after base is placed. Inlets in areas where wattles cannot be stakes will be protected using sand bag inlet protection.

Temporary grassing will be established immediately on all exposed soils that will not be disturbed again for 13 days or more.

Where dewatering is necessary, dewatering bags will be used to prevent the discharge of sediment.

2.9.6 Post-Construction Activities

Post-construction activities involve the final stages of BMP implementation (including removal of temporary BMPs), restoration, seeding and mulching, and termination of the NPDES permit.

Once the construction phase of the project is completed, all disturbed soils will be permanently stabilized. Permanent grassing by seeding and mulching will be initiated immediately upon completion of final disturbance.

The rip rap pipe end treatments will remain in place as a permanent BMP. Prior to permit termination, the outlet protection will be inspected and repairs made, if needed.
3.0 Implementation

3.1 Facility Identification

The Construction General Permit requires that, prior to any regulated activity and until authorization is terminated, the following information be posted at an easily accessible location to adequately identify the project:

- Name of the Permittee;
- ADEM NPDES ALR, followed by the six digit NPDES authorization number;
- Facility or project name; and
- Other descriptive information deemed appropriate by the Permittee.

The facility identification will be repaired or replaced as necessary.

3.2 Inspections and Reporting

3.2.1 Pre-Construction Observation

Prior to the placement of any BMPs or the commencement of land-disturbing activities, a pre-construction site inspection will be conducted by the QCP or a person under the direct supervision of the QCP. The pre-construction inspection will include a visual observation of the proposed areas of land disturbance, areas that will be used for storage of construction materials, affected ditches and other storm water conveyances (if any), proposed outfalls, and proposed receiving waters. A record of the pre-construction observation, including dated photographic documentation of the observed areas, will be maintained in Appendix G.

3.2.2 Daily Observations

Each day that construction activity takes place at the project site, personnel designated by the Permittee will visually observe the portions of the project where active disturbance is occurring. Due to their location within the Blevins Gap Nature Preserve, BMPs installed at Outfalls 12, 13, 14, and 23 and the proposed blasting debris stockpile will be observed as part of each daily observation while disturbance or construction is occurring in the drainage area for the four outfalls.

Records of the daily observations will be maintained in Appendix F or an alternative location identified in Appendix F, and will include the name of the person conducting the daily inspection, the date and time, daily precipitation, and a list of noted deficiencies. An example Daily Observation Log is included in Appendix F, although an alternative log may be used.
3.2.3 **Comprehensive Inspections**

Complete and comprehensive BMP inspections of the entire permitted area will be performed by the QCP, a qualified person under the direct supervision of the QCP, or a QCI employed by the Permittee at a minimum of once per month, in accordance with the Construction General Permit.

Additional inspections will be performed following each 0.75-inch or greater rainfall that occurs within any 24-hour period. Inspections following a qualifying precipitation event must commence no later than 24 hours after resuming construction activities and must be completed within 5 days of the qualifying event. Depending on rain events, multiple comprehensive inspections may be performed each month.

The ADEM Construction Stormwater Inspection Report and BMP Certification (ADEM Form 23) is included in Appendix D. This form will be used for official reporting to ADEM in accordance with permit requirements. This form will be signed by the QCP and the registered responsible official or his authorized representative. Inspection reports will be maintained in Appendix G.

3.2.4 **CBMPP Evaluations**

The QCP will perform an on-site evaluation of the implemented erosion and sediment controls for adequacy and consistency with the CBMPP and with site conditions. The QCP inspection and CBMPP evaluation will be conducted a minimum of once every six months, or as often as necessary to correct poorly functioning or damaged erosion or sediment controls.

If, based on the CBMPP evaluation, the QCP identifies any needed modifications or additions to erosion and sediment controls, the CBMPP will be updated. Any amendments to the CBMPP will be recorded on the CBMP Plan Review and Evaluation Log in Appendix I.

3.2.5 **Corrective Actions**

Deficiencies noted during the required inspections will be recorded in Appendix H with any corrective action or mitigation needed to correct the deficiencies and a proposed compliance schedule. Unless otherwise specified by ADEM, poorly functioning erosion controls or sediment controls, non-compliant discharges, or any other deficiencies observed during the inspections shall be corrected within five (5) days of the inspection, unless prevented by unsafe weather conditions. If unsafe weather conditions are present, they should be documented.

Records of corrective actions will be maintained in Appendix H or in an alternative location identified in Appendix H. An example Corrective Actions Log is included in Appendix H, although an alternative log may be used.

3.3 **CBMPP Modifications**

If modifications or additions to erosion and sediment controls or other pollution prevention measures are required, the CBMPP will be updated. Any amendments to the CBMPP will be recorded on the CBMPP Review and Evaluation Log in Appendix I.
3.4 **Documentation**

Documentation will be maintained on-site and will be made available for examination. Records will be retained for a minimum period of at least 3 years after construction is complete.

The following is a list of records to be made available for inspectors to review:

- A copy of the certified electronic Notice of Intent (Appendix D)
- A copy of the letter from ADEM granting coverage under the Construction General Permit (Appendix C)
- Dates of BMP installation, construction activity, stabilization, and BMP removal (Appendix F)
- Inspection reports (Appendix G)
- Corrective actions log (Appendix H)
- Daily rainfall measurements for the site (Appendix F)
- Copy of the site CBMPP

The CBMPP, all inspection reports, rain/precipitation log, corrective action log, revision log, etc. shall be kept at the subject facility at all times while construction is ongoing.

3.5 **Termination of Permit**

The Construction General Permit will be terminated upon verification by the QCP that all regulated activities at the site have been completed, construction/industrial effects removed, solid waste/debris properly disposed, all disturbed areas have been fully reclaimed, suitably stabilized, or perennial vegetative cover established, and storm water discharges do not appear to represent a significant adverse impact to water quality. In accordance with the Construction General Permit, established vegetation will be considered final if 100% of the soil surface is uniformly covered in permanent vegetation with a density of 85% or greater.

The permit may also be terminated if the permittee no longer has operational control of the facility or legal responsibility for the site.

A blank copy of the Termination Request (ADEM Form 21) is included in Appendix D.

4.0 **BMP Objectives**

BMPs are implemented to decrease sedimentation and erosion and to reduce impacts caused by runoff and storm water. This is generally accomplished by (a) protecting existing vegetation, (b) protecting exposed surfaces, (c) trapping sediment, and (d) controlling runoff and storm water.
4.1 Protecting Existing Vegetation

Vegetation dissipates the energy of rain and slows the movement of runoff water, while roots and organic matter hold soil in place. Vegetation tends to increase water movement through the soil, thus reducing runoff.

The following BMPs will be implemented to protect existing vegetation at the subject construction site:

- Selective clearing
- Rock ditch checks
- Rip-rap outlet protection

4.2 Protecting Exposed Surfaces

Exposed surfaces such as soil or gravel are vulnerable to erosion due to storm water or wind. The subject site is expected to experience sheet flow and concentrated flow due to rainfall, as well as intermittent concentrated flow due to excavation dewatering. Steep slopes are located on either side of the project area for much of the alignment.

The following BMPs will be implemented to protect exposed surfaces from flowing water at the subject construction site:

- Temporary seeding
- Sediment barriers
- Wattle ditch checks
- Sand bag ditch checks
- Rock ditch checks
- Dewatering bags

4.3 Trapping Sediment

Sedimentation occurs when fine soil and other particles are carried by wind and water and are deposited in another location. Sediment in waterbodies can adversely affect water quality, stream flows, and aquatic habitat.

The following BMPs will be implemented to trap sediment at the subject construction site:

- Construction entrance/exit
- Type A silt fence
- Inlet protection
- Wattle ditch checks
- Sand bag ditch checks
- Dewatering bags

Specific maintenance requirements, including sediment removal, are discussed in Section 5 for each planned BMP.
4.4 Controlling Storm Water Flows

The primary purpose of storm water management BMPs is to reduce and/or control the flow volumes and peak flow rates for storm water as it leaves the site, thereby reducing downstream erosion and the transport of pollutants.

The following BMPs will be implemented to control storm water flows from the proposed construction:

- Wattle ditch checks
- Sand bag ditch checks
- Rock ditch checks
- Rip-rap outlet protection
- Dewatering Bags

5.0 Planned Sediment and Erosion Control BMPs

The BMPs currently planned for the subject project during active construction include a temporary construction entrance/exit pad, silt fences, filter fabric inlet protection, rip-rap outlet protection, temporary seeding, and permanent seeding.

5.1 Protect Existing Vegetation

The best and most cost effective protection against soil erosion is well-established vegetative cover. Vegetation dissipates the energy of the rain and increases water infiltration into the soil, thus reducing runoff. Roots and organic matter hold the soil in place.

Groundcover at the site prior to construction consists primarily of the existing roadway, bordered by grass and trees. To reduce the amount of soil exposed for erosion, existing vegetation will be cleared only as necessary, and only in areas undergoing active disturbance.

5.2 Temporary Seeding

After the soil has been exposed, the following steps will be taken to stabilize the soil, control erosion, and reduce sediment and runoff to downstream areas.

- Immediate cover will be provided by grass or mulch on any land stripped of vegetation and not under construction for longer than 13 days, including stockpiles.

- Seeding selection for temporary cover will be determined as shown in Table TS-1 in the Alabama Handbook. The seed mix will be selected by planting date for North Alabama. Seed mixtures will be free of noxious weeds. A copy of Table TS-1 is included in Appendix B.

- Temporary seedings will be mulched. Mulch adhesives will not be asphalt-based. Areas subjected to concentrated flow may require an appropriate erosion control blanket.
5.3 Temporary Construction Entrance/Exit

Stabilized construction entrances and exits are installed to reduce the amount of soil tracked off the construction site by vehicles leaving the site and to reduce erosion and rutting on the portion of the site where the pads are installed.

A gravel construction entrance/exit pad will be constructed at the off-site staging area prior to the commencement of grading activities. Construction exits will also be installed where construction vehicles will enter and exit disturbed areas onto Cecil Ashburn, where possible. Due to the limited space available at the subject site, construction exits may not be feasible in some areas.

Installation considerations include the following:

- Gravel construction entrance/exits will be installed at all locations where construction traffic will be entering and exiting the site.
- The construction entrance/exit pad will be underlain by non-woven geotextile (Mirafi 550X or approved equivalent).
- The stone for the construction entrance/exit pad will meet the specifications for ASTM D448 Coarse Aggregate Gradation No. 1.
- In no case will any construction entrance/exit be less than 12 inches in depth.
- Width will not be less than 15 feet and will be wide enough so that the largest construction vehicle will fit with room to spare.
- Length will not be less than 50 feet.

**CONSTRUCTION ENTRANCE/EXIT PAD MAINTENANCE**

- Construction entrance/exit will be inspected weekly and after storm events or heavy use.
- Construction entrance/exit will be maintained in a condition that will prevent tracking or flow of mud onto pavement.
- Mud and debris tracked onto roadways will be removed immediately by scraping. Mud will not be washed off of roadways.
- The construction entrance/exit will be periodically dressed with stone as needed.

Installation details are provided on ALDOT Drawing ESC-502 in Appendix A.
5.4  **Silt Fencing**

As shown on the Project Plans, wire-backed Type A silt fencing will be installed along the south side of the project area to prevent off-site sedimentation.

Silt fencing will also be installed upgradient and downgradient of any stockpile locations, prior to the commencement of grading activities. The silt fencing is intended to divert flow from contacting the stockpiles and to contain eroded soils.

Installation details are provided on **ALDOT Drawing ESC-200-4** in Appendix A. Recommendations for installing silt fences are as follows:

- Silt fences are limited to situations in which only sheet flow or overland flow is expected, and will not be used in areas of concentrated flow.
- Posts will be a minimum of 5 feet long and will be driven a minimum of 2 feet into the ground.
- Posts will be spaced a maximum of 10 feet apart.
- Woven wire mesh will be attached to the upslope side of the posts. The wire fencing should be a minimum 14-gage with a maximum mesh spacing of 6 inches. The bottom 6 inches of wire fence must be placed in the trench.
- Joints in the wire mesh will overlap at least 2 feet.
- The filter fabric will be trenched in at the bottom to prevent runoff from undermining the fence. Type A silt fences require a trench a minimum of 6 inches deep.
- Filter fabric will be attached to the upslope side of the fence posts. A minimum of 24 inches of fabric will remain above ground and a minimum 6 inches of fabric will be embedded in the trench.
- Joints between two sections of silt fence will be overlapped at least 1 foot.
- Silt fencing will be properly installed in a manner consistent with the manufacturer’s recommendations.

**SILT FENCE MAINTENANCE**

- Inspect silt fencing at least once per week and after each significant rain event.
- Remove sediment when it reaches one-third of the fence height in depth.
- Removed sediment will be placed in a level area on-site, out of the path of storm water flows. Temporary or permanent stabilization will be initiated immediately if the sediment is not placed in an active construction area.
• Promptly repair or replace silt fencing damaged during rain events or construction activities.

5.5 Straw Wattle Ditch Checks

Straw wattles are tubes of straw used for erosion control, sediment control, and stormwater runoff control. Wattles may be used on slopes or in flat areas, behind curbs, or as inlet protection in place of straw bales. Straw wattle ditch checks are utilized to reduce flow velocities in concentrated flow areas where the flow rate does not exceed 1.0 cubic feet per second.

Straw wattle ditch checks will be installed in the ditches along Old Big Cove Road and in the ditches north and south of Sutton Road, as noted on the Project Plans.

Installation details are provided on ALDOT Drawing ESC-300-4 in Appendix A. Installation considerations include the following:

• Wattles will be installed so the center is lower than the ends.

• The ends of the ditch check must extend to the top of the ditch to prevent storm water from flowing around the wattles.

• The wattles will be staked securely to the ground to ensure their stability, as shown on the installation detail.

