



## **Appendix B: Response to Comments (Public Review Period)**



**STATE OF TENNESSEE  
DEPARTMENT OF TRANSPORTATION  
ENVIRONMENTAL DIVISION**

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**Response to Comments (Public Review Period) on the  
Tennessee Department of Transportation  
Statewide Storm Water Management Plan**

**May 2007**

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## General Comments on the SSWMP

### A. Erosion Control Measures

**Knox County Department of Engineering and Public Works (Tom Leonard, Sevier County; Rodney Rockett):** The Environmental Protection Agency has tested and evaluated compost-based erosion control measures in side-by-side comparisons with traditional measures, and has found them to be equal or superior to those traditional measures in managing stormwater, controlling erosion, and establishing vegetation. The cities of Gatlinburg, Pigeon Forge, Sevierville and Sevier County Public Works and Sanitation departments and the Knox County Department of Engineering and Public Works, Solid Waste Division strongly recommends that the following EPA-approved and recommended BMPs (courtesy USEPA website) are included in the final plan:

[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet\\_results&view=specific&bmp=118](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=118)

[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet\\_results&view=specific&bmp=119](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=119)

**TDOT Response:** Agree, and EC Compost is addressed though not necessarily included in Design Division Materials or on the CGP.

Texas A&M did a research project looking at this and the compost berms are not stable under the conditions shown. Apparently, the berm in the picture was established and vegetated before it was tested. However, our experience is that compost berms in any kind of concentrated flow that will build up behind the berm to a significant depth will cause the berm to fail.

[http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet\\_results&view=specific&bmp=120](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=120)

**TDOT Response:** This is included in the construction manual and has been proven. It has been adopted by TDOT.



### B. Summary Observations on New SSWMP

**WWF & HRWA:** Tennessee is home to some of the world's most diverse aquatic ecosystems, including many endangered and threatened species. However, their biological integrity is being threatened by a number of factors, one of which is storm water pollution and its subsequent impact on water bodies. Storm water management is critical to the ecological health of watersheds. Sediment is the largest pollutant of waters within the state, and is conveyed to streams via storm

water. Other pollutants in storm water, such as oils, gasoline, fertilizers pesticides, also have adverse effects on the ecosystem. However, there are positive measures that can be taken to reduce the impacts caused by storm water. The Statewide Storm Water Management Plan (SSWMP) is a vital step to protecting the drinking water sources, recreation opportunities, and ecological biodiversity. Below are some summary observations on the new plan.

### **1. Prevention over Remediation**

**WWF & HRWA:** We were pleased to read that overall the SSWMP identified prevention of erosion as a priority over remediation. Might we suggest that the Tennessee Department of Transportation (TDOT) stress prevention and avoiding areas of ecological exceptional significance even more throughout the plan and acknowledge that carefully implemented measures during the planning and design stages will protect the resource, save money, and prevent project delays.

**TDOT Response:** TDOT coordinates reviews with the Natural Heritage Program and will have data sets through the Statewide Environmental Management System project to help identify sensitive areas during project planning and development.

### **2. Involving Stakeholders Earlier in the Design Process**

**WWF & HRWA:** We are very pleased to see the desire on the part of TDOT to involve parties earlier in the design process, when plans can be easily and economically adjusted. We recommend that biologists of specialized training be involved with engineers in the design process early on to facilitate ecologically minded, successful projects. We believe that this collaboration will protect the resource and improve project efficiency, cost, and timeliness.

**TDOT Response:** Biologists from the Ecology Group within the Environmental Division are included in the IPPT. Per recommendations in the SSWMP, they are integrated into the project planning earlier in the planning process.

### **3. Installation, Maintenance, Inspections, and Enforcement**

**WWF & HRWA:** The SSWMP introduces many technological methods of addressing storm water issues, but mentions that failure is due most frequently to poor installation and maintenance. We strongly recommend that TDOT require comprehensive erosion control training classes to contractors, includes a field laboratory component, to promote awareness of proper installation and maintenance. More frequent and comprehensive inspections with forceful enforcement may be a key part of the success of the program.

**TDOT Response:** Training is being developed to address these issues.

### **4. Quantitative Values for Storm Water Standards**

**WWF & HRWA:** While the Clean Water Act (CWA) allows for use of qualitative inspections for pollution, to eliminate ambiguity, one option TDOT should implement is the establishment and use of quantitative standards for pollutants. We suggest that standards be established based upon the ambient environment, allowing no more than a given percent over the background or pre-construction

conditions. For example, three other states in the region – Alabama, Florida, and North Carolina – have numeric turbidity criteria. Tennessee should not lag behind measuring this important parameter, given it measures what is often cited as the state’s greatest water pollution problem.

**TDOT Response:** The establishment of effluent guidelines for construction is under the purview of the USEPA and TDEC.

#### **5. Exclusive Use of Native Plants along Roadways/Right of Ways/Buffer Strips**

**WWF & HRWA:** The SSWMP is inconsistent on stressing the benefits of native plants in roadside settings and in mitigation and restoration efforts. We recommend that native plants be required for all remediation. These plants present significant benefits regarding erosion control, habitat, beautification, and reduced long-term costs of maintenance.

**TDOT Response:** The use of native plants for revegetation of roadsides is expensive, and somewhat impractical for a variety of reasons.

First the highway and the immediate roadside is a structure that has been treated, sloped, compacted and stabilized to provide a safe, stable driving surface and safety runoff zones. The soil and micro climatic conditions that exist on the roadside are hostile to many native species that may be growing in adjacent areas or the immediate eco-region.

From an ecological perspective, the construction of a highway constitutes what some ecologists refer to as a “catastrophic event”. This means simply that a new successional process is begun. In a new successional process, pioneer species move in and prepare the soil and micro-climatic conditions for other species to follow eventually reaching what is called a “climax community”. The lesson in this for roadside managers (and that is not always recognized by those who press for the use of native species) on the roadside is that we must begin our revegetation efforts with pioneer species, many of which are considered invasives or exotics, because they are either not present or underrepresented in mature diverse vegetative communities, which characterize what would be considered native plant communities. In other words on the roadside we must do our initial planting using pioneer species in order to prepare for the invasion of natives which will come from the native seed bank as the new succession progress and matures.