• The stakes will be driven a minimum of 12 inches into the ground, with a minimum of two stakes placed on the upstream side of the wattle.

• The stakes should only penetrate the netting and should not be driven through the wattle.

Where wattle ditch checks are planned for placement on exposed soils, the ditch checks shall have a geotextile underlayment, in accordance with ALDOT Special Provision No. 12-0399(2), Section 665.02(j). The geotextile will be placed across the ditch, with the ends higher than the flowline. The geotextile will be stapled on the upstream and downstream edges, with the staples placed 10 inches on center. Staples will also be placed 18 inches on center along the channel edges and down the center of the channel. A geotextile underlayment is not required where ditches are otherwise lined with sod, established permanent vegetation, or an erosion control product.

STRAW WATTLE DITCH CHECK MAINTENANCE

• Wattle ditch checks will be inspected after rain events for displacement or erosion around the ends of the dam.

• The ditch will be inspected after each significant rainfall event. If erosion exceeds expectations, another check may be added.

• Sediment will be removed when it reaches a depth of 50% of the original wattle height.
• Removed sediment will be placed in a level area on-site, out of the path of storm water flows. Temporary or permanent stabilization will be initiated immediately if the sediment is not placed in an active construction area.

• If underlayment was used, the geotextile will be inspected for signs of undermining.

5.6 Sand Bag Ditch Check
Sand bag ditch checks are small barriers constructed of stacked sand bags. They are intended for use in paved ditches or ditches with rocky bottoms. Sand bag ditch checks are planned for the swales along Cecile Ashburn Drive. Installation details are provided on ALDOT Drawing ESC-300-3 in Appendix A. Installation considerations include the following:

• Bags may be cotton, burlap, woven polypropylene, polyethylene, polyamide fabric, or other material that will adequately confine the aggregate content for the duration of the use of the bag.

• Bags shall be filled with sand, limestone screenings, or aggregate that is smaller than ALDOT #78.

• Each filled bag shall have minimum dimensions of 18 inches long, 12 inches wide, and 3 inches high.

• Each filled bag shall have a minimum weight of 30 pounds.

• The ends of the ditch check must extend to the top of the ditch to prevent storm water from flowing around the ditch check.

• The ditch check will be constructed by placing two bags side by side, perpendicular to the expected flow.

• The second layer of sand bags will be placed on top of the previous row, with the bags positioned parallel to the expected flow.

• The third layer of sand bags will be placed on top of the second layer, with the bags oriented perpendicular to the expected flow.

• The center of the ditch check will be reinforced on the downgradient side by stacking additional sand bags across the full width of the ditch, as shown on ALDOT Drawing ESC-300-3.

SAND BAG DITCH CHECK MAINTENANCE

• Inspect ditch checks at least once per week and after each significant rain event for signs of displacement or deterioration.

• Remove sediment when it reaches one-third of the ditch check height in depth.
• Removed sediment will be placed in a level area on-site, out of the path of storm water flows. Temporary or permanent stabilization will be initiated immediately if the sediment is not placed in an active construction area.

5.7 Rock Ditch Checks

A rock ditch check is a small barrier constructed across an area of concentrated flow for the purpose of reducing channel erosion. Rock ditch checks are not intended to function as sediment traps; instead, they reduce the velocity of channel flow.

Rock ditch checks will be installed in areas where high velocity concentrated flow is anticipated, as shown in the locations noted in the Project Plans.

Installation details are provided on ALDOT Drawing ESC-300-6 in Appendix A. Installation considerations include the following:

• Geotextile will be placed under the entire width of rock and will extend 3 feet beyond the toe of the slope on the upstream and downstream sides.

• The ditch check will extend across the width of the ditch, with the center of the dam located a minimum of 1 foot lower than the ends.

• Ditch checks will be between 1 and 3 feet in height at the spillway, with a minimum top width of 2 feet and 3:1 slopes.

ROCK DITCH CHECK MAINTENANCE

• Inspect ditch checks after each rainfall event. Check for rock displacement and erosion of the channel or abutments.

• Sediment deposits will be removed when the level of deposition reaches approximately 50% of the height of the ditch check.

• Removed sediment will be placed in a level area on-site, out of the path of storm water flows. Temporary or permanent stabilization will be initiated immediately if the sediment is not placed in an active construction area.

• The geotextile underlayment will be inspected for signs of undermining.

5.8 Storm Drain Inlet Protection

Storm sewers that are operational during construction activities can convey large amounts of sediment offsite. Storm drain inlet protection is intended to filter sediment from storm water flow and to slow the runoff to encourage settlement of suspended particles prior to entering storm water inlets. This BMP is intended to prevent...
sediment from entering inlet structures, as well as serving to prevent the silting-in of inlets, storm drainage systems, or receiving channels.

5.8.1 **Straw Wattle Inlet Protection**

Straw wattles are planned for inlets surrounded by soil. Installation considerations include the following:

- Straw wattles used for inlet protection must be secured using wooden stakes driven a minimum of 12 inches into the ground.
- The stakes should only penetrate the netting and should not be driven through the wattle.
- Sections shall be abutted firmly to ensure no gaps remain where runoff could bypass the wattle.

Installation details are provided on **ALDOT Drawing ESC-400-3** in Appendix A.

5.8.2 **Sand Bag Inlet Protection**

Sand bag inlet protection will be used on base or pavement where wattles cannot be staked in place. Installation considerations include the following:

- Sand bags will have minimum dimensions of 18 inches long, 12 inches wide, and 3 inches high, and will have a minimum weight of 30 pounds.
- Sand bags will be placed around drop inlets so that the inner diameter of the completed barrier is a minimum of 8 feet.
- Sand bags will be placed 3 bags high, with the bags staggered so no gaps are evident.

Installation details are provided on **ALDOT Drawing ESC-400-5** in Appendix A.

**INLET PROTECTION MAINTENANCE**

- Inlet protection structures will be inspected regularly for signs of sedimentation and damage caused by rain events and/or construction activities.
- Storm pipes and inlets will be inspected regularly for evidence of siltation.
- Sediment will be removed when sediment storage capacity is reduced by 50%.
- Removed sediment will be placed in a level area on-site, out of the path of storm water flows. Temporary or permanent stabilization will be initiated immediately if the sediment is not placed in an active construction area.
• Repairs to inlet protection structures and silt removal from around these structures will be made promptly.

5.9 Outlet Protection

Outlet protection reduces the speed of concentrated storm water flows and therefore reduces erosion or scouring at storm water outlets. As shown on the Project Plans, outlet protection is currently planned for six drainage structures (5C, 72, 82, 97, 112, and 114). The outlet protection will be installed immediately following installation of the storm sewer pipes, but will remain as a permanent BMP following the completion of the project.

Recommendations for installing outlet protection are as follows:

• Grade the slope at the outlet smooth. The slope should be 2:1 or flatter.

• Provide an 18-inch keyway at the end of the slope so the final stone surface is level with the ground surface.

• Install filter fabric as a separator between the stone and the soil subgrade.
  ♦ The filter fabric must be a non-woven fabric equivalent to Mirafi 180N or BP Amoco 4553.
  ♦ The filter fabric must be properly protected from puncturing or tearing during installation.
  ♦ Repair any damage to the fabric by removing the riprap and placing another piece of filter cloth over the damaged area. If the damage is extensive, replace the entire geotextile fabric.
  ♦ All connecting joints should overlap a minimum of 1.5 feet with the upstream edge over the downstream edge.

• Install Class 2 rip-rap over the filter fabric. The final stone depth and apron length varies for each location. Riprap may be placed by equipment. Care should be taken to avoid damaging the filter fabric during rip-rap installation.

Dimensions for the planned outlet protection are included on Sheets 91 to 91Z of the Project Plans. Installation details from the Alabama Handbook are also provided in Appendix B.

OUTLET PROTECTION MAINTENANCE

• Rip-rap outlet protection will be inspected following heavy rains for signs of erosion and damage caused by storm water flow and/or construction activities.

• The outlet protection will be inspected regularly for evidence of siltation.

• If siltation is noted, the source of the sediment will be identified and BMPs will be installed to prevent additional sedimentation.

• Repairs to the outlet protection and silt removal from the rip-rap will be made promptly.
5.10 Dewatering Bags

Water discharged from excavations typically contains large amounts of sediment. In the event excavations on-site require dewatering, dewatering bags will be utilized to remove sediment from the water prior to discharge. **Discharges from the dewatering of trenches and excavations are prohibited, unless managed by appropriate controls.**

Dewatering bags are square or rectangular bags made of non-woven geotextile fabric that are attached to the discharge hose of a pump to collect sand, silt, and fines. Installation considerations include the following:

- Dewatering bags will be placed on a stabilized surface as far from ditches and inlets as is practical. Discharge from the bags will not be allowed to flow over disturbed soils.
- Dewatering bags will not be installed on steeply sloped surfaces.
- Only one pipe will discharge to each bag.
- Dewatering bags will be properly installed and consistent with the manufacturer’s recommendations.

**DEWATERING BAG MAINTENANCE**

- Dewatering bags will be inspected regularly for flow conditions, bag condition, and bag capacity.
- Dewatering bags will be replaced when it no longer filters sediment or passes water at a reasonable rate.
- Used dewatering bags will be disposed of properly off-site.

6.0 Additional BMPs

The need for additional BMPs may occur as the construction project advances. Additional BMPs may also be required by ADEM or recommended by the Operational Qualified Credentialed Professional if the planned BMPs appear to be ineffective. Some of these additional BMPs are discussed below.

6.1 Erosion Control Blankets

ECBs aid in controlling erosion where the erosion hazard is high and plant growth will be too slow to provide protective cover. ECBs may be temporary or permanent, and must be selected based on slope gradient, length of slope, soil conditions, expected flows, and anticipated duration of activities. Temporary ECBs will deteriorate in a short period of time and are intended to provide protection of soil and seed from runoff; permanent ECBs are intended to provide anchorage for vegetative growth.

Temporary Type C2 and Type C4 ECBs are planned for the ditches along the proposed access and connector roads, as indicated on Sheet 2B of the Project Plans.
Temporary ECBs will be secured using U-shaped staples. The staples will be of sufficient thickness to secure the ECB without excessive distortion.

Installation details are provided on ALDOT Drawing ESC-509 in Appendix A. Additional installation guidelines include, but are not limited to:

- The legs of the staples will be at least 6 inches long with a crown of 1 inch.
- The upslope end of the ECB strips shall be embedded a minimum of 6 inches.
- ECB strips shall overlap at least 3 inches.
- The ends of strips shall overlap at least 6 inches, with the upgradient section on top.
- The ECBs shall be spread smoothly, and shall be in contact with the soil at all points. The ECB will not be stretched tight.
- Where the manufacturer’s installation guidelines differ from these recommendations, the Contractor will follow the more stringent of the two.

**EROSION CONTROL BLANKET MAINTENANCE**

- Inspect ECBs after each storm event until vegetation is established.
- Check for movement of the ECB.
- Check for runoff flowing under the ECB.
- If erosion is observed, pull back the ECB, add tamped soil, reseed, and re-secure the blanket.

If the QCP determines that ECBs are needed at the subject site, the CBMPP will be modified to include specifications and installation diagrams for the selected practices.

### 7.0 Post-Construction BMPs

#### 7.1 Permanent Vegetation

Final stabilization will be initiated immediately upon completion of earth-disturbing activities. Final stabilization will be accomplished by paving or by seeding the disturbed soils with perennial, permanent vegetation. Seeding selection for permanent cover will be determined in accordance with Table PS-1 in the Alabama Handbook. The seed mix will be selected by planting date for North Alabama. Seed mixtures will be free of noxious weeds. A copy of Table PS-1 is included in Appendix B.
Established vegetation will be considered final if 100% of the soil surface is uniformly covered in permanent vegetation with a density of 85% or greater.

7.2 **Rip-Rap Outlet Protection**

The outlet protection installed during construction will remain in place following the completion of the project. Prior to termination of the permit, the outlet protection will be inspected for damage or sedimentation. Repairs to the outlet protection and/or sediment removal will be conducted prior to submittal of the Termination Request.

8.0 **Good Housekeeping and General Facility BMPs**

Good Housekeeping BMPs will reduce the movement of potential pollutants other than sediments. These pollutants that are carried with storm water may eventually reach downstream bodies of water. Materials such as petroleum products are difficult to control once they are present in runoff water. The best practical control option available is to prevent these pollutants from reaching runoff waters through the use of proper material handling and storage practices.

- Construction equipment will be regularly checked to confirm it is in proper working and operational order.
- Work areas and traffic routes will be kept clear of obstructions to reduce the potential for accidental spills and to facilitate site inspections.
- **Washing of concrete truck chutes, tools, mixers, and the backs of concrete trucks will take place on-site.** A lined washout pit will be constructed as discussed in Section 8.1. Washout water will not be allowed to enter a waterbody or to infiltrate into the soil.
- **Portable toilet facilities will be located on-site.** To prevent contamination of storm water with sanitary wastewater or disinfectant chemicals, BMPs will be implemented as discussed in Section 8.2.
- **No equipment washing is currently planned to take place on-site.** Should equipment washing be conducted, it will only be undertaken in specific locations where rinsate can be collected and properly discharged. These locations will be selected in advance and noted on the site civil plans and the CBMPP will be updated to include best practices for washing operations.
- **Equipment fueling or maintenance will take place on-site.** To prevent contamination of storm water with petroleum products, BMPs will be implemented as discussed in Section 8.3.
- **Blasting activities will take place on-site.** To prevent contamination of storm water with blasting debris, BMPs will be implemented as discussed in Section 8.4.
- Miscellaneous waste (i.e., litter, garbage, etc.) will be collected at a central location and be properly disposed. The site will be routinely “policed” to prevent blowing litter and deposition off-site upon adjacent properties or waters of the state.
8.1 Concrete Washout Pit

Concrete washout water is a caustic and corrosive slurry containing toxic metals. The pH of concrete washout is typically around 12, while the allowable pH range for freshwater is between 6.0 and 8.5. Part I.C.3 of the Construction General Permit specifically prohibits the discharge of concrete washout unless managed by an appropriate control.

The best management practice objectives for concrete washout are to collect and retain all the concrete washout water and solids to prevent the mixture from reaching the soil surface and migrating to surface waters or into the ground water, and to recycle the collected concrete washout water and solids.

The washing of concrete truck chutes, tools, mixers, and the rear of concrete trucks will take place on-site. S&ME recommends that the project utilize an above-grade washout pit. The pit must be sized to contain the expected washout volume and must include sufficient freeboard to accommodate storm water. The pit will be constructed of straw bales staked in place with a double lining of plastic at least 10-mil thickness and free of any holes or tears. The on-site washout of concrete truck drums is prohibited.

An installation diagram is included in Appendix A. Installation considerations include the following:

- Washout facilities will be installed in locations that provide convenient access to concrete trucks, preferably near the area where concrete is being poured. On large sites with extensive concrete work, washouts should be placed at multiple locations for ease of use.
- Washout areas will not be placed within 50 feet of storm drains, open ditches, or waterbodies.
- If the washout facility is not within view from the pour location, signage will be installed to direct the truck drivers.

**WASHOUT PIT MAINTENANCE**

- The washout pit lining will be inspected regularly for holes or leaks.
- The area surrounding the washout pit will be inspected regularly for signs of leakage.
- The washout pit will be emptied when it reaches 75% of capacity. The water will be allowed to evaporate and the solids will be broken up and removed for disposal in a landfill.
- If the lining is damaged during cleanout, it will be replaced prior to subsequent use.


8.2  Portable Toilet Facilities

Portable toilet facilities are currently planned for the subject site. Portable toilets have the potential to contribute pollutants such as bacteria, disinfectants, organics matter, and suspended solids. BMPs for portable toilets include the following:

- Portable toilets will be placed a minimum of 20 feet away from the nearest downslope storm drain inlet and a minimum of 10 feet from the curb and gutter, not within a paved street or other impervious area.
- Portable toilets will be placed on a level ground surface with clear access to the unit.
- If portable toilets cannot be placed at a safe distance from the downslope storm drain inlet or curb, a sand bag berm will be constructed around the portable toilet unit for spill and leak containment.
- If unit placement is for longer than one week and if the unit is vulnerable to tipping from wind exposure or vandalism, portable toilets will be secured through staking or cabling.
- Owner identification and contact information will be displayed in a prominent place on each unit.

**PORTABLE TOILET MAINTENANCE**

- Inspect portable toilets for leaks daily.
- Have the units serviced and sanitized at time intervals that will maintain sanitary conditions of each toilet.
- Only a licensed waste collector will service on-site portable toilets.
- Suppliers should carry bleach for disinfection in the event of a spill or leak.
- Properly store (cover) and handle chemical materials.
- Do not dump portable toilet contents into storm drains or water bodies.

8.3  Equipment Fueling and Maintenance

Equipment fueling and maintenance activities will be conducted on-site. Fueling operations have the potential to contribute pollutants to storm water through spills and leaks from fueling equipment or tanks. Equipment maintenance may contribute pollutants through mishandling of used oil, antifreeze, grease, or fuel.

Secondary containment for fueling operations will be provided by active measures. The following equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of storm water:

- A designated fueling area will be established at least 50 feet from downstream drainage facilities and watercourses. Fueling will be performed on level-grade areas.
Equipment will be transported to the fueling area. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.

Drip pans or absorbent pads will be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated, bermed fueling area.

Nozzles used in vehicle and equipment fueling will be equipped with an automatic shutoff to control drips.

Fueling operations will not be left unattended.

Absorbent spill cleanup materials and spill kits will be available in fueling areas and on fueling trucks, and will be disposed of properly after use. Use absorbent materials for small spills. Do not hose down or bury the spill. Remove the absorbent materials promptly and dispose of properly.

Vehicles and equipment will be inspected each day of use for leaks. Leaks will be repaired immediately or problem vehicles or equipment will be removed from the project site.

Spills of **25 gallons or more** must be reported to the ADEM (334-271-7700) and the National Response Center (800-424-8802). ADEM also requires that any release of oil that reaches water be reported. Notification should include the following information:

1. Name, address, and telephone number of person reporting the spill
2. Name and address of the facility
3. Date and time of the incident
4. Location of the incident
5. Type of material released or spilled
6. Estimated quantity of materials released or spilled
7. Source of spill and cause, if known
8. Nearest downstream body of water
9. Weather conditions at the incident location
10. NPDES Permit Number
11. Any other information that may help emergency personnel respond to the incident

8.4 Blasting

Blasting activities will be conducted at various locations between Station 76+00 and Station 165+00. Rock debris will be removed from the blasting area as quickly as possible and transported to the designated stockpile area west of Cecil Ashburn Drive and north of the existing North Alabama Land Trust entrance (Station 115+00 to Station 122+00). The rock debris is currently planned to be used as fill for parking areas proposed under a separate project.
BMPs will be installed to prevent contamination of storm water with rock dust. Additional measures will be implemented to minimize the generation of dust.

8.5  Removal of Off-site Sedimentation

Should off-site sedimentation occur, the sediment deposits will be removed and placed in a level area on-site, out of the path of storm water flow. Temporary or permanent stabilization will be initiated immediately if the relocated sediment is placed in an area not under construction.

9.0  Environmentally Sensitive Areas

Special attention will be given to potentially environmentally sensitive areas on-site and adjoining property boundaries. No surface waters are located within 25 feet of the project boundaries. Steep slopes are present at the site.

9.1  Receiving Water TMDLs

As discussed in section 1.3, a TMDL was established for Aldridge Creek in 2002 due to impairments from low dissolved oxygen and organic enrichment; therefore, the subject site is considered a Priority Construction Site. BMPs will be implemented to minimize soil disturbance related to the proposed construction. Exposed soils will be stabilized as soon as possible. If observed, sediment deposits will be removed immediately and additional BMPs will be placed to mitigate the contributing erosion.

9.2  Blevins Gap Nature Preserve

Cecil Ashburn Drive intersects the Blevins Gap Nature Preserve between Stations 111+00 and Station 142+00. The preserve is a 971-acre complex managed by the Land Trust of North Alabama and Forever Wild that includes 10.5 miles of hiking trails.

Outfalls 12, 13, and 14 discharge within the preserve boundary. The proposed blasting debris stockpile and associated Outfall 23 are also located within the preserve. As discussed in Section 3.2.2, BMPs installed in this area will be observed each day there is construction activity within the drainage area of the four outfalls, as part of the daily observation. Extra care will be taken to prevent impairment or disturbance of the nature preserve.
10.0 Certification of Responsible Official

I certify under the penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and/or imprisonment for knowing violations.

________________________________________
Kathy Martin, P.E.
City Engineer / Authorized Representative
City of Huntsville, Alabama

11.0 Certification of Qualified Credentialed Professional

I certify under penalty of law that a comprehensive Construction Best Management Practices Plan (CBMPP) for the prevention and minimization of all sources of pollution in stormwater and authorized related process wastewater runoff has been prepared under my supervision for this site/activity, and associated regulated areas/activities. The CBMPP meets the requirements of this permit and, if properly implemented and maintained by the operator, discharges of pollutants in stormwater runoff can reasonably be expected to be effectively minimized to the maximum extent practicable according to the requirements of ADEM Administrative Code Chapter 335-6-6-.23 and the Permit. The CBMPP describes the erosion and sediment control measures that must be fully implemented and regularly maintained as needed at the permitted site in accordance with sound sediment and erosion control practices to ensure the protection of water quality.

____________________________________
Sarah L. Yeldell, P.E.
Project Engineer
S&ME, Inc.
12.0 Acknowledgement

S&ME, Inc. certifies that the information provided in this CBMPP reflects the conditions reported, encountered, and discovered at the time of plan preparation. When performing this scope of services, S&ME, Inc. observed the degree of care and skill generally exercised by other consultants undertaking similar studies at the same time, under similar circumstances and conditions, and in the same geographic area. Conclusions regarding the subject site are based on observations of existing conditions, available documentation, and our interpretation of the collected data.

S&ME, Inc.

Sarah L. Yeldell, P.E.  
Project Engineer

Deborah J. Jones, P.E.  
Senior Engineer
Appendices
Appendix A    Figures
NOTES:

1. A STABILIZED CONSTRUCTION ENTRANCE SHALL BE CONSTRUCTED AT LOCATIONS SHOWN ON THE DESIGN SURVEY WHERE CONTROL SHIFTS OR AS APPROVED BY THE ENGINEER BASED ON SAFETY, ECONOMY, AND CONSTRUCTION SCHEDULE. THE ENTRANCE IS POINTS OF ENTRANCE FROM UNSTABILIZED AREAS OF THE PROJECT TO PUBLIC ROADS WHERE OFFSITE TRACKING OF MUD COULD OCCUR. TRAFFIC FROM UNSTABILIZED AREAS OF THE PROJECT SHALL BE DIRECTED THROUGH THE STABILIZED ENTRANCE. BARRIERS, FLAGGING, OR OTHER PROTECTIVE MEANS SHALL BE USED AS REQUIRED TO LIMIT AND DIRECT VEHICLE ENTRY ACROSS THE STABILIZED ENTRANCE.

2. THE CONTRACTOR MAY PROVIDE AN ALTERNATIVE TECHNIQUE TO MINIMIZE OFFSITE TRACKING OF MUD. THE ALTERNATIVE MUST BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO ITS USE.

3. ALL MATERIALS STORED, DRIPPED, OR TRACKED INTO PUBLIC ROADS INCLUDING THE STABILIZED CONSTRUCTION ENTRANCE AGGREGATE AND CONSTRUCTION MUD SHALL BE REMOVED DAILY, OR MORE FREQUENTLY IF SO DIRECTED BY THE ENGINEER.

4. AGGREGATES SHALL BE ADJUSTED TO MATCH SIZES CONTAINING CHEESECUT SMALLER AGGREGATE WILL TRACK OFF THE PROJECT AND ARE UNSTABILIZED.

5. THE STABILIZED CONSTRUCTION ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL ALLOW IT TO PERFORM ITS FUNCTION TO PREVENT OFFSITE TRACKING. THE STABILIZED CONSTRUCTION ENTRANCE SHALL BE REPAIRED WHEN NECESSARY TO AVOID AGGREGATE WINDING DOWN THE STREET. ADDITIONAL STABILIZATION OF THE STABILIZED ENTRANCE MAY BE REQUIRED TO LIMIT MUD TRACKING.

6. THE NORMAL SIZE OF A STABILIZED CONSTRUCTION ENTRANCE IS 15' X 15'. UNLESS OTHERWISE SHOWN IN THE PLAN, IF THE VOLUME OF ENTRANCY AND EXITING VEHICLES WARRANTS, A 30' WIDTH MAY BE USED IF APPROVED BY THE ENGINEER.

SPECIFICATIONS:

CURRENT ALABAMA DEPARTMENT OF TRANSPORTATION

NATIONAL STANDARDS REQUIREMENTS APPLIED TO THIS WORK. ALABAMA DEPARTMENT OF TRANSPORTATION SOFTWARE engages with the Unit: (m²/ft²) mm PPI (lbs/ft²) lb/m² (kg/ft²) ft²/m² oz/yd² (oz/m²) DWT (lbs) TPT (tons) advisable. Please consult the project engineer for more information.
ELEVATION VIEW

NOTES:
1. METHOD II FENCE INSTALLATION ALSO TO INCLUDE ANCHORS AND "T"-BACKS AS REQUIRED.
2. SILT FENCE SHALL BE USED IN AREAS WHERE FLOW IS LOW TO MODERATE OR AS DIREC BY THE ENGINEER.
3. SILT FENCES ARE TEMPORARY SEDIMENT CONTROL ITEMS THAT SHALL BE ERECTED DOWN GRADE OF FASIBLE AREAS SUCH AS NEWLY GRADED FILL SLOPES AND ADJACENT TO STREAMS AND CHANNELS.
4. SILT FENCE SHOULD BE PLACED WELL IN THE PATH OF FLOW AND ALONG EDGE OF CLEARING LIMITS. THIS WILL ALLOW ROOM FOR ADDITIONAL BEST MANAGEMENT PRACTICES SUCH AS VEGETATED BARRIERS.
5. WHENEVER POSSIBLE SILT FENCE SHALL BE CONSTRUCTED ACROSS A LEVEL AREA IN THE SHAPE OF A SMILE. THIS AIDS IN PONCING OF RUNDY AND FACILITATE SEDIMENTATION.
6. THE CONTRACTOR MAY ELECT TO USE EITHER INSTALLATION METHOD I OR METHOD II.
7. METHOD II INSTALLATION SHALL BE ACCOMPLISHED USING AN IMPLEMET THAT IS MANUFACTURED FOR THE APPLICATION AND PROVIDES A CONFIGURATION MEETING THE REQUIREMENTS OF THE DETAIL.
8. SEE ALDOT LIST 352-3 FOR APPROVED SILT FENCE GEOTEXTILES.