Research at Texas A&M University’s Texas Transportation Institute has on-going research that is clearly demonstrating these principles. One project completed (Project No. 0-5212) compared bermudagrass, often considered an exotic species because it was introduced from Africa, four other mixes of native grasses and forbs. In the initial year, the bermudagrass thrived and invaded the other plots along with other weedy pioneer species. However, by the fifth year, the bermudagrass had all but disappeared from the native plots and native grammagrass and switchgrass had invaded and begun to take over the bermudagrass plot. It is also important to note that these plots were on very steep slopes and were not ever mowed, watered or fertilized.

Work continues but what the researchers are concluding is that if a good pioneer community is established it will prepare the roadside for a transition to native species if there is proper mowing and minimum disturbance. Much of the native material that moves into the mix comes from the seed bank of the topsoil and adjacent plant community. Planted natives do not seem to appear in numbers representative of the seed planted.

The primary safety and environmental concern of TDOT during construction and in the immediate post construction period is establishing a sustainable vegetation community of pioneer species that will prevent erosion and prepare the soil and micro-climatic conditions of the roadside so that a natural succession to a diverse, sustainable community of native species will emerge. It should be understood that achieving the goal of a roadside dominated by adapted native plant species requires an extended period of time that goes far beyond the close of construction and that achieving the goal is more a function of cultural and mowing practice than of the species planted.

The rationale document included in the SSWMP also makes a specific recommendation for development of a directed research program aimed at developing seed mixes and maintenance practices that will achieve the goal of establishing sustainable roadside vegetation communities dominated by native species.

#### **6. Concern for Nutrient Loading Potential**

**WWF & HRWA:** Several of the suggested erosion mitigation methods utilize composts mixed with biosolids or manure. We can imagine situations in which the use of those materials could have a net negative effect. For example, nutrient leaching could lead to degradation of water quality to the receiving body due to eutrophication. We recommend not using these types of erosion control methods within the buffer zones of streams.

**TDOT Response:** This has been clearly stated in our response regarding the use of compost as an erosion control material particularly the EPA suggestion of using compost as filter berms in swales and channel. Not only are nutrients a problem, particularly phosphorous, but the compost itself can be come a pollutant if it is washed out and into an adjacent water body.

#### **7. Size and Location of Buffer Strips**

**WWF & HRWA:** The SSWMP mentions a variety of different methods of applying buffer strips. We suggest the use of buffer zones on along all waterways in addition to impaired or high quality streams. Buffer zones should be sized depending upon the drainage area and slope. For example, a system that has been adopted by Williamson County, which uses 50 feet on either side for one acre or less of drainage, 75 feet if one to five acres are drained, and 100 feet of buffer for more than five acres of drainage. Additionally, we recommend that construction activities, such as road building or cut and fill storage, be prohibited inside the Federal Emergency Management Agency (FEMA) designated 100-year floodplain.

**TDOT Response:** TDOT projects are linear projects. Most projects cross-streams perpendicularly and do not parallel them. Note that the SSWMP includes two different types of buffers with different water quality goals: grass buffer strips provide sediment control along the perimeter of construction sites; water quality buffers as described in the TN CGP are protected strips of mixed vegetation along streams that provide stream protection, not sediment control.

### **8. The Consent Order**

#### **Sierra Club (Brian Paddock):**

a) What happens to the consent order after this goes to TDEC and they work their will on it?

b) Do you think there will be a document or something that shows what is left of the consent order in terms of pieces that are still -- have some ongoing vitality?

**Response from TDEC (Ken Pointer):** The consent order will cease to be in its current form when TDEC approves the SSWMP, and when -- that point in time I suppose we will issue a letter to TDOT stating that basically the amended consent order has been superceded by the SSWMP and there are some components of the consent order that will still be in play, but for the most part, the SSWMP will take the place of the amended consent order, and that is the intent of the amended consent order, that TDOT should go forth and produce a Statewide Storm Water Management Plan. Secondly, yes, there will be a document, and I suppose that will be in our acceptance letter and transmittal letter of that acceptance, in fact, TDOT is stating what remains to be done, search projects, there are other things that will be a continued effort that were instigated by the amended consent order.

## **C. Public Participation**

### **1. Complaints**

**Sierra Club (Brian Paddock):** [As told to the court reporter] Just a couple of general comments, and I did not have a chance to review all of the other drafts manuals, so my omission of comments shouldn't suggest that they are -- they couldn't use some additional comments, but I can't do it tonight. There does not appear to be anything in the environmental procedure manual that reflects how a public complaint about erosion and sediment or other environmental damage in the course of a TDOT project should be handled and how it should be acknowledged in terms of compliance with the law, and it's not clear that the Statewide Environmental Management System that they are putting together has a place to record public complaints and the outcome of the investigation of those complaints, and the acknowledgment of those complaints as being of concern and whether corrective action was needed. Maybe that is not the place for it. Maybe they have sent it someplace else, but I think that a system where if a passer by comes and sees that there is a lot of mud in a stream which is, in fact, part of the way the whole lawsuit and consent order came into existence was public outcry, needs to be acknowledged as having a place in the environmental management system and in keeping track of compliance with environmental standard.

**TDOT Response:** Public comments on a specific project should be conveyed through TDOT's Public Affairs. The complaint will be provided to the Environmental Coordinator for investigation and corrective action as needed.

## **2. Training**

**Sierra Club (Brian Paddock):** The other comment is that there was some description of a series of trainings that will be available to [TDOT], [TDEC], and contractors staff, engineers and so forth, and I would like to see after the training system is not quite so fully loaded by the people that have to have it right at the beginning, that there might be some opportunity for members of the public particularly who are active in watching TDOT projects and what happens to them and so forth, to have a chance to attend.

**TDOT Response:** These training courses are technical in nature and will be designed very specifically for the TDOT/TDEC audience. At some point in the future, TDOT may make these training opportunities available to the public. However, the goal of the training is to specifically train TDOT staff on stormwater planning, design and implementation on linear construction projects, while also providing the training to TDEC.

## **3. Stream Relocation**

**Sierra Club (Brian Paddock):** Also the stream mitigation where you build another channel for a stream which is, I believe, the sixth workshop he described would, I think, be of a good deal of interest to people who are concerned with the streams in Tennessee and with the ones that have to be relocated by TDOT in the course of a project, and this assurance of a good effort to try to maintain all the environmental value of a flowing stream in its natural state, even though you have moved it someplace else and put it in a different channel that's a very, very, difficult environmental achievement. It's not generally regarded and even good engineers and scientists can do as good a job as mother nature does with how streams function and the kinds of things that live in them, and the kinds of things that live along their banks.