SPECIFICATIONS:
CURRENT ALABAMA DEPARTMENT OF TRANSPORTATION
H301-A НЕС 200-4
NOT TO SCALE
ELEVATION DETAIL

NOTES:
1. MINIMUM RECOMMENDED PLACEMENT INTERVAL BETWEEN WATTLE DITCH CHECK IS 100 FEET UNLESS SHOWN OTHERWISE ON THE PLANS OR APPROVED BY THE ENGINEER. SEE SPACING GUIDANCE ON ESC-300-1.
2. ANCHORING STAKES SHALL BE SIZED, SPACED, DRIVEN, AND BE OF A MATERIAL THAT EFFECTIVELY SECURES THE CHECK. STAKE SPACING SHALL BE A MAXIMUM OF TWO FEET.
3. WATTLE SHOULD NOT BE USED IN HARD BOTTOM CHANNELS.
4. STAPLES SPACED 18 INCHES APART, ALONG THE CHANNEL EDGES AND DOWN THE CENTER OF THE CHANNEL, STAPLES SPACED 10 INCHES APART, ACROSS THE UPSTREAM AND DOWNSTREAM EDGES.

WATTLE DITCH CHECK SELECTION GUIDELINES

WATTLE DITCH CHECKS ARE APPROPRIATE FOR VELOCITY REDUCTION AND CONTROL OF SEDIMENT TRANSPORT UNDER LOW TO MEDIUM FLOW CONDITIONS NOT EXCEEDING 1.0 CF/FT/SEC.
DETAIL (DITCH CHECK)

NOTE:
- ENDPOINT A MUST BE HIGHER THAN FLOWLINE HEIGHT B.
- REINFORCEMENT SHALL SPAN THE ENTIRE DITCH Bottom.

CONCRETE DITCH

SAND BAG DITCH CHECK

SIDE VIEW
(IN DITCH BOTTOM)

NOTES:
1. MINIMUM RECOMMENDED PLACEMENT INTERVAL BETWEEN SAND BAG DITCH CHECK IS 100' UNLESS SHOWN OTHERWISE ON THE PLANS OR APPROVED BY THE ENGINEER. SEE SPACING GUIDANCE ON SHEET ESC-300-1.

2. PREVENTING SEDIMENT FROM ENTERING A PAVED DITCH IS PREFERABLE TO CAPTURING SEDIMENT WITHIN PAVED DITCH.

SAND BAG DITCH CHECK SELECTION GUIDELINES

SAND BAG DITCH CHECKS ARE USED FOR VELOCITY REDUCTION AND MINIMAL SEDIMENT TRAPPING IN CONCRETE, PAVED DITCHES OR IN DITCHES THAT HAVE ROCKY SITTING.
TEMPORARY ROCK DITCH CHECKS IN ROADSIDE DITCHES

NOTES:
1. Minimum spacing for rock ditch checks shall be 5 feet or as directed by the Engineer. SEE SPACING GUIDANCE ON SPACING SHEET 200-1.
2. Rock ditch checks shall be chained with filter fabric.
3. See list 11-3 for approved geotextiles.

ROCK DITCH CHECK SELECTION GUIDELINES

The type and size of rock used to construct the check will be selected by the designer and shown on the plans. The size of rock chosen will be proportional to expected flows and velocities.
CURB INLET PROTECTION (STAGE 2)
SINGLE OR DOUBLE WING INLET

PLAN VIEW

DROP INLET PROTECTION

NOTES:
1. ANCHORING STAKES SHALL BE SIZED, SPACED, AND BE OF A MATERIAL THAT EFFECTIVELY SECURES THE INLET. STAKE SPACING SHALL BE A MAXIMUM OF TWO FEET.
2. OASIS ENDS OF WATTLE PER MANUFACTURERS RECOMMENDATIONS (1'-3" MAX).
3. SEE ATTACHMENT FOR APPROVED WATTLE.
4. SILT FENCE OR SAND BAGS MAY ALSO BE USED FOR THIS APPLICATION. SAWDUST IS NOT ACCEPTABLE DURING THIS STAGE.

SECTION A-A

SECTION B-B

SPECIFICATIONS:

CURRENT ALABAMA DEPARTMENT OF TRANSPORTATION
"THIS DOCUMENT SINCE PRINTED IN THE FORM SHOWN WILL BE USED AS THE STANDARD OF REFERENCE FOR ALL MILITARY AND CONTRACTORS. MODIFICATIONS TO THIS DOCUMENT WILL BE MADE ONLY WITH THE AUTHORIZATION OF THE ENGINEER ABBREVIATION, TO BE APPLIED TO THE REVISION NUMBER ON THE MATERIALS AND PRODUCTS OF THE DESIGNER AND CONTRACTOR."
1. ROLLED EROSION CONTROL PRODUCTS SHALL BE INSTALLED PARALLEL TO THE DIRECTION OF FLOW. THERE SHALL BE AN ANCHOR TRENCH AT THE UPSTREAM EDGE OF THE INSTALLATION. UPSTREAM REPS SHALL OVERLAP ANY DOWNSTREAM REPS. ADJACENT REPS SHALL ALSO BE OVERLAPPED.

2. STAKES SHALL BE PLACED ON OVERLAPS, AT THE TOP OF THE REPS, AND THROUGHOUT THE REPS INSTALLATION IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS TO ENSURE THE REPS IS IN CONTACT WITH THE UNDERLYING SOIL.

3. HYDRAULIC EROSION CONTROL PRODUCTS SHALL BE INSTALLED BY SPRAYING IN OPPOSING DIRECTIONS TO PROVIDE A SOLID BLANKET OF PRODUCT. REPS SHALL BE APPLIED BY EQUIPMENT AND AT A RATE THAT MEETS THE RECOMMENDATIONS OF THE PRODUCT MANUFACTURER SPECIFIC TO THE SLOPE.

4. HYDRAULIC EROSION CONTROL PRODUCTS SHOULD NOT BE INSTALLED IN AREAS SUBJECT TO CHANNELIZED FLOW OR AREAS HAVING A POTENTIAL TO FLOOD DURING A LOCAL 2 YEAR, 24 HOUR STORM EVENT.

5. REPS TYPE C2 AND C4 ARE TO BE PLACED ON TOP OF SEEDING. REPS TYPE C6, C8 AND C10 ARE TO BE PLACED BELOW THE TOPSOIL AND SEEDING. THE TOPSOIL AND SEEDING MUST BE COVERED BY EITHER SOIL OR REPS TYPE C2 OR C4. (SEE OPTIONS A AND B). ONLY USE OPTION A IF NEEDED CAN BE KEPT OUT OF THE CHANNEL UNTIL VEGETATION. IF NOT, USE OPTION B.

6. SEE ALDOT 3-311 FOR APPROVED ROLLED AND HYDRAULIC EROSION CONTROL PRODUCTS.
Appendix B  Alabama Handbook References
Temporary Seeding (TS)

Practice Description

Temporary seeding is the establishment of fast-growing annual vegetation from seed on disturbed areas. Temporary vegetation provides economical erosion control for up to a year and reduces the amount of sediment moving off the site.

This practice applies where short-lived vegetation can be established before final grading or in a season not suitable for planting the desired permanent species. It helps prevent costly maintenance operations on other practices such as sediment basins and sediment barriers. In addition, it reduces problems of mud and dust production from bare soil surfaces during construction. Temporary or permanent seeding is necessary to protect earthen structures such as dikes, diversions, grass-lined channels and the banks and dams of sediment basins.

Planning Considerations

Temporary vegetative cover can provide significant short-term erosion and sediment reduction before establishing perennial vegetation.

Temporary vegetation will reduce the amount of maintenance associated with sediment basins.
Temporary vegetation is used to provide cover for no more than 1 year. Permanent vegetation should be established at the proper planting time for permanent vegetative cover.

Certain plants species used for temporary vegetation will produce large quantities of residue which can provide mulch for establishment of the permanent vegetation.

Proper seedbed preparation and selection of appropriate species are important with this practice. Failure to follow establishment guidelines and recommendations carefully may result in an inadequate or short-lived stand of vegetation that will not control erosion.

The selection of plants for temporary vegetation must be site specific. Factors that should be considered are type of soils, climate, establishment rate, and management requirements of the vegetation. Other factors that may be important are wear, mowing tolerance, and salt tolerance of vegetation.

Seeding properly carried out within the optimum dates has a higher probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as plantings are deviated from the optimum dates, the probability of failure increases rapidly. Seeding dates should be taken into account in scheduling land-disturbing activities.

Site quality impacts both short-term and long-term plant success. Sites that have compacted soils should be modified whenever practical to improve the potential for plant growth.

The operation of equipment is restricted on slopes steeper than 3:1, severely limiting the quality of the seedbed that can be prepared. Provisions for establishment of vegetation on steep slopes can be made during final grading. In construction of fill slopes, for example, the last 4-6” might not be compacted. A loose, rough seedbed with irregularities that hold seeds and fertilizer is essential for hydroseeding. Cut slopes should be roughened (see practice Land Grading).

Good mulching practices are critical to protect against erosion on steep slopes. When using straw, anchor with netting or asphalt. On slopes steeper than 2:1, either hydraulic mulch or erosion control blanket is more appropriate than straw to protect the slope.

The use of irrigation (temporary or permanent) will greatly improve the success of vegetation establishment.

**Design Criteria**

**Plant Selection**

Select plants that can be expected to meet planting objectives. To simplify plant selection, use Table TS-1, Commonly Used Plants for Temporary Cover and Figure TS-1, Geographical Areas for Species Adaptation and Seeding Dates. Seeding mixtures commonly specified by the Alabama Department of Transportation are an
appropriate alternative for plantings on rights-of-ways. Additional information related to plantings in Alabama is found in Chapter 2 in the section Non-woody Vegetation for Erosion and Sediment Control.

Figure TS-1 Geographical Areas for Species Adaptation and Seeding Dates

*Note: Site conditions related to soils and aspect in counties adjacent to or close to county boundaries may justify adjustments in planting dates by qualified design professionals.*
Table TS-I  Commonly Used Plants for Temporary Cover

<table>
<thead>
<tr>
<th>Species</th>
<th>Seeding Rate/AC PLS</th>
<th>North Seeding Dates</th>
<th>Central Seeding Dates</th>
<th>South Seeding Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millet, Browntop or German</td>
<td>40 lbs</td>
<td>Apr 1-Aug 1</td>
<td>Apr 1-Aug 15</td>
<td>Apr 1-Aug 15</td>
</tr>
<tr>
<td>Rye</td>
<td>3 bu</td>
<td>Sep 1-Nov 15</td>
<td>Sep 15-Nov 15</td>
<td>Sep 15-Nov 15</td>
</tr>
<tr>
<td>Ryegrass</td>
<td>30 lbs</td>
<td>Aug 1-Sep 15</td>
<td>Sep 1-Oct 15</td>
<td>Sep 1-Oct 15</td>
</tr>
<tr>
<td>Sorghum-Sudan Hybrids</td>
<td>40 lbs</td>
<td>May 1-Aug 1</td>
<td>Apr 15-Aug 1</td>
<td>Apr 1-Aug 15</td>
</tr>
<tr>
<td>Sudangrass</td>
<td>40 lbs</td>
<td>May 1-Aug 1</td>
<td>Apr 15-Aug</td>
<td>Apr 1-Aug 15</td>
</tr>
<tr>
<td>Wheat</td>
<td>3 bu</td>
<td>Sep 1-Nov 1</td>
<td>Sep 15-Nov 15</td>
<td>Sep 15-Nov 15</td>
</tr>
<tr>
<td>Common Bermudagrass</td>
<td>10 lbs</td>
<td>Apr 1-July 1</td>
<td>Mar 15-July 15</td>
<td>Mar 1-July 15</td>
</tr>
<tr>
<td>Crimson Clover</td>
<td>10 lbs</td>
<td>Sept 1-Nov 1</td>
<td>Sept 1-Nov 1</td>
<td>Sept 1-Nov 1</td>
</tr>
</tbody>
</table>

PLS means pure live seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and purity of 90%, PLS = 0.8 x 0.9 = 72%. 10 lbs PLS = 10/0.72 = 13.9 lbs of the species to be planted.

**Site Preparation and Soil Amendments**

Complete grading and shaping before applying soil amendments if needed to provide a surface on which equipment can safely and efficiently be used to apply soil amendments and accomplish seedbed preparation and seeding.

**Lime**

Apply lime according to soil test recommendations. If a soil test is not available, use 1 ton of agricultural limestone or equivalent per acre on coarse textured soils and 2 tons per acre on fine textured soils. Do not apply lime to alkaline soils or to areas which have been limed during the preceding 2 years. Other liming materials that may be selected should be provided in amounts that provide equal value to the criteria listed for agricultural lime or be used in combination with agricultural limestone or Selma chalk to provide equivalent values to agricultural limestone.

**Fertilizer**

Apply fertilizer according to soil test results. If a soil test is not available, apply 8-24-24 fertilizer.

When vegetation has emerged to a stand and is growing, 30 to 40 lbs/acre (approximately 0.8 lbs/1000 ft²) of additional nitrogen fertilizer should be applied.

*Note: Fertilizer can be blended to meet exact fertilizer recommendations. Take soil test recommendations to local fertilizer dealer for bulk fertilizer blends. This may be more economical than bagged fertilizer.*
Application of Soil Amendments

Incorporate lime and fertilizer into the top 6” of soil during seedbed preparation.

Seedbed Preparation

Good seedbed preparation is essential to successful plant establishment. A good seedbed is well pulverized, loose, and smooth. If soils become compacted during grading, loosen them to a depth of 6” to 8” using a ripper or chisel plow.

If rainfall has caused the surface to become sealed or crusted, loosen it just prior to seeding by disk ing, raking, harrowing, or other suitable methods. When hydroseeding methods are used, the surface should be left with a more irregular surface of clods.

Planting Methods

Seeding
Evenly apply seed using a cyclone seeder (broadcast), drill seeder, cultipacker seeder, or hydroseeder. Broadcast seeding and hydroseeding are appropriate for steep slopes where equipment cannot operate safely. Small grains should be planted no more than 1” deep, and grasses and legumes no more than ½” deep. Seed that are broadcast must be covered by raking or chain dragging, and then lightly firmed with a roller or cultipacker.