**TDOT Response:** These training courses are technical in nature and will be designed very specifically for the TDOT/TDEC audience. At some point in the future, TDOT may make these training opportunities available to the public. However, the goal of the training is to specifically train TDOT staff on stormwater planning, design and implementation on linear construction projects, while also providing the training to TDEC.

## **4. Workshops, Training, Regulations**

**Sierra Club (Brian Paddock):** So I would hope that people who are not directly related with TDOT projects would at some point get a chance to participate in those workshops, get that training, and see the kinds of standards and suggestions and guidance that is held out to TDOT staff for those kinds of things. There are a number of water quality -- people that teach water quality issues in colleges and universities, there are people involved in water protection kinds of environmental organizations, and I think a number of them would be very

interested to be able to come and sit and watch those trainings particularly the ones on stream relocation. Thank you very much.

**TDOT Response:** Through the TDEC / Corps of Engineers Public Notice Process, the public has an opportunity to provide comments on any stream relocation activities. The training courses will not be the appropriate forum for receiving public comments. However, in the future, TDOT may make these training opportunities available to the public to provide the technical design aspects of stream mitigation and relocation projects.

## I. Comments on Program Rationale, Evaluations, and Recommendations

### Section 1.1.1 Past Planning Practices Evaluation

#### Page 1-2, 3

“Consideration of sensitive resources early in project development will reduce development time and overall costs of highway projects. Furthermore, incorporating such factors into project planning can reduce the impacts of highway projects and will result in projects that are more compatible with natural and cultural environments while serving the public in a safe and efficient manner.”

AND:

“Storm water management planning should begin with the initial phases of transportation project planning.”

AND:

“It is important to note that, while NEPA is required only for projects that include federal funding, the same early planning processes should apply to projects that do not include federal funding to ensure they are also compatible with environmental protection goals.”

**World Wildlife Fund and Harpeth River Watershed Association (WWF & HRWA):** These positive changes in philosophy and outlook can dramatically reduce the environmental impacts of highway and road construction activities. We are pleased that TDOT is progressing to higher levels of environmental consideration, and commend them for their efforts. Storm water runoff and the subsequent pollution to adjacent receiving waters is a leading cause of impairment to waters of the state. We agree that storm water management should become an integral component of the planning phase, which will reduce overall costs and achieve maximum gain in protecting water quality. Additionally, storm water management activities and follow-up should be a continued procedure during the construction and post-construction phases. Holding consistent, conscience regulations that are incorporate environmental considerations and impacts early in the planning and throughout the implementation stages will be to all parties' benefit.

**TDOT Response:** Agreed. Storm water management will become a part of project planning phase.

### Section 1.3.3.4 Recommendations for predicting the impact of increased flows

#### Page 1-11 Hydraulic Evaluation Criteria

**ETI Corporation (Stacey Morris, P.E.):** Paragraph 1.3.3.4, under the subparagraph titled “Hydraulic Evaluation Criteria” the Draft SSWMP states “Roadway construction produces a 10% or greater increase in peak flow volume for the design year storm event at any outfall”. Based on the wording of this statement, it appears only the peak flows into adjacent streams are being evaluated. The CGP (paragraph 3.5.4) for waters impaired by sediment or habitat alteration due to in-channel erosion states the SWPPP “shall include a description of measures that will be installed during the construction process to control pollutants and any increase in the volume of storm water discharges that will occur after construction operations have been completed.” Since the total runoff volume a stream is being required to accommodate has a direct effect on the channel characteristics (i.e., bank erosion, bed load, deposition, etc.), it appears this statement in the Draft SSWMP may need to be modified to address not only increases in peak runoff volumes but also increases in total runoff volume. Measures to increase infiltration may have to be included in the design of the roadway in order to remain in compliance with the CGP.

**TDOT Response:** Under their NPDES Phase 2 MS4 permit, TDOT must identify post-construction water quality BMPs that may include infiltration BMPs. However, it must be considered that many areas of the state have native soils that have poor infiltration rates. Larger TDOT projects, such as interchanges, often have infiltration areas built into the design in the inner portions of the ramps.

### Section 1.3.1 Recommendations to incorporate checks and balances into the PPRM

#### Page 1-6

“We recommend incorporating checks and balances into the project planning design and construction processes to ensure the PPRM is being followed.”

**WWF & HRWA:** We concur with statement. A greater level of communication would allow for increased efficiency and better results regarding adherence to environmental considerations early in the planning stages. If either WWF or HRWA can be of assistance in these processes, please contact us.

**TDOT Response:** Agreed.

### Section 1.3.3 Recommendations on interdisciplinary team protocols to predict the impact of discharging increased flows during and after construction.

#### Page 1-12

“TDOT should follow their own guidance on storm water design and communicate these design standards and goals to each jurisdiction crossed by the project.”

**WWF & HRWA:** We agree in principal that TDOT should adopt consistent standards for storm water design, particularly when projects may pass through multiple jurisdictions (as mentioned on page 1-12). We recommend TDOT evaluate the standards for each jurisdiction affected and adopt the standards, which are most protective of aquatic fauna and water quality for use as a consistent protocol throughout the entire project.

**TDOT Response:** TDOT feels that their design standards and goals are the best fit for TDOT projects and more protective of aquatic resources than many of the jurisdictions in TN.

### Section 1.4.1.2 Stream Determinations and Mitigation

#### Page 1-15

“Natural stream channel design should be used for all stream relocations greater than 50 ft. to avoid payment into the in-lieu-fee program for relocations.”

**WWF & HRWA:** Although fifty feet may be a short distance in the overall length of a stream, natural stream channel design should be incorporated into all stream locations to the extent practicable (as recommended on page 1-16). The in-lieu-fee program should be used not as the first choice over mitigation obligations, but rather as a means of alleviating unavoidable damages. This document should contain stronger language and action to minimize the destruction of stream banks, allow no unmitigated sections (even if less than 50 feet), and provide economic incentives for conservation by increasing the cost structure of the fee-in-lieu program (much greater fees than \$200/ft).

**TDOT Response:** The Mitigation Practices Chapter contains procedures for designing and constructing stream channels at culvert inlets and outlets (within the 50 ft. range). The 50-ft reference ft. has been removed from this section. Natural channel design principals are to be used on large sections of stream relocations, whereas some simple bioengineering techniques can be used within the 50-ft range to provide aquatic and riparian zone habitat. Natural streambank stabilization measures can and should be employed where practicable within the 50-ft. range. In addition, the Mitigation Chapter recommends that stream not be overwidened at the culvert inlets and outlets.