Hydroseeding
Surface roughening is particularly important when hydroseeding, as a roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydroseeding operations; large clods, stones, and irregularities provide cavities in which seeds can lodge.

Mix seed, inoculant if required, and a seed carrier with water and apply as slurry uniformly over the area to be treated. The seed carrier should be a cellulose fiber, natural wood fiber or other approved fiber mulch material which is dyed an appropriate color to facilitate uniform application of seed. Use the correct legume inoculant at 4 times the recommended rate when adding inoculant to hydroseeder slurry. The mixture should be applied within one hour after mixing to reduce damage to seed.

Fertilizer should not be mixed with the seed-inoculant mixture because fertilizer salts may damage seed and reduce germination and seedling vigor. Fertilizer may be applied with a hydro seeder as a separate operation after seedlings are established.

Mulching

The use of appropriate mulch provides instant cover and helps ensure establishment of vegetative cover under normal conditions and is essential to seeding success under harsh site conditions (see the Mulching practice for guidance). Harsh site
conditions include the following: slopes steeper than 3:1 and adverse soils (soils that are shallow to rock, rocky, or high in clay or sand). Areas with concentrated flow should be treated differently and require a hydromulch formulated for channels or an appropriate erosion control blanket.
Permanent Seeding (PS)

Practice Description

Permanent seeding is the establishment of perennial vegetation on disturbed areas from seed. Permanent vegetation provides economical long-term erosion control and helps prevent sediment from leaving the site. This practice is used when vegetation is desired and appropriate to permanently stabilize the soil.

Planning Considerations

The advantages of seeding over other means of establishing plants include the smaller initial cost, lower labor input, and greater flexibility of method.

Disadvantages of seeding include potential for erosion during the establishment stage, seasonal limitations on suitable seeding dates, and weather-related problems such as droughts.

The probability of successful plant establishment can be maximized through good planning. The selection of plants for permanent vegetation must be site specific. Factors that should be considered are type of soils, climate, establishment rate, and management requirements of the vegetation. Other factors that may be important are wear, mowing tolerance, and salt tolerance of vegetation.

Plant selection for permanent vegetation should be based on plant characteristics, site and soil conditions, time of year of planting, method of planting, and the intended use of the vegetated area. Climate factors can vary widely in Alabama.
Important plant attributes are discussed in Vegetation Establishment for Erosion and Sediment Control in Chapter 2.

Plant selection may include companion plants to provide quick cover on difficult sites, late seedings, or where the desired permanent cover may be slow to establish. Annuals are usually used for companion plants and should be selected carefully to prevent using a species that provide so much competition that it prevents the establishment of the desired species.

Seeding properly carried out within the optimum dates has a higher probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as plantings are deviated from the optimum dates, the probability of failure increases rapidly. Seeding dates should be taken into account in scheduling land-disturbing activities.

Site quality impacts both short-term and long-term plant success. Sites that have compacted soils, soils that are shallow to rock or have textures that are too clayey or too sandy should be modified whenever practical to improve the potential for plant growth and long-term cover success.

The operation of equipment is restricted on slopes steeper than 3:1, severely limiting the quality of the seedbed that can be prepared. Provisions for establishment of vegetation on steep slopes can be made during final grading. In construction of fill slopes, for example, the last 4-6” might not be compacted. A loose, rough seedbed with irregularities that hold seeds and lime and fertilizer is essential for hydroseeding. Cut slopes should be roughened (see Land Grading practice).

Proper mulching is critical to protect against erosion on steep slopes. When using straw, anchor with netting or asphalt. On slopes steeper than 2:1, jute, excelsior, or synthetic matting may be required.

The use of irrigation (temporary or permanent) will greatly improve the success of vegetation establishment.

**Design Criteria**

*Plant Selection*

Select plants that can be expected to meet planting objectives. To simplify plant selection, use Figure PS-1 Geographical Areas for Species Adaptation and Seeding Dates and Table PS-1, Commonly Used Plants for Permanent Cover. Mixtures commonly specified by the Alabama Department of Transportation are an appropriate alternative for plantings on rights-of-ways. Additional information related to plants commonly used in Alabama is found in Chapter 2 under the section Vegetation for Erosion and Sediment Control.

The plants used for temporary vegetation may be used for companion plants provided the seeding rate of the annual species is reduced by one half. See the Temporary Seeding practice for additional information on establishing temporary
vegetation. Ryegrass or other highly competitive plants should not be used as a companion plant.

Figure PS-1 Geographical Areas for Species Adaptation and Seeding Dates

Note: Site conditions related to soils and aspect in counties adjacent to or close to county boundaries may justify adjustments in planting dates by qualified design professionals.
Table PS-1 Commonly Used Plants for Permanent Cover with Seeding Rates and Dates

<table>
<thead>
<tr>
<th>Species</th>
<th>Seeding Rates/Ac PLS</th>
<th>North</th>
<th>Central</th>
<th>South</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bahiagrass, Pensacola</td>
<td>40 lbs</td>
<td>30 lbs</td>
<td>--</td>
<td>Mar 1-July 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mar 1-July 1</td>
<td>Feb 1-Nov 1</td>
</tr>
<tr>
<td>Bermudagrass, Common</td>
<td>10 lbs</td>
<td>Apr 1-July 1</td>
<td>Mar 15-July 15</td>
<td>Mar 1-July 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mar 15-July 15</td>
<td>Feb 15-Sept 1</td>
</tr>
<tr>
<td>Bahiagrass, Pensacola</td>
<td>30 lbs</td>
<td>30 lbs</td>
<td>--</td>
<td>Mar 1-July 1</td>
</tr>
<tr>
<td>Bermudagrass, Hybrid</td>
<td>Solid Sod</td>
<td>Anytime</td>
<td>Anytime</td>
<td>Anytime</td>
</tr>
<tr>
<td>(Lawn Types)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bermudagrass, Hybrid</td>
<td>Sprigs 1/sq ft</td>
<td>Mar 1-Aug 1</td>
<td>Mar 1-Aug 1</td>
<td>Feb 15-Sept 1</td>
</tr>
<tr>
<td>(Lawn Types)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fescue, Tall</td>
<td>40-50 lbs</td>
<td>Sep 1-Nov 1</td>
<td>Sep 1-Nov 1</td>
<td>--</td>
</tr>
<tr>
<td>Sericea</td>
<td>40-60 lbs</td>
<td>Mar 15-July 15</td>
<td>Mar 1-July 15</td>
<td>Feb 15-July 15</td>
</tr>
<tr>
<td>Sericea &amp; Common Bermudagrass</td>
<td>40lbs</td>
<td>Mar 15-July 15</td>
<td>Mar 1-July 15</td>
<td>Feb 15-July 15</td>
</tr>
<tr>
<td></td>
<td>10 lbs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PLS means pure live seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and purity of 90%, PLS= 0.8 X 0.9 = 72%. 10 lbs PLS = 10/0.72 = 13.9 lbs of the species to be planted.

Seedbed Requirements

Establishment of vegetation should not be attempted on sites that are unsuitable due to compaction or inappropriate soil texture, poor drainage, concentrated overland flow, or steepness of slope until measures have been completed to correct these problems. To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. A good growth medium should have these attributes:

- Sufficient pore space to permit root penetration.
- Enough fine-grained soil material (silt and clay) to maintain adequate moisture and nutrient supply.
- Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans should be 12” or more, except on slopes steeper than 2:1 where topsoiling is not feasible.
- A favorable pH range for plant growth, usually 6.0-6.5.
• Sufficient nutrients (nitrogen, phosphorus and potassium) for initial plant establishment.

• Freedom from large roots, branches, stones, or large clods. Clods and stones may be left on slopes steeper than 3:1 if they are to be hydroteed.

If any of the above attributes are not met: i.e., if the existing soil is too dense, coarse, shallow or acidic to foster vegetation – chiseling, topsoil, or special amendments should be used to improve soil conditions. The soil conditioners described below may be beneficial or topsoil may be applied (for guidance on topsoiling see Topsoiling practice). These amendments should only be necessary where soils have limitations that make them poor for plant growth or for turf establishment.

• Peat-appropriate types are sphagnum moss peat, reed-sedge peat, or peat humus, all from fresh-water sources. Peat should be shredded and conditioned in storage piles for at least 6 months after excavation.

• Sand—should be clean and free of toxic materials.

• Vermiculite—use horticultural grade.

• Rotted manure—use stable or cattle manure not containing undue amounts of straw or other bedding materials.

• Thoroughly rotted sawdust—should be free of stones and debris. Add 6 lbs of nitrogen to each cubic yard.

Soil Amendments

Liming Materials

Lime (Agricultural limestone) should have a neutralizing value of not less than 90 percent calcium carbonate equivalent and 90 percent will pass through a 10 mesh sieve and 50 percent will pass through a 60 mesh sieve.

Selma chalk should have a neutralizing value of not less than 80 percent calcium carbonate equivalent and 90 percent will pass through a 10 mesh sieve.

Other liming materials that may be selected should be provided in amounts that provide equal value to the criteria listed for agricultural lime or be used in combination with agricultural limestone or Selma chalk to provide equivalent values to agricultural limestone.

Plant Nutrients

Commercial grade fertilizers that comply with current Alabama Fertilizer Laws should be used to supply nutrients required to establish vegetation.
Lime and fertilizer needs should be determined by soil tests. Soil testing is performed by the Auburn University Soil Testing Laboratory and provides recommendations based on field tests on Alabama soils. The local county Cooperative Extension Service can provide information on obtaining soil tests. Commercial laboratories that make recommendations based on soil analysis may be used.

When soil tests are not available, use the following rates for application of soil amendments.

Sandy soils: Use 1 ton/acre (exception on sandy soils – if the cover will be tall fescue and clover) use 2 tons/acre.
Clayey soils: 2 tons/acre.
(Do not apply lime to alkaline soils).

Grasses alone: Use 400 lbs/acre of 8-24-24 or the equivalent. Apply 30 lbs of additional nitrogen when grass has emerged and begun growth (approximately 0.8lbs/1000 ft²).
Grass-legume mixtures: Use 800 to 1200 lbs/acre of 5-10-10 or the equivalent.
Legumes Alone: Use 400 to 600 lbs/acre of 0-20-20 or the equivalent.

Note: Fertilizer can be blended to meet exact fertilizer recommendations. Take soil test recommendations to local fertilizer dealer for bulk fertilizer blends. This may be more economical than bagged fertilizer.

Application of Soil Amendments

Apply lime and fertilizer evenly and incorporate into the top 6” of soil by diskig, chiseling or other suitable means during seedbed preparation. Operate machinery on the contour. On sites too steep for seedbed preparation, fertilizer and lime can be applied with a hydroteeder.

Seedbed Preparation

If needed, grade and shape to provide a surface on which equipment can safely and efficiently be used for seedbed preparation and seeding.

Install necessary sediment control practices before seedbed preparation and complete grading according to the approved plan.

Prepare a friable seedbed with tillage to a depth of at least 6”. Break up large clods, alleviate compaction, and smooth and firm the soil into a uniform surface. Fill in or level depressions that can collect water.

Planting Methods

Seeding
Use certified seed for permanent seeding whenever possible. Certified seed is inspected by the Alabama Crop Improvement Association to meet high quality standards and will be tagged with a “Certified Seed” tag. (Note: all seed sold in Alabama is required by law to be tagged to identify seed purity, germination, and
presence of weed seeds. Seed must meet state standards for content of noxious weeds.)

Seeding dates are determined using Figure PS-1 and Table PS-1.

Inoculate legume seed with the Rhizobium bacteria appropriate to the species of legume. Details of legume inoculation are located in Chapter 2 in the part on Vegetation for Erosion and Sediment Control under Inoculation of Legumes.

Plant seed uniformly with a cyclone seeder, a drill seeder, a cultipacker seeder, or by hand on a fresh, firm, friable seedbed. If the seedbed has been sealed by rainfall, it should be disked so the seed will be sown into a freshly prepared seedbed.

When using broadcast-seeding methods, subdivide the area into workable sections and determine the amount of seed needed for each section. Apply one-half the seed while moving back and forth across the area, making a uniform pattern; then apply the second half in the same way, but moving at right angles to the first pass.

Cover broadcast seed by raking or chain dragging; then firm the surface with a roller or cultipacker to provide good seed contact. Small grains should be planted no more than 1” deep and grasses and legume seed no more than ½” deep.

**Hydroseeding**

Surface roughening is particularly important when hydroseeding, as a roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydroseeding operations; large clods, stones, and irregularities provide cavities in which seeds can lodge.

Mix seed, inoculant if required, and a seed carrier with water and apply as a slurry uniformly over the area to be treated. The seed carrier should be a cellulose fiber, natural wood fiber or other approved fiber mulch material which is dyed an appropriate color to facilitate uniform application of seed. Use the correct legume inoculant at 4 times the recommended rate when adding inoculant to a hydroseeder slurry. The mixture should be applied within one hour after mixing to reduce damage to seed.

Fertilizer should not be mixed with the seed-inoculant mixture because fertilizer salts may damage seed and reduce germination and seedling vigor.

Fertilizer may be applied with a hydroseeder as a separate operation after seedlings are established.

Lime is not normally applied with a hydraulic seeder because it is abrasive but if necessary it can be added to the seed slurry and applied at seeding or it may be applied with the fertilizer mixture. Also lime can be blown onto steeper slopes in dry form.
Sprigging
Hybrid bermudagrass cannot be grown from seed and must be planted vegetatively. Vegetative methods of establishing common and hybrid bermudagrass, centipedegrass and zoysia include sodding, plugging and sprigging (see Sodding practice).

When sprigs are planted with a sprigging machine, furrows should be 4-6” deep and 2 feet apart. Place sprigs no farther than 2 feet apart in the row and so that at least one rooting node is in the furrow.