Evaluating the cost structure of the in-lieu-fee program and providing economic incentives for protecting streambanks is outside of the scope of the Statewide Stormwater Management Program documents. The Tennessee Stream Mitigation Review Team, which consists of TDEC, Corps of Engineers, TWRA, USF&W, and USEPA, and TVA, would need to be consulted on the procedures for the in-lieu-fee mitigation program.

#### Page 1-15, 16

“It is recommended that TDOT use Statewide Stream Determination Protocol defined by TDEC. If there is not a current standard stream determination protocol, it is recommended that TDOT, in consultation with TDEC, take a leading role in

developing a stream determination protocol to be used across the state.”

**WWF & HRWA:** WWF and HRWA agree that a standard method for the determination of streams be used and enforced throughout the state. In addition to protecting water quality, consistent determination procedures can help resolve water / property rights issues encountered throughout the state. We recommend that a consistent, objective, and enforceable method of determination be utilized, such as mentioned from the North Carolina Department of Environment and Natural Resources. This guide provides a scientific, repeatable approach to stream identification.

**TDOT Response:** We concur, and we are working with TDEC to develop a consistent stream determination protocol.

#### Section 1.4.2 Identification and Labeling of Natural Resources

##### Page 1-17

“There does not appear to be a consistent procedure in place for identifying and labeling impacted waters of the state...Wetlands are typically well labeled on the plans with standard wetland hatching, as are known springs, but streams and sensitive areas (i.e., endangered species or critical habitat) are not clearly identified. It is recommended that all streams, springs, wet weather conveyances and sensitive areas be clearly labeled and identified on the present layout sheet and on the EPSC plan.”

**WWF & HRWA:** As for the reasons described above, more consistent labeling will decrease confusion and allow for greater protection of resources during the planning stages of a project. If consistent stream identification practices are adopted, then consistent labeling is a logical follow-up and can help in preventing a re-design of the project in the future.

**TDOT Response:** Agreed.

##### Page 1-18

“It is recommended that prior to initiation of construction that all permitted areas and other environmentally sensitive areas be clearly delineated in the field with highly visible barriers, such as orange safety fencing.”

**WWF & HRWA:** Lack of contractor awareness / confusion has caused destruction of sensitive resources unnecessarily, as cited (pp 1-18). Other states, as mentioned, utilize this protocol. Marking environmentally sensitive areas can avoid their destruction. Delineation with some sort of barrier will also eliminate ignorance as an excuse for violation, and will make it easier for the contractor to ensure liability.

**TDOT Response:** Training being developed will help with awareness.

### Section 1.4.3 PPRM changes relative to mitigation design

#### Page 1-19

“It is recommended that the Development and Preparation of Mitigation Plans be incorporated into the process around Activities 285-305. ... This early involvement should aid in avoiding problems later in the project...”

**WWF & HRWA:** We concur with this recommendation. Earlier involvement of mitigation into project will decrease costs and create more sustainable projects.

**TDOT Response:** Agreed.

“It is recommended that the Ecology Report, which identifies jurisdictional natural resources that require permitting and mitigation, be attached to the project and tracked.”

**WWF & HRWA:** We concur with this recommendation. Continual consideration for the Ecology Report requires communication to ensure consistent implementation of applicable regulations.

**TDOT Response:** Agreed.

### Section 1.4.4 Environmental Pre-Con

#### Page 1-20

“It is recommended that TDOT conduct an environmental pre-construction meeting for all projects that involve Clean Water Act permitting (i.e., Section 404, Nationwide, CGP, and/or ARAP).”

**WWF & HRWA:** We recommend changing the language above to state,

“A special environmental pre-construction meeting be is required prior to any project requiring Clean Water Act permitting so as to ensure adequate time allotted to environmental concerns.”

**WWF & HRWA:** At this meeting, agency and non-agency staff should be invited to attend. This goal of this meeting—or series of meetings—should be to address issues such as erosion control, listed species (endangered, threatened and candidate), sensitive areas, etc.

**TDOT Response:** This meeting is to be conducted after Clean Water Act permits have been applied for and received. The intent of the environmental pre-construction meeting is to communicate the permit requirements to field staff and contractors, to identify sensitive features within the site, and to discuss construction practices as they relate to protection of environmental resources within or adjacent to the project.

#### Section 1.4.6 Tracking Environmental Commitments

##### Page 1-23, 24

“The process of tracking environmental commitments appears to be lacking in the current TDOT program development. ... Federal Highway Administration convened a consortium of several state DOTs to review tracking of environmental commitments and published the work in Domestic Scan: Environmental Commitment Implementation, Innovative and Successful Approaches (Domestic Scan)”

AND

“TxDOT has a web-based Environmental Tracking System (ETS). ETS was developed to resolve permit-tracking issues the Department was having.”

**WWF & HRWA:** Tracking and following through on environmental commitments is essential to ensuring their long-term success, as well as avoiding litigation due to non-compliance. We recommend that some tool, which can track such commitments, be implemented.

**TDOT Response:** Section 1.3.1 addresses these issues. It includes a recommendation to incorporate checks and balances into the Project, Planning and Resource Management process, as well as the Statewide Environmental Management System being developed currently. The modifications to these processes will be made during SSWMP implementation.

#### Section 1.4.7 Staffing Requirements for Ecology and Permits Section

##### Page 1-25

“Currently TDOT has no staff dedicated to coordinating Endangered or Threatened species review and surveys and does not have an engineering group or anyone dedicated to providing oversight of on-site mitigation projects. Currently, one position in the Ecology Section is responsible for all TDOT wetland mitigation banking.”

**WWF & HRWA:** It is a vital step that TDOT has recognized the need for staff to oversee endangered or threatened species and for providing oversight to mitigation projects. Such a staffing shortage will not allow for the processing, review, or enforcement of the required permits. We recommend hiring a staff to proactively manage the gaps identified. We see these people as necessary to protect resources of the states and to ensure compliance with federal permits.

**TDOT Response:** We concur.

### Section 1.5.1 GIS recommendations - 303(d) list, labeling streams/rivers with TMDLs along with qualifier for limiting constituent, HQW streams/rivers

#### Page 1-26

“TDOT should monitor the 303 (d) list revision and include any revisions that have been approved by the EPA in a GIS data layer in TDOT’s internal server. The Data layer should clearly indicate the stream reach impaired and the pollutant impairment. TMDLs should be monitored and incorporated into a data layer for the interdepartmental GIS system. The data layer should clearly indicate the limiting constituent for ease of use.”

**WWF & HRWA:** GIS is a powerful tool for natural resources management, and it should be incorporated into water quality management as indicated. We agree these data layers should be used early in the planning process and as described. To help citizens have better input in the transportation planning process, this information should also be available to the public. For aid in further clarification, the state General Construction Storm water permit requires the applicant to document in the SWPPP if it is eligible for the permit for waters with an approved Total Maximum Daily Load (TMDL) (TNR 10-0000, sections 3.5.10). TMDL monitoring and management is one reason to use numerical values for storm water sediment standards—allowing consistency and generating ease of use among managers.

**TDOT Response:** It is anticipated that the data populating SEMS will be available to the public.

### Section 1.5.2 Recommendation on streams under CGP

#### Page 1-27

“The TN CGP requires that a 60-foot wide buffer or equivalent measure be maintained between an active construction site and any stream included on the impaired streams list (303 (d) list) or identified as high quality waters....The buffer zone should average 60ft. with the minimum at any one place being 25 ft.”

**WWF & HRWA:** We strongly agree that buffer zones should be maintained. However, we believe that the buffer zone should not be based on an average value (potentially creating very narrow sections), but rather suggest that a minimum buffer width be maintained at all times. Additionally, the 100-year flood zone should be protected as a buffer zone, even if that goes outside of the minimum required dimension. A progressive step-wise increase in the size of the riparian buffer zone, such as increasing the buffer zone down stream proportional to the size of the surface area drained and or slope of the drainage, should be implemented. Additionally, we recommend the width of the buffer be proportional to the slope of the upstream drainage; steeper catchments require more buffer than a more gradual pitch. We propose using a system that has been adopted by Williamson County, which uses 50 feet on either side for one acre or less of drainage, 75 feet if one to five acres are drained, and 100 feet of buffer for more than five acres of drainage. Additionally, we recommend that construction

activities, such as road building or cut and fill storage, be conducted outside FEMA designated 100-year floodplains.

**TDOT Response:** TDOT projects will follow the buffer requirements of the TN CGP.

“EPSC plans are not included at the Preliminary Plans stage but are included with the R.O.W. and Construction Field Review meeting plans.”

**WWF & HRWA:** EPSC plans should be included as a fundamental initial component from the earliest stages of project development. The sooner erosion prevention plans are introduced to a construction project, the more easily, economically, and effectively they can be integrated.

**TDOT Response:** It is not practical to develop EPSC plans prior to the right-of-way development phase.

#### **Section 1.6.1 Current TDOT Procedures for EPSC Plan Review, SWPPP Preparation, and Stream Mitigation Design and Section 1.6.1.1 Review of Other State DOTs**

##### **Page 1-29**

“Under the current system, the use of multiple consultants as EPSC Plan reviewers leaves the process fraught with inconsistencies.”

**WWF & HRWA:** It is a positive step that TDOT has recognized this potentially damaging situation. This is a very undesirable situation and frustrating to the Design Engineers, as indicated. We recommend that TDOT conduct its storm water plans more closely to the state of Florida (pp 1-29)

**TDOT Response:** TDOT will evaluate applicability.

“SWPPPs are done by the roadway designer as part of the roadway plans. . . . Designers of the Roadway are expected to prepare the SWPPP and EPSC Plans.”

**WWF & HRWA:** This method of integrating erosion control into the design process would make the procedure more effective and cost efficient.

**TDOT Response:** It is the ultimate goal of the Department to bring EPSC plan review in-house.

## Section 1.6.2 EPSC Plan Review, SWPPP Development, Stream Mitigation Design Process Structure

### Page 1-30

“The Primary recommendation is for TDOT’s Environmental Division to establish a new, specialized group for Environmental Design.”

**WWF & HRWA:** We agree with the recommendation; the Environmental Design group should more cohesively coordinate efforts and include such activities as review of the EPSC Plans, development of all SWPPP, and stream mitigation design. We also agree with the recommendation that the group should consist of specialized engineers; however, we recommend that specialized ecologists and/or biologists be a part of this comprehensive group. In our experiences, when those two groups— biologists and engineers—come together early in the process, designs can be most easily amended to yield the least impact upon the environment, while reducing the costs and avoiding projects delays. This point reiterates the environmental and economic incentives for an avoidance and preventative approach to storm pollution.

**TDOT Response:** The new Natural Resources Office, within the Environmental Division, will include the new EDG, the existing Ecology Group, and the existing Permits Office, which will facilitate coordination. The EDG and Ecology groups will be part of the Interdisciplinary Project Planning Team early in the project planning process to identify stream and/or wetland mitigation opportunities.

### Page 1-31

“If the calculated disturbed acreage is less than 1 acre, the plan will not require an NPDES permit and will, therefore, not require the preparation of a SWPPP and the NOI ... If the disturbed acreage for a project is less than 1 acre, the EPSC Plan for the given project will be initially reviewed by the EDG. If the plan is inadequate based on the EDG review, comments should be provided to the TDOT Design Division for the required revisions. After these revisions are made, the plan will be reviewed again by the EDG. This process will continue until the EDG is satisfied with the EPSC Plan.”

**WWF & HRWA:** Another form of checks and balances should be implemented for the EDG review to ensure that it is not able to grant exceptions to disturbances less than one acre without some oversight by another acting party. We recommend that the exceptions in the “less than 1 acre” category and the final plans to be implemented (which have been approved by the EDG) should be brought before a reviewing panel of representatives from TDEC for final approval.

**TDOT Response:** The CGP applies to projects disturbing one acre or more or that are part of a larger common plan of development. If a project disturbs less than one acre and is *not* part of a larger common plan of development, then a consultation with TDEC is not necessary as the CGP will not apply. However,

TDOT will still prepare an EPSC plan, install, and maintain measures in the field, regardless of size.

### Section 2.1.1.1 Section 209-Project Erosion and Siltation Control

#### Page 2-2

“The three primary functions involved in designed for the prevention of storm water pollution are: -Surface protection... - Sediment capture... -Flow control...”