When broadcasting is used for sprig planting, broadcast sprigs at the specified rate (Table PS-1). Press into the top ½” to 2” of soil with a cultipacker or with a disk set nearly straight so that the sprigs are not brought back to the surface. A mulch tacking machine may be used to press sprigs into the soil.

Mulching
The use of mulch provides instant cover and helps ensure establishment of vegetation under normal conditions and is essential to seeding success under harsh site conditions (see Mulching practice). Harsh site conditions include: slopes steeper than 3:1 and adverse soils (shallow, rocky, or high in clay or sand). Areas with concentrated flow should be treated differently and require sod, a hydromulch formulated for channels or an appropriate erosion control blanket.

Irrigation
Moisture is essential for seed germination and vegetation establishment. Supplemental irrigation can be very helpful in assuring adequate stands in dry seasons or to speed development of full cover. It is a requirement for establishment of vegetation from sod and sprigs and should be used elsewhere when feasible. However, irrigation is rarely critical for low-maintenance vegetation planted at the appropriate time of the year.

Water application rates must be carefully controlled to prevent runoff. Inadequate or excessive amounts of water can be more harmful than no supplemental water.

Maintenance
Generally, a stand of vegetation cannot be determined to be fully established until soil cover has been maintained for 1 full year from planting. Inspect vegetated areas for failure and make necessary repairs and vegetate as soon as possible.

If a stand has inadequate cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand after seedbed preparation or over-seed the stand. Consider a temporary seeding if the time of year is not appropriate for establishment of permanent vegetation (see Temporary Seeding practice).

If vegetation fails to grow, a soil test should be made to determine if soil acidity or nutrient imbalance is responsible.
To attain complete establishment, fertilization is usually required in the second growing season. Turf grasses require annual maintenance fertilization. Use soil tests if possible or follow the guidelines given for the specific seeding mixtures.

Protect vegetation during its establishing period from traffic that will be harmful. If appropriate, use either temporary fences or barriers to protect areas that may be damaged by excessive traffic.
Mulching (MU)

Practice Description

Mulching is the application of plant residues such as straw or other suitable fibrous materials to the soil surface. Mulch protects the soil surface from the erosive force of raindrop impact and reduces the velocity of overland flow. It helps seedlings germinate and grow by conserving moisture, protecting against temperature extremes and controlling weeds. Mulch also maintains the infiltration capacity of the soil. Mulch can be applied to seeded areas to help establish plant cover. It can also be used in unseeded areas to protect against erosion over the winter or until final grading and shaping can be accomplished except in areas with concentrated flow.

Planning Considerations

Surface mulch is the most effective, practical means of controlling runoff and erosion on disturbed land prior to vegetation establishment. Mulch absorbs the energy associated with raindrops and thereby minimizes soil particle detachment, which is the initiation step of erosion.

Mulch also reduces soil moisture loss by evaporation, prevents crusting and sealing of the soil surface, moderates soil temperatures, and provides a suitable microclimate for seed germination.
Organic mulches such as straw, wood chips and shredded bark have been found to be very effective mulch materials. Materials containing weed and grass seeds which may compete with establishing vegetation should not be used. Also, decomposition of some wood products can tie up significant amounts of soil nitrogen, making it necessary to modify fertilization rates or add fertilizer with the mulch.

Hydraulic Erosion Control Products (HECPs) as defined by the Erosion Control Technology Council (ECTC) can also be used as effective mulch applications. HECPs are designated as 5 different types based on product characteristics and performance. Information from the ECTC table dated August 2010 is provided as Table MU-1. To ensure that you use the most valid information refer to the latest HECP specifications provided by the ECTC or the manufacturer’s recommendation. The Alabama Department of Transportation (ALDOT) characterizes mulches based on performance levels identified in Sections 656 and 659 of their Standard Specifications for Highway Construction.

The choice of materials for mulching should be based on soil conditions, season, type of vegetation to establish, and size of the area. Properly applied and tacked mulch is always beneficial. Mulching is especially important when conditions of germination are not optimum, such as midsummer and early winter, and on difficult sites such as cut slopes, fill slopes and droughty soils.

Straw has traditionally been the most commonly used mulching material in conjunction with seeding. Wheat straw is the mostly commonly used straw, and can be spread by hand or with a mulch blower. If the site is susceptible to blowing wind, the straw should be tacked down with a tackifier, or a crimper to prevent loss.

Wood chips are suitable for areas that will not be closely mowed, and around ornamental plantings. Chips do not require tacking. Because they decompose slowly they must be treated with 12 pounds of nitrogen per ton to prevent nutrient deficiency in plants. They can be an inexpensive mulch if the chips are obtained from trees cleared on the site.

Compost, peanut hulls, and pine straw are organic materials that potentially make excellent mulches but may only be available locally or seasonally. Creative use of these materials may reduce costs.

Jute mesh or the various types of netting is very effective in holding mulch in place on waterways and slopes before grasses become established.

Erosion control blankets promote seedling growth in the same way as organic mulches and are suited for use in areas with concentrated flows (see Erosion Control Blanket practice).
Table MU-1 Hydraulic Erosion Control Products (HECP) Specification Chart

<table>
<thead>
<tr>
<th>Type HECP²</th>
<th>Term</th>
<th>Functional Longevity³</th>
<th>Typical Application Rates Lbs/acre (kg/ha)</th>
<th>Typical Maximum Slope Gradient (H:V)</th>
<th>Maximum Uninterrupted Slope Length (ft)</th>
<th>Maximum C Factor⁴,⁵ (3:1 test)</th>
<th>Minimum Vegetation Establishment⁶</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ultra Short</td>
<td>1 month</td>
<td>1500—2500 (1700—2800)</td>
<td>≤_4:1</td>
<td>2 0</td>
<td>0.75</td>
<td>150 %</td>
</tr>
<tr>
<td>2</td>
<td>Short Term</td>
<td>2 month</td>
<td>2000—3000 (2250—3400)</td>
<td>≤_3:1</td>
<td>2 5</td>
<td>0.5</td>
<td>150 %</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
<td>3 month</td>
<td>2000—3500 (2250—3900)</td>
<td>≤_2:1</td>
<td>5 0</td>
<td>0.15</td>
<td>200 %</td>
</tr>
<tr>
<td>4</td>
<td>Extended Term</td>
<td>6 month</td>
<td>2500—4000 (2800—4500)</td>
<td>≤_1:1</td>
<td>7 5</td>
<td>0.1</td>
<td>300 %</td>
</tr>
<tr>
<td>5</td>
<td>Long Term</td>
<td>12 month</td>
<td>3000—4500 (3400—5100)</td>
<td>≤_0.5:1</td>
<td>100</td>
<td>0.02</td>
<td>400 %</td>
</tr>
</tbody>
</table>

¹ This table is for general guidelines only. Refer to manufacturer for application rates, instructions, gradients, maximum continuous slope lengths and other site specific recommendations.

² These categories are independent of rolled erosion control products (RECPs) categories, despite the identical names.

³ A manufacturer’s estimated time period, based upon field observations, that a materials can be anticipated to provide erosion control as influenced by it composition and site-specific conditions.

⁴ “C” Factor calculated as ratio of soil loss from HECP protected slope (tested at specified or greater gradient, h:v) to ratio of soil loss from unprotected (control) plot based on large-scale testing.

⁵ Acceptable large-scale test methods may include ASTM D 6459, or other independent testing deemed acceptable by the engineer.

⁶ Minimum vegetation establishment is calculated as outlined in ASTM D 7322 being a percentage by dividing the plant mass per area of the protected plot by the plant mass per area of the control plot.

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(Source: Erosion Control Technology Council, August 2010)
Design Criteria

Site Preparation

Before mulching, complete the required site preparation. Site preparation includes grading, if needed, and seedbed preparation and fertilizing, liming and seeding if a planting is being made by means other than hydroseeding.

Spreading the Mulch

Select a mulch material based on the site and practice requirements, availability of material, and availability of labor and equipment. Table MU-2 lists commonly used mulches.

<table>
<thead>
<tr>
<th>Material</th>
<th>Rate Per Acre and (Per 1000 ft.²)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straw with Seed</td>
<td>1 ½-2 tons (70 lbs-90 lbs)</td>
<td>Spread by hand or machine to attain 75% groundcover; anchor when subject to blowing.</td>
</tr>
<tr>
<td>Straw Alone (no seed)</td>
<td>2 ½-3 tons (115 lbs-160 lbs)</td>
<td>Spread by hand or machine; anchor when subject to blowing.</td>
</tr>
<tr>
<td>Wood Chips</td>
<td>5-6 tons (225 lbs-270 lbs)</td>
<td>Treat with 12 lbs. nitrogen/ton.</td>
</tr>
<tr>
<td>Bark</td>
<td>35 cubic yards (0.8 cubic yard)</td>
<td>Can apply with mulch blower.</td>
</tr>
<tr>
<td>Pine Straw</td>
<td>1-2 tons (45 lbs-90 lbs)</td>
<td>Spread by hand or machine; will not blow like straw.</td>
</tr>
<tr>
<td>Peanut Hulls</td>
<td>10-20 tons (450 lbs-900 lbs)</td>
<td>Will wash off slopes. Treat with 12 lbs. nitrogen/ton.</td>
</tr>
<tr>
<td>HECPs</td>
<td>0.75 – 2.25 tons (35 lbs – 103 lbs)</td>
<td>Refer to ECTC or Manufacturer’s Specifications.</td>
</tr>
</tbody>
</table>

Uniformly spread organic mulches by hand or with a mulch blower at a rate which provides about 75% ground cover. Spread HECPs utilizing appropriate equipment and at rates as specified. When spreading straw mulch by hand, divide the area to be mulched into sections of approximately 1000 sq. ft. and place 70-90 pounds of straw (1 ½ to 2 bales) in each section to facilitate uniform distribution. Caution, an over-application of wheat straw will reduce stand success – do not over-apply wheat straw when mulching a seeding!

When straw mulch is subject to be blown away by wind, it must be anchored immediately after spreading. It is best anchored with a mulch anchoring tool.

Application of a commercial tackifier through a hydroseeder is often practical for steep slopes and can be effective on most sites. Binders (tackifiers) may be applied after mulch is spread or may be sprayed into the mulch as it is being...
blown onto the soil. Applying straw and binder together is the most effective method. Liquid binders include an array of commercially available synthetic binders and organic tackifiers.

In high wind situations like roadways, crimping the mulch is the best alternative as the use of mulch binders may still result in the mulch being rolled up on the edge.

Straw mulch may also be anchored with lightweight plastic, cotton, jute, wire or paper netting which is stapled over the mulch. The manufacturer’s recommendations on stapling netting should be followed.

**Maintenance**

Inspect all mulches periodically, and after rainstorms to check for rill erosion, dislocation, or failure. Where erosion is observed, apply additional mulch or if washout has occurred, repair the slope grade, reseed, and reinstall mulch. Continue inspections until vegetation is firmly established.
Outlet Protection (OP)

Practice Description

This practice is designed to prevent erosion at the outlet of a channel or conduit by reducing the velocity of flow and dissipating the energy. Outlet protection measures usually consist of a riprap-lined apron, a reinforced concrete flume with concrete baffles, a reinforced concrete box with chambers or baffles and possibly pre-manufactured products. This practice applies wherever high velocity discharge must be released on erodible material.

Planning Considerations

The outlets of pipes and structurally lined channels are points of critical erosion potential. Stormwater which is transported through man-made conveyance systems at design capacity generally reaches a velocity which exceeds the ability of the receiving channel or area to resist erosion. To prevent scour at stormwater outlets, a flow transition structure is required which will absorb the initial impact of the flow and reduce the flow velocity to a level which will not erode the receiving channel or area of discharge.

The most commonly used structure for outlet protection is an erosion resistant lined apron. These aprons are generally lined with loose rock riprap, grouted riprap or concrete. They are constructed at zero grade for a distance which is related to the outlet flow rate and the tailwater level. Criteria for designing these structures are contained in this practice. Several outlet conditions are shown in Figure OP-1. Example design problems for outlet protection are found at the end of this practice.
Where the flow is excessive for the economical use of an apron, excavated stilling basins may be used. Acceptable designs for stilling basins may be found in the following documents available from the U. S. Government Printing Office.

Design Criteria

Structurally lined aprons at the outlets of pipes and paved channel sections should be designed according to the following criteria:

Pipe Outlets

Capacity

The structurally lined apron should have the capacity to carry the peak stormflow from the 25-year 24-hour frequency storm or the storm specified in state laws or local ordinances or the design discharge of the water conveyance structure, whichever is greatest.

Tailwater

The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. Manning’s Equation may be used to determine tailwater depth. Manning’s Equation may be found in the practice Grass Swales. If the tailwater depth is less than half the diameter of the outlet pipe, it shall be classified as a Minimum Tailwater Condition. If the tailwater depth is greater than half the pipe diameter, it shall be classified as a Maximum Tailwater Condition. Pipes which outlet to flat areas, with no defined channel, may be assumed to have a Minimum Tailwater Condition.

Apron Length

The apron length should be determined from Figure OP-2 or OP-3 according to the tailwater condition.

Apron Thickness

The apron thickness should be determined by the maximum stone size (dmax), when the apron is lined with riprap. The maximum stone size shall be 1.5 x d50 (median stone size), as determined from Figure OP-2 or OP-3. The apron thickness shall be 1.5 x dmax.

When the apron is lined with concrete, the minimum thickness of the concrete shall be 4".
Figure OP-2 Outlet Protection Design for Tailwater < 0.5 Diameter

Curves may not be extrapolated.
**Apron Width**

If the pipe discharges directly into a well-defined channel, the apron should extend across the channel bottom and up the channel banks to an elevation 1 foot above the maximum tailwater depth or to the top of the bank, whichever is the least.