**WWF & HRWA:** Additionally, materials and methods for keeping storm water pollution originating from road chemicals (oils, greases, salt, etc.) out of receiving waters should be addressed. These pollutants are usually not considered in storm water pollution prevention plans, but pose a real threat to water quality and aquatic life. Attention and methods should be drawn to managing and providing some treatment for the “first flush” (typically considered the first quarter to half inch of rainfall) of a storm event, which conveys the vast majority of pollutants. Concern with larger storm events should focus on water quantity, whereas the smaller and more frequent events need focus on water quality issues. Additionally, methods and materials for improving infiltration and thus mitigating impervious surface effects should be addressed. Reducing the quantity of runoff present relieves stress on drain structures, reduces safety hazards associated with puddling, and reduces storm water contributions to collection systems (thus reducing likelihood of combined sewer overflows). These points should be a part of the storm water discussion.

**TDOT Response:** Several issues are mixed here however, from a construction point of view it seems there is a concern with addressing non-structural BMPs. These issues are covered in the SWPPP by boiler plate requirements for materials handling, site management considerations, spill prevention, spill cleanup and reporting as well as issues of general housekeeping. There is a particular emphasis on these non-structural measures in the training. It appears that the comment is directed primarily at the post-construction operation of the roadway. These requirements are outside of the scope of the SSWMP and are being addressed through the Department’s MS4 permit.

### Section 2.1.2.2 Temporary Seeding and Mulching

#### Page 2-6

“Temporary Seeding and Mulching”

**WWF & HRWA:** We recommend stressing importance of native seeding and vegetation, as well as harms of noxious weeds. See comments from Section 3.4.1.

**TDOT Response:** Please see the discussion of native plant establishment earlier, on page 3.

### Section 2.1.2.5 209.06-Construction Requirements

#### Page 2-7

“ ‘Areas to be graded shall not be cleared and grubbed more than 20 calendar days prior to the beginning of grading...’; however, the General Permit specifies 15 days see 3.5.3.1 (h) and (i).”

**WWF & HRWA:** We recommend TDOT implement a consistent policy to reduce confusion on site. We strongly recommend that this time be 5 calendar days. This shortened time period would reduce the time that bare ground is exposed, and thus, reduces erosion potential.

**TDOT Response:** TDOT projects will follow the requirements of the CGP.

### Section 2.1.2.6.2 209.07-(c) Sediment Structures

#### Page 2-7

“These structures are also designed with an overflow spillway to pass events greater than the designed capacity.”

**WWF & HRWA:** We recommend that staged overflow sediment structures be implemented rather than simple overflows. These structures all for greater flows to pass without carrying all sediment loads; for example, different overflow outlets allow 25 year, 50 year, and 100-year storm event to pass.

**TDOT Response:** Size/ROW requirement and probability issues make this very impractical for construction and not an effective expenditure of resources. The likelihood of a 25 year or less frequent storm event occurring during a construction project is relatively small, therefore the CGP does not require temporary facilities be designed to accommodate such rare events.

### Section 2.1.2.6.4 Sediment Basin

#### Page 2-7

“The structure will consist of an earthen basin either excavated or confined by an earthen dam having a control structure to extend the residence time for a period sufficient to precipitate sediment held in suspension.”

**WWF & HRWA:** This passage creates some potential ambiguity. It would be clearer if the residence time requested were defined in absolute terms to ensure consistent compliance.

**TDOT Response:** More information on sediment basin design can be found in Chapter 10 of the Drainage Design Manual, which does include basin drawdown design.

#### **Section 2.1.2.6.7 Windrow:**

##### **Page 2-8**

“If windows are used for an extended period...”

**WWF & HRWA:** We believe this statement contains a typographical error. It should read “windrow”.

**TDOT Response:** Agreed. This has been corrected.

#### **Section 2.1.2.7.9 Erosion Control Mulch:**

##### **Page 2-10**

“Straw materials should be crimped or bonded with an approved tackifier.”

**WWF & HRWA:** We recommend requiring the use of environmentally friendly tackifiers. Some tackifiers are petrochemical-based, and can present a hazard to aquatic life if run-off enters a water body.

**TDOT Response:** Actually, the crimping is even more environmentally friendly and in most cases longer lasting. Bituminous materials have been excluded as tack materials even though the current standard specifications still include asphalt as a tack material.

Asphalt emulsion does not present a hazard to aquatic resources as long as they are properly applied, including allowing a drying period between the application and any rain events and avoiding spraying on stream banks.

#### **Section 2.1.2.7.11 Temporary Seeding *and* Section 2.1.2.7.12 Permanent Seeding**

##### **Page 2-10**

“Temporary Seeding, Permanent Seeding “

**WWF & HRWA:** Using temporary seeds is a method we can support. We recommend that temporary seeding be void of invasive weeds, and that a pure live seed provision be established to ensure quality. Permanent seeding should require use of native plants as part of the mentioned “permanent, sustainable cover”.

**TDOT Response:** Please see discussion of native plants and recommendation for research on page 3.

### Section 2.1.2.7.13 Rock Riprap

#### Page 2-10

**WWF & HRWA:** If riprap must be used in streams or contact water bodies, it should not contain asphalts that may leach petrochemicals, or if concrete is used, it should be fully cured to avoid raising stream pH. We further suggest use of bioengineering methods, such as willow staking among the riprap, to further secure and establish the stream bank.

**TDOT Response:** TDOT specifications identify the makeup of riprap, which exclude the use of asphalt or broken concrete. In addition, the Mitigation Chapter discusses bioengineering techniques for streambank stabilization.

### Section 2.1.2.7.15 Permanent Erosion Control

#### Page 2-11

**WWF & HRWA:** We recommend that native plants be required as part of any permanent erosion control method. Some commonly cited benefits include erosion control; reduced watering, fertilizing, and mowing costs; habitat for a number of plant and animal species; and beautification of the local ecological character.

**TDOT Response:** See previous native plant discussion on page 3.

### Section 2.1.2.9 Section 801.07 Mulching

#### Page 2-11

“However, on clay soils, it is difficult to effectively prevent erosion using straw or hay mulch; in most cases, research has shown that blankets and bonded fiber matrix materials are more effective.”

**WWF & HRWA:** It is positive that TDOT acknowledges different sites require different erosion control methods. We recommend that specific methods for mulching / erosion control be specified and dictated by the geotechnical analysis of the project site. This will allow for site-specific flexibility, while ensuring more consistently desirable results based on local conditions.

**TDOT Response:** Erosion control design will rely on soil types, velocities, shear stresses, and other criteria to determine the most appropriate erosion controls for a site. This information will be covered in training classes so that the designer can select the appropriate materials and methods.