If the pipe discharges onto a flat area with no defined channel, the width of the apron should be determined as follows:

- The upstream end of the apron, adjacent to the pipe, should have a width 3 times the diameter of the outlet pipe.

- For a Minimum Tailwater Condition, the downstream end of the apron should have a width equal to the pipe diameter plus the length of the apron obtained from the figures.

- For a Maximum Tailwater Condition, the downstream end shall have a width equal to the pipe diameter plus 0.4 times the length of the apron from Figures OP-2 or OP-3.

![Figure OP-3](image)

*Figure OP-3  Outlet Protection Design for Tailwater ≥ 0.5 Diameter*
Bottom Grade

The apron should be constructed with no slope along its length (0.0% grade). The invert elevation of the downstream end of the apron shall be equal to the elevation of the invert of the receiving channel. There shall be no overfall at the end of the apron.

Side Slope

If the pipe discharges into a well-defined channel, the side slopes of the channel should not be steeper than 2:1 (Horizontal:Vertical).

Alignment

The apron should be located so that there are no bends in the horizontal alignment.

Geotextile

When riprap is used to line the apron, non-woven geotextile should be used as a separator between the graded stone, the soil subgrade, and the abutments. Geotextile should be placed immediately adjacent to the subgrade without any voids between the fabric and the subgrade. The geotextile will prevent the migration of soil particles from the subgrade into the graded stone. The geotextile shall be of the strength and durability required for the project to ensure the aggregate and soil base are stable. Generally, the non-woven geotextile should meet the requirements found in ASSHTO M288.

Materials

The apron may be lined with loose rock riprap, grouted riprap, or concrete. The median sized stone for riprap should be determined from the curves on Figure OP-2 and OP-3 according to the tailwater condition.

After the median stone size is determined, the gradation of rock to be used should be specified using Tables OP-2 and OP-3. Table OP-2 is used to determine the weight of the median stone size ($d_{50}$). Using this median weight, a gradation can be selected from Table OP-3, which shows the commercially available riprap gradations as classified by the Alabama Department of Transportation.

Stone for riprap should consist of field stone or rough unhewn quarry stone of approximately rectangular shape. The stone should be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering and it shall be suitable in all other respects for the purpose intended. The specific gravity of the individual stones should be at least 2.5.
When the apron is lined with concrete, the concrete should have a minimum compressive strength at 28 days of 3000 pounds per square inch. American Concrete Institute guidelines should be used to design concrete structures and reinforcement. As a minimum, the concrete should be reinforced with steel welded wire fabric.
### Table OP-2  Size of Riprap Stones

<table>
<thead>
<tr>
<th>Weight</th>
<th>Mean Spherical Diameter (feet)</th>
<th>Rectangular Shape</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Length</td>
</tr>
<tr>
<td>50</td>
<td>0.8</td>
<td>1.4</td>
</tr>
<tr>
<td>100</td>
<td>1.1</td>
<td>1.75</td>
</tr>
<tr>
<td>150</td>
<td>1.3</td>
<td>2.0</td>
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<tr>
<td>300</td>
<td>1.6</td>
<td>2.6</td>
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<tr>
<td>500</td>
<td>1.9</td>
<td>3.0</td>
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<td>7.6</td>
</tr>
<tr>
<td>20000</td>
<td>6.1</td>
<td>10.0</td>
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</tbody>
</table>

### Table OP-3  Graded Riprap

<table>
<thead>
<tr>
<th>Class</th>
<th>Weight (lbs.)</th>
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<tbody>
<tr>
<td></td>
<td>d_{10}</td>
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<tr>
<td>1</td>
<td>10</td>
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<tr>
<td>2</td>
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<tr>
<td>4</td>
<td>-</td>
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<tr>
<td>5</td>
<td>-</td>
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</tbody>
</table>
Appendix C    Permit Documentation
Appendix D  ADEM Forms
**Item I.**

<table>
<thead>
<tr>
<th>Permittee Name:</th>
<th>Facility/Site Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permit Number:</td>
<td>County:</td>
</tr>
<tr>
<td>Facility Entrance Latitude &amp; Longitude:</td>
<td>Phone Number:</td>
</tr>
</tbody>
</table>

Facility Street Address or Location Description:

**Item II.**

List name of current ultimate receiving water(s) (indicate if through MS4) and the number of disturbed acres which drains through each treatment system or BMP: Add additional sheet(s) if necessary.

<table>
<thead>
<tr>
<th>Receiving Water</th>
<th>Disturbed Acres</th>
<th>Discharge Point #</th>
<th>Representative Outfall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ YES □ NO</td>
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<td>□ YES □ NO</td>
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<td>□ YES □ NO</td>
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<td></td>
<td>□ YES □ NO</td>
</tr>
</tbody>
</table>

**Item III.**

1. □ YES □ NO Did discharges of sediment or other pollutants occur from the site? If “Yes”, please list a description of the discharge(s) and their location(s):

2. □ YES □ NO Were BMPs properly implemented and maintained at the time of inspection? If “No”, please provide location(s) and descriptions of BMPs that need maintenance:

3. □ YES □ NO Are BMPs needed in addition to those already present onsite at the time of inspection? If “Yes” please provide a description and location of additional BMPs that are needed:

4. □ YES □ NO Have any BMPs failed to operate as designed? If “Yes”, please provide location(s) and description of BMP(s) that failed:

5. □ YES □ NO Were there BMPs required by the CBMPP that were not installed or installed in a manner not consistent with the CBMPP? If “Yes”, please provide a description and location where the BMPs were not installed or installed incorrectly:

**Item IV.**

The Permitee shall conduct turbidity monitoring in accordance with Part V of the permit:

1. □ YES □ NO Is this facility a Priority Construction Site?
2. □ YES □ NO Has the facility disturbed greater than 10 acres?
3. □ YES □ NO Was the site discharging at the time of inspection?
4. □ YES □ NO Samples collected, if “Yes”, sampling data must be attached.
Item V.

Weather Conditions:

<table>
<thead>
<tr>
<th>Discharge Point #</th>
<th>Date, Time, and Location of Samples Collected</th>
<th>Sample Results</th>
<th>Analytical Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

"Based upon the inspection of (date & time) _______________________________ conducted by the QCP, QCI, or a qualified person (list:_______________________________________________________________) under the direct supervision of the QCP identified below. The QCI or QCP identified below certifies that effective structural and non-structural BMPs have been fully implemented and regularly maintained to the maximum extent practicable for the prevention and minimization of all sources of pollution in stormwater and authorized related process wastewater runoff, except for those deficiencies noted above, in accordance with the facility’s CBMPP, good sediment, erosion, and other pollution control practices, and the requirements of the permit. I certify that discharges have been tested or evaluated for the presence of non-stormwater and non-authorized process wastewaters. I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I certify that this form has not been altered, and if copied or reproduced, is consistent in format and identical in content to the ADEM approved form. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations."

<table>
<thead>
<tr>
<th>Name &amp; Designation of QCI or QCP</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Name &amp; Title of Permittee Responsible Official</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TERMINATION REQUEST – GENERAL PERMIT NUMBER ALR100000

NPDES PERMIT NUMBER ALR100000 IS A GENERAL PERMIT AUTHORIZING DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES THAT RESULT IN A TOTAL LAND DISTURBANCE OF ONE ACRE OR GREATER AND SITES LESS THAN ONE ACRE BUT ARE PART OF A LARGER COMMON PLAN OR DEVELOPMENT OR SALE

Mail to: Alabama Department of Environmental Management
Water Division
Post Office Box 301463
Montgomery, Alabama 36130-1463

PLEASE COMPLETE ALL QUESTIONS. RESPOND WITH “N/A” AS APPROPRIATE. INCOMPLETE OR INCORRECT ANSWERS, OR MISSING SIGNATURES WILL DELAY PROCESSING. IF SPACE IS INSUFFICIENT, CONTINUE ON AN ATTACHED SHEET(S) AS NECESSARY. ATTACH CBMPP AND OTHER INFORMATION AS NEEDED. PLEASE TYPE OR PRINT LEGIBLY IN INK.

Item I.

<table>
<thead>
<tr>
<th>Permitee Name</th>
<th>Facility/Site Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPDES Permit Number</td>
<td>Facility Street Address or Location Description</td>
</tr>
<tr>
<td>ALR10</td>
<td>City, State, and Zip Code</td>
</tr>
</tbody>
</table>

Item II.

1. Yes ☐ No ☐ Has all regulated activity authorized by this Permit at this facility been completed? (i.e. construction/industrial effects removed; solid waste/debris properly disposed; all disturbed areas have been fully reclaimed, permanently stabilized, or perennial vegetative cover established; and stormwater discharges do not represent an adverse impact to water quality.)

2. Yes ☐ No ☐ Has the Permittee lost operational control of the facility/site?

3. Yes ☐ No ☐ Has the Permittee lost legal responsibility for the facility/site?

If “Yes” to any or all of questions 2 or 3, in order for this termination request to be granted, the Name, Phone Number, and Address of the succeeding responsible permittee/operator(s) must be listed and the succeeding responsible operator must obtain coverage:

“I understand that discharging pollutants in storm water associated with regulated activity to waters of the State that is not authorized by NPDES permit coverage is a violation of State law. I also understand that the submittal of this request for termination does not release the operator from liability for any violations of this permit, ADEM Administrative Code Chapter 335-6-6, or other ADEM rules until a complete and correct request for termination of the permit is received by the Department. I understand that the permittee, operator, owner, developer, contractors, home builder(s), property owners association, etc., separately or collectively, must retain permit coverage for subdivision developments or other phased developments until all disturbance activity, including individual home construction, is substantially complete. I understand that should an inspection or complaint reveal significant noncompliance with ADEM rules, an environmental problem related to the discharge of stormwater from the site or that incorrect information has inadvertently been provided, implementation of remedial measures may be required, to include resubmittal of the NOI in order to correct any deficiencies, comply with federal stormwater permitting requirements, and provide for the protection of water quality. “I certify under penalty of law that this form, the CBMPP, and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the qualified credentialed professional (QCP) and other person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, correct, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine or imprisonment for knowing violations.

Name & Designation of QCP | Signature | Date |
---------------------------|-----------|------|

Name & Title of Responsible Official | Signature | Date |
-------------------------------------|-----------|------|

ADEM Form 21 11-11 Page 1 of 1
Appendix E    USDA Soils Reports
Custom Soil Resource Report for
Madison County, Alabama
Cecil Ashburn Drive / Sutton Road

April 11, 2018
Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.
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</tr>
<tr>
<td>Mv—Muskingum (Gorgas) stony fine sandy loam, 10 to 20 percent slopes, very stony</td>
<td>21</td>
</tr>
<tr>
<td>Oo—Ooltewah fine sandy loam</td>
<td>23</td>
</tr>
<tr>
<td>Rr—Rockland, limestone, hilly</td>
<td>24</td>
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<td>Rs—Rockland, limestone, steep</td>
<td>25</td>
</tr>
<tr>
<td>Sv—Stony rolling land, Talbott, and Colbert soil materials</td>
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</tr>
<tr>
<td>Ty—Tyler very fine sandy loam</td>
<td>27</td>
</tr>
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</tbody>
</table>
How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units).

Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil
scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and
identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.
The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: [Web Mercator (EPSG:3857)]

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Madison County, Alabama
Survey Area Data: Version 9, Oct 6, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 13, 2015—Jun 7, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.
### Map Unit Legend

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ac</td>
<td>Abernathy-Emory fine sandy loams, 0 to 2 percent slopes</td>
<td>5.8</td>
<td>3.3%</td>
</tr>
<tr>
<td>Al</td>
<td>Allen clay loam, severely eroded, rolling</td>
<td>3.4</td>
<td>1.9%</td>
</tr>
<tr>
<td>Am</td>
<td>Allen fine sandy loam, undulating</td>
<td>3.7</td>
<td>2.1%</td>
</tr>
<tr>
<td>An</td>
<td>Allen fine sandy loam, eroded, undulating</td>
<td>13.8</td>
<td>7.9%</td>
</tr>
<tr>
<td>Ar</td>
<td>Allen stony fine sandy loam, eroded, rolling</td>
<td>2.9</td>
<td>1.7%</td>
</tr>
<tr>
<td>Jf</td>
<td>Jefferson fine sandy loam, eroded, undulating</td>
<td>4.3</td>
<td>2.5%</td>
</tr>
<tr>
<td>Mv</td>
<td>Muskingum (Gorgas) stony fine sandy loam, 10 to 20 percent slopes, very stony</td>
<td>1.2</td>
<td>0.7%</td>
</tr>
<tr>
<td>Oo</td>
<td>Ooltewah fine sandy loam</td>
<td>1.4</td>
<td>0.8%</td>
</tr>
<tr>
<td>Rr</td>
<td>Rockland, limestone, hilly</td>
<td>1.1</td>
<td>0.6%</td>
</tr>
<tr>
<td>Rs</td>
<td>Rockland, limestone, steep</td>
<td>132.4</td>
<td>76.0%</td>
</tr>
<tr>
<td>Sv</td>
<td>Stony rolling land, Talbott, and Colbert soil materials</td>
<td>3.9</td>
<td>2.3%</td>
</tr>
<tr>
<td>Ty</td>
<td>Tyler very fine sandy loam</td>
<td>0.1</td>
<td>0.1%</td>
</tr>
<tr>
<td><strong>Totals for Area of Interest</strong></td>
<td></td>
<td><strong>174.1</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

### Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called
noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a soil series. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into soil phases. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can
be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.
Madison County, Alabama

Ac—Abernathy-Emory fine sandy loams, 0 to 2 percent slopes

Map Unit Setting

- National map unit symbol: 2sr8s
- Elevation: 480 to 1,070 feet
- Mean annual precipitation: 50 to 65 inches
- Mean annual air temperature: 57 to 64 degrees F
- Frost-free period: 195 to 240 days
- Farmland classification: All areas are prime farmland

Map Unit Composition

- Abernathy and similar soils: 60 percent
- Emory and similar soils: 25 percent
- Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Abernathy

Setting

- Landform: Depressions, drainageways
- Landform position (two-dimensional): Toeslope
- Landform position (three-dimensional): Base slope
- Down-slope shape: Concave, linear
- Across-slope shape: Linear
- Parent material: Alluvium over residuum weathered from limestone

Typical profile

- Ap - 0 to 6 inches: fine sandy loam
- Bw - 6 to 20 inches: silt loam
- 2Ab - 20 to 34 inches: silty clay loam
- 2Btb - 34 to 80 inches: silty clay loam

Properties and qualities

- Slope: 0 to 2 percent
- Depth to restrictive feature: More than 80 inches
- Natural drainage class: Well drained
- Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
- Depth to water table: About 30 to 39 inches
- Frequency of flooding: None
- Frequency of ponding: Occasional
- Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
- Available water storage in profile: High (about 9.8 inches)

Interpretive groups

- Land capability classification (irrigated): None specified
- Land capability classification (nonirrigated): 3w
- Hydrologic Soil Group: C
- Hydric soil rating: No
Description of Emory

Setting

Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Alluvium derived from limestone over residuum weathered from limestone

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw - 8 to 31 inches: silt loam
2Ab - 31 to 42 inches: silty clay loam
2Btb - 42 to 80 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 60 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydric Soil Group: B
Hydric soil rating: No

Minor Components

Decatur

Percent of map unit: 10 percent
Landform: Interfluvies
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Allen

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No
Al—Allen clay loam, severely eroded, rolling

Map Unit Setting

*National map unit symbol:* kk91
*Elevation:* 700 to 1,230 feet
*Mean annual precipitation:* 46 to 56 inches
*Mean annual air temperature:* 57 to 64 degrees F
*Frost-free period:* 180 to 220 days
*Farmland classification:* Farmland of statewide importance

Map Unit Composition

*Allen and similar soils:* 85 percent
*Minor components:* 1 percent

Estimates are based on observations, descriptions, and transects of the map unit.

Description of Allen

Setting

*Landform:* Hills
*Landform position (two-dimensional):* Shoulder
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear
*Across-slope shape:* Convex
*Parent material:* Alluvium derived from sandstone and shale

Typical profile

*H1 - 0 to 7 inches:* clay loam
*H2 - 7 to 25 inches:* loam
*H3 - 25 to 60 inches:* clay

Properties and qualities

*Slope:* 6 to 12 percent
*Depth to restrictive feature:* More than 80 inches
*Natural drainage class:* Well drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.57 to 1.98 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water storage in profile:* Moderate (about 8.8 inches)

Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 3e
*Hydrologic Soil Group:* B
*Hydric soil rating:* No
Minor Components

Lee

Percent of map unit: 1 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: Yes

Am—Allen fine sandy loam, undulating

Map Unit Setting

National map unit symbol: kk92
Elevation: 700 to 1,230 feet
Mean annual precipitation: 46 to 56 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 180 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Allen and similar soils: 90 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Allen

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 7 inches: fine sandy loam
H2 - 7 to 25 inches: loam
H3 - 25 to 60 inches: clay

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components
Lee
Percent of map unit: 1 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: Yes

An—Allen fine sandy loam, eroded, undulating

Map Unit Setting
National map unit symbol: kk93
Elevation: 700 to 1,230 feet
Mean annual precipitation: 46 to 56 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 180 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Allen and similar soils: 85 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Allen
Setting
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Alluvium derived from sandstone and shale

Typical profile
H1 - 0 to 7 inches: fine sandy loam
H2 - 7 to 25 inches: loam
H3 - 25 to 60 inches: clay
Properties and qualities

- **Slope:** 2 to 6 percent
- **Depth to restrictive feature:** More than 80 inches
- **Natural drainage class:** Well drained
- **Runoff class:** Low
- **Capacity of the most limiting layer to transmit water (Ksat):** Moderately high to high (0.57 to 1.98 in/hr)
- **Depth to water table:** More than 80 inches
- **Frequency of flooding:** None
- **Frequency of ponding:** None
- **Available water storage in profile:** Moderate (about 8.8 inches)

Interpretive groups

- **Land capability classification (irrigated):** None specified
- **Land capability classification (nonirrigated):** 2e
- **Hydrologic Soil Group:** B
- **Hydric soil rating:** No

Minor Components

- **Lee**
  - **Percent of map unit:** 1 percent
  - **Landform:** Flood plains
  - **Landform position (two-dimensional):** Toeslope
  - **Landform position (three-dimensional):** Talf
  - **Down-slope shape:** Convex
  - **Across-slope shape:** Linear
  - **Hydric soil rating:** Yes

**Ar—Allen stony fine sandy loam, eroded, rolling**

Map Unit Setting

- **National map unit symbol:** kk96
- **Elevation:** 700 to 1,230 feet
- **Mean annual precipitation:** 46 to 56 inches
- **Mean annual air temperature:** 57 to 64 degrees F
- **Frost-free period:** 180 to 220 days
- **Farmland classification:** Not prime farmland

Map Unit Composition

- **Allen, (nella), and similar soils:** 85 percent
- **Minor components:** 1 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Allen, (nella)

Setting

- **Landform:** Hills
- **Landform position (two-dimensional):** Shoulder
- **Landform position (three-dimensional):** Side slope
**Down-slope shape:** Linear  
**Across-slope shape:** Convex  
**Parent material:** Alluvium derived from sandstone and shale

**Typical profile**  
- **H1** - 0 to 7 inches: cobbly fine sandy loam  
- **H2** - 7 to 25 inches: cobbly clay loam  
- **H3** - 25 to 60 inches: cobbly clay loam

**Properties and qualities**  
- **Slope:** 6 to 12 percent  
- **Depth to restrictive feature:** More than 80 inches  
- **Natural drainage class:** Well drained  
- **Runoff class:** Low  
- **Capacity of the most limiting layer to transmit water (Ksat):** Moderately high to high (0.57 to 1.98 in/hr)  
- **Depth to water table:** More than 80 inches  
- **Frequency of flooding:** None  
- **Frequency of ponding:** None  
- **Available water storage in profile:** Moderate (about 6.8 inches)

**Interpretive groups**  
- **Land capability classification (irrigated):** None specified  
- **Land capability classification (nonirrigated):** 4e  
- **Hydric Soil Group:** B  
- **Hydric soil rating:** No

**Minor Components**  
- **Lee**  
  - **Percent of map unit:** 1 percent  
  - **Landform:** Flood plains  
  - **Landform position (two-dimensional):** Toeslope  
  - **Landform position (three-dimensional):** Talf  
  - **Down-slope shape:** Convex  
  - **Across-slope shape:** Linear  
  - **Hydric soil rating:** Yes

---

**Jf—Jefferson fine sandy loam, eroded, undulating**

**Map Unit Setting**  
- **National map unit symbol:** kkd5  
- **Elevation:** 900 to 1,800 feet  
- **Mean annual precipitation:** 46 to 56 inches  
- **Mean annual air temperature:** 57 to 64 degrees F  
- **Frost-free period:** 180 to 220 days  
- **Farmland classification:** All areas are prime farmland

**Map Unit Composition**  
- **Jefferson, (holston), and similar soils:** 85 percent  
  Estimates are based on observations, descriptions, and transects of the mapunit.
Description of Jefferson, (holston)

Setting

Landform: Stream terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy colluvium derived from sandstone and shale

Typical profile

H1 - 0 to 10 inches: fine sandy loam
H2 - 10 to 26 inches: loam
H3 - 26 to 60 inches: gravelly clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 9.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Mv—Muskimung (Gorgas) stony fine sandy loam, 10 to 20 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2sr8b
Elevation: 490 to 1,940 feet
Mean annual precipitation: 45 to 56 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Muskimung (gorgas) and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.
Description of Muskingum (gorgas)

Setting
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy residuum weathered from sandstone

Typical profile
A - 0 to 6 inches: stony fine sandy loam
Bt - 6 to 16 inches: sandy loam
R - 16 to 80 inches: bedrock

Properties and qualities
Slope: 10 to 20 percent
Percent of area covered with surface fragments: 3.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.07 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very low (about 1.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Hartsells
Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Apison
Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No
Enders

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Oo—Ooltewah fine sandy loam

Map Unit Setting
National map unit symbol: kkdn
Elevation: 700 to 1,230 feet
Mean annual precipitation: 46 to 56 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Ooltewah, (chenneby ponded), and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ooltewah, (chenneby Ponded)

Setting
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile
H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 60 inches: loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 18 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: High (about 10.7 inches)
Custom Soil Resource Report

Interpretive groups
- Land capability classification (irrigated): None specified
- Land capability classification (nonirrigated): 4w
- Hydrologic Soil Group: B/D
- Hydric soil rating: Yes

Rr—Rockland, limestone, hilly

Map Unit Setting
- National map unit symbol: kndx
- Elevation: 500 to 1,200 feet
- Mean annual precipitation: 46 to 56 inches
- Mean annual air temperature: 57 to 64 degrees F
- Frost-free period: 180 to 220 days
- Farmland classification: Not prime farmland

Map Unit Composition
- Barfield and similar soils: 80 percent
- Minor components: 1 percent
- Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barfield

Setting
- Landform: Hills
- Landform position (two-dimensional): Shoulder
- Landform position (three-dimensional): Side slope
- Down-slope shape: Linear
- Across-slope shape: Convex
- Parent material: Residuum weathered from limestone

Typical profile
- H1 - 0 to 6 inches: silty clay
- H2 - 6 to 18 inches: stony clay
- H3 - 18 to 28 inches: unweathered bedrock

Properties and qualities
- Slope: 12 to 25 percent
- Depth to restrictive feature: 8 to 20 inches to lithic bedrock
- Natural drainage class: Well drained
- Runoff class: Very high
- Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
- Depth to water table: More than 80 inches
- Frequency of flooding: None
- Frequency of ponding: None
- Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups
- Land capability classification (irrigated): None specified
- Land capability classification (nonirrigated): 6s
- Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Lee

Percent of map unit: 1 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: Yes

Rs—Rockland, limestone, steep

Map Unit Setting

National map unit symbol: kkdy
Elevation: 500 to 1,200 feet
Mean annual precipitation: 46 to 56 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 180 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Barfield and similar soils: 80 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barfield

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Residuum weathered from limestone

Typical profile

H1 - 0 to 6 inches: silty clay
H2 - 6 to 18 inches: clay
H3 - 18 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 40 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups
- Land capability classification (irrigated): None specified
- Land capability classification (nonirrigated): 7s
- Hydrologic Soil Group: D
- Hydric soil rating: No

Minor Components

Lee
- Percent of map unit: 1 percent
- Landform: Flood plains
- Landform position (two-dimensional): Toeslope
- Landform position (three-dimensional): Talf
- Down-slope shape: Convex
- Across-slope shape: Linear
- Hydric soil rating: Yes

Sv—Stony rolling land, Talbott, and Colbert soil materials

Map Unit Setting
- National map unit symbol: kkf3
- Elevation: 500 to 1,200 feet
- Mean annual precipitation: 46 to 56 inches
- Mean annual air temperature: 57 to 64 degrees F
- Frost-free period: 180 to 220 days
- Farmland classification: Not prime farmland

Map Unit Composition
- Barfield and similar soils: 85 percent
- Minor components: 1 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barfield

Setting
- Landform: Hills
- Landform position (two-dimensional): Shoulder
- Landform position (three-dimensional): Side slope
- Down-slope shape: Linear
- Across-slope shape: Convex
- Parent material: Residuum weathered from limestone

Typical profile
- H1 - 0 to 6 inches: stony silty clay
- H2 - 6 to 18 inches: stony silty clay
- H3 - 18 to 28 inches: unweathered bedrock
Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Lee

Percent of map unit: 1 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: Yes

Ty—Tyler very fine sandy loam

Map Unit Setting

National map unit symbol: kkfj
Elevation: 700 to 1,200 feet
Mean annual precipitation: 46 to 56 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 180 to 220 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Tyler, (taft), and similar soils: 90 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tyler, (taft)

Setting

Landform: Stream terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium derived from sedimentary rock

Typical profile
H1 - 0 to 8 inches: very fine sandy loam
H2 - 8 to 30 inches: silt loam
H3 - 30 to 60 inches: loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Natural drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 12 to 13 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components
Guthrie
Percent of map unit: 1 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Convex
Across-slope shape: Concave
Hydric soil rating: Yes
References


Appendix F   Daily Observation Logs
<table>
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<tr>
<th>DATE</th>
<th>RAINFALL (INCHES)</th>
<th>TIME OF OBSERVATION</th>
<th>OBSERVED BY</th>
<th>SITE ACTIVITY NOTES</th>
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Appendix G  BMP Inspection Reports
Appendix H  Corrective Actions Log
## CORRECTIVE ACTIONS LOG

**CECIL ASHBURN DRIVE WIDENING PROJECT - HUNTSVILLE, MADISON COUNTY, ALABAMA**

<table>
<thead>
<tr>
<th>SITE</th>
<th>DEFICIENCY</th>
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**NOTE:** Unless otherwise specified by ADEM, temporary and nonstructural BMPs will be repaired within seven (7) days of an observed deficiency.
Appendix I       Plan Review Documentation
This table logs the review and evaluation of the Construction Best Management Practices Plan for the *Cecil Ashburn Widening Project* construction site and documents the amendments that have been applied. Technical amendments require certification by a Professional Engineer licensed in the State of Alabama. Insert all amendment documentation and/or Professional Engineer certification in Appendix I.

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<th>REVIEWER NAME</th>
<th>REVIEWER SIGNATURE</th>
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<th>DESCRIBE AMENDMENTS</th>
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