### Section 2.1.2.10 Section 801.06 Seeding

#### Page 2-11, 12

“Given the harsh conditions of the roadside, heat, droughty, compacted soils, and no supplemental irrigation, it is doubtful

that any cool season species will likely persist for an extended period or form sustainable community, thus leaving the roadside to be colonized by other weedy pioneer species.”

**WWF & HRWA:** This Section summarizes the perfect rationale behind use of native plants, which are generally much more able to tolerate such conditions. We recommend that use of native plants be required as a permanent sustainable component to erosion solutions. Such benefits include erosion control; reduced watering, fertilizing, and mowing costs; habitat for a number of plant and animal species; and beautification of the local ecological character.

**TDOT Response:** This really does not support the blanket use of native plants, unless they are adapted pioneers that will prepare the roadside for succession to stable mixed vegetation communities. Please see the discussion of natives and the recommendation for research on page 3.

“It is recommended that rotary seeding be removed as a primary seeding option in favor of drill seeding.”

**WWF & HRWA:** We concur with this recommendation. Drill seeding is more effective, and it should provide more erosion control; however, where practicable, no-till drill seeding should be required.

**TDOT Response:** We agree that no-till seed drills are useful tools. However, no-till drill seeding is only necessary where cover or on areas with existing vegetation. For the most part highway construction involves seeding on or over unvegetated areas. No-till is suggested for planting large areas that have been seeded with cover crops or in cases where the department may wish to overseed areas with wild flowers.

#### Section 2.1.2.14 Section 918.14 Grass Seed

##### Page 2-14

“The specification of seed materials as to delivery, inspection, and testing are vague in that there is no mention for minimums for germination and purity, or presence of weed seed.”

**WWF & HRWA:** It is a positive step that TDOT recognizes this potentially damaging situation. We recommend specifying minimums for germination and purity (pure live seed requirement), and requiring that no noxious weed seed be present. In addition, we suggest that native grass seeds with a blend of cool season Eurasian cover crop be mandated for an effective matrix in reducing erosion.

**TDOT Response:** Minimums for germination are not really practical since seed lots will vary significantly from lot to lot. The key to the issue is the actual calculation of pure live seed and then determining the appropriate seed rate. This is discussed in some detail in the construction manual. As to the issue of weed seed, the requirement is for no noxious weeds and less than 1% weed seed. These are Tennessee Dept of Agriculture requirements.

“While this is common [uniform fertilizer mix], it does not acknowledge that different soils have different nutrient needs.”

**WWF & HRWA:** We recommend setting standards for soil specific fertilizer application such that fertilizers do not cause eutrophication of receiving water bodies, but also provide nutritional needs; particularly limiting phosphorous application close to water bodies.

**TDOT Response:** That was recommended in the rationale document.

### Section 2.1.3.3 Section C: Flexible Channel Liners

#### Page 2-17, 18

“Biodegradable materials should only be used to line channels having concentrated flows of 2 lb/sf or less during the revegetation process.”

**WWF & HRWA:** Biodegradable materials should not be dismissed. If there exists a suitable biodegradable product that holds up to such conditions, it should be least considered.

**TDOT Response:** The issue here is not quite clear. The intention of the statement is to point out that channels with a design stress greater than 2 psf need permanent armoring for long term stability as vegetation alone will not provide protection against scour of the channel bottom. Therefore, if a channel has a design stress of greater than 2 psf biodegradable materials will not provide the long-term protection necessary. We would encourage the use of a permanent flexible armor over impervious hard armor because it maintains infiltration.

“Since soil is the number one pollutant it tends to be the focus while other equally harmful pollutants such as solvent, pH modifying materials, solid waste, sanitary waste and others may be overlooked.”

**WWF & HRWA:** TDOT has made a positive move in observing that these other pollutants are often overlooked. We recommend additionally that petrochemicals be added to the list of concerns from road / construction sites.

**TDOT Response:** They are included.

“The structural EPSC measures are only one part of the management tools that need to be in place to ensure that waster resources are protected. Other nonstructural measures must be considered in the overall planning and design process, including: spill prevention and clean up planning, solid waste storage and management, hazardous materials storage and containment, and sanitary waste management plans.”

**WWF & HRWA:** We suggest adding to the list of non-structural concerns regarding water quality such factors as invasive species control and wellhead

protection programs to protect drinking water (including for public distribution systems) resources from contamination.

**TDOT Response:** It would seem that these are special considerations that would be addressed in the initial planning and design phases of the work.

### Section 2.3.2 Selecting Design Storm Parameters for Temporary Erosion Control Design

#### Page 2-20

“Selecting Design Storm Parameter for Temporary Erosion Control Design”

**WWF & HRWA:** There is some question in our minds as to whether a 2-year design storm is adequate for high quality waters. A more conservative approach for high quality waters (such as a 10-year design storm), even for a temporary structure, would be preferable. Use of the basin time of concentration, as indicated (pp 2-20) is recommended as a reasonable design option. In addition, the definition of “temporary” should be better established: if only present for a few days, a structure could be less conservatively sized than if present for the entire duration of the construction project. Furthermore, protection of waters should be not limited to less-frequent, higher volume events. The majority of chemical and sediment pollution is due to the “first flush” (roughly first half inch of rainfall), and these events should also be considered. BMP structures should be utilized to catch these rainfall events and provide for some degree of treatment. Concern with larger storm events should focus on water quantity, whereas the smaller and more frequent events need focus on water quality issues.

**TDOT Response:** The design for erosion controls is not the same as the design for sediment control as described in the CGP (2-yr, 24-hr or 5-yr, 24-hr). The section in question describes erosion control design, such as stable channel (not stream channel) design. When designing erosion controls (i.e., long and short term stabilization of channels), 2 storm events are typically used: the 2 yr storm – this design takes into consideration the sheer stresses in a channel when no vegetation exists; and the 10-yr storm – this design considers the sheer stresses in a channel under final stabilization conditions (grass, turf reinforcement mats, rip rap, etc.).

### Section 2.3.3 The 90th Percentile Storm as the Basis for Temporary EPSC Design

**ETI Corporation (Stacey Morris, P.E.):** Paragraph 2.3.3 presents a case for using the 90th percentile storm as the basis for temporary EPSC design. ETI supports this approach and feel it would yield results more in line with the current research. Very good recommendation!

**TDOT Response:** Consistent with recommendations of the SSWMP documents.

**Page 2-22**

“Because of the intensity issue, over design of the EPSC measures using 24-hour depths will not necessarily give greater levels of protection. In fact in some situations it will likely result in less protection. For this reason, TDOT should not adopt the 5-year, 24 hour depth as the primary design parameter, but rather look at possibly adopting a standard that would capture 90% or 95% of all rainfall events likely to occur during a construction period.”

**WWF & HRWA:** We concur with recommendation; a 95% capture philosophy rather than a design-frequency storm appears to be a better option for adequate capture. The key appears to be to capture run-off from short frequency, intense events, which is not reflected in the 24-hour frequency data.

**TDOT Response:** Consistent with recommendations of the SSWMP documents. For clarification, sentence will be modified, “...capture runoff from 90% or 95% percent of rainfall events from disturbed areas likely to occur during a construction period”.

**Section 3.1.1.1 Full-Scale Testing Methods**

**Page 3-4**

“When not properly installed, performance varies considerably, with an average removal efficiency of around 50%.”

**WWF & HRWA:** It is a positive action that TDOT recognizes the need for better BMP performance to adequately protect water quality. Overall, based on this statistic, more emphasis needs to be placed on proper installation, maintenance, and inspection, in addition to technology.

**TDOT Response:** TDOT is addressing this aspect with the training program and implementation of the SSWMP

**Section 3.2 Product Approval Procedures 15/A.2.a**

**Page 3-8**

“The specifications are so specific, with respect to index qualities, that many materials currently on the market that performs well may technically be disqualified based on composition alone.”

**WWF & HRWA:** This sentence contains a typographical error: “performs” should read “perform”. Overall, we believe that approval should be more results-based rather than examining specific products, based on the logic that is presented in this Section above.

**TDOT Response:** As to the issue of approvals, the recommended approval process being adopted by Materials and outlined in the Rationale document does focus on performance and not material composition.

#### **Section 3.3.2.4 The Wisconsin Department of Transportation**

##### **Page 3-13**

“Vegetation results will be evaluated after the first year of installation.”

**WWF & HRWA:** The Wisconsin Department of Transportation requires that vegetation planted into erosion mats be evaluated after a period of one year to ensure satisfactory growth and cover. We find that this monitoring and quality control procedure to be very positive, and suggest that TDOT adopt such a policy of vegetation monitoring within its jurisdiction. Technology Acceptance and Reciprocity Partnership We recommend that TDOT join the TARP program to stay up to date on progressive technology and methods. Doing so would be to the great benefit of the agency, and foster greater collaboration. Communication will save resources and funds because each state will not have to test each new product.

**TDOT Response:** That was presented as an option in the rationale document.

##### **Page 3-17**

“In general compost from biosolids, chicken mortality, or cow manure must be mixed with yard waste materials or decomposed wood chips to be effective.”

**WWF & HRWA:** Use of biosolids, chicken byproducts, or manure for erosion control near receiving water bodies may pose serious bacterial contamination threats. Bacterial contamination may pose a severe human health threat, through drinking water supplies and contact recreation (e.g. swimming). Biosolids also may contain high levels of heavy metals (such as copper), which may leach out and have adverse effects upon the recipient waters. Application of such materials can cause adverse water quality effects through eutrophication; excess nutrient loading (phosphorous and nitrogen) degrades dissolved oxygen levels and harms beneficial aquatic life. Therefore, we feel that these materials should not be recommended for use where they may contaminate water bodies. We suggest not allowing their application within designated buffer zones along water bodies.

**TDOT Response:** If the material has been properly composted, i.e., reached a sustained temperature of 110° to 145° for approximately 72 hours, bacteria are no longer a threat. However, we would agree that there are other nutrient concerns that make the use of compost questionable in certain locations. The key is adopting a clear specification for compost materials to be used and guidance for application areas.

There seems to be two schools of thought. EPA is pushing the use of compost in a variety of situations for roadside applications. Some of the literature and info

sheets neglect these hazards for some reason. The SSWMP documents acknowledge these constraints.

### Section 3.3.4.3 Stage III

#### Page 3-23

"If after one year, there are no significant issues with the performance of the product..."

**WWF & HRWA:** This Section is referring to the third stage of product testing and evaluation of erosion prevention and sediment control devices. We feel that the language throughout this particular Section is rather vague (example above), and should require quantitative results in performance. We suggest definitions for "issue with the performance of the product" "satisfactory performance" etc. Better definition should help prevent confusion for the future.

**TDOT Response:** Those definitions will be developed on a product-by-product basis over time, given specific expectations and applications. Because of differences in soil type, slope, soil chemistry, numeric standards are very difficult. After several years of operating a program of this type and testing several materials for similar functions it will be possible to begin setting some ranges for minimum performance and to identify limitations to BMP applications.

### Section 3.4.1 Seed Mixes for Tennessee

#### Page 3-24

**WWF & HRWA:** This Section cites controversy or confusion surrounding native and invasive species. This Section cites Executive Order 13112 February 3, 1999 Invasive Species, which states:

An "invasive species" is defined as a species that is 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. (Executive Order 13112)

The first point above covers all non-native or exotic species within the invasive species category. Perhaps from a technical standpoint this may be true, there are certain non-native species that are very destructive and some that are more passive. The most harmful invasive plants are usually referred to as noxious weeds. The so-called "adapted" plants referred to in the Section are not overly aggressive and serve some human need. They are often simple grains or "pasture grasses". However, these 'adapted' species may be able to grow in the region, but do not have the benefit of thousands of years of evolution, which allow native plants to survive in balance. Native plants can survive drought and do not require the same human attention in the form of irrigation and fertilizing. It appears that this Section devalues the virtues of native vegetation:

“While the adapted species should continue to be the core of the permanent stabilization seed mixes there are a number of native and adapted species listed in Table 3-3 could useful in roadside seed mixes in Tennessee.”

We recommend that the core seeding mix be composed of native species, with supplemental use of cool-season adapted species to quickly establish a cover crop. This matrix-based approach promises the best overall sustainability for erosion control and low maintenance.

**TDOT Response:** See previous discussions on the use of non-natives and establishment of vegetation along the roadside on page 3.

### Section 3.4.2 Use of Native Seed in Roadside Applications

#### Page 3-26 to 3-29

**WWF & HRWA:** The FHWA and other organizations currently encourage use of native plant species on the roadsides. While the movement is well intentioned, significant problems can occur when it come to roadside conditions if the use of natives is generalized to the entire roadside.”

This Section then goes on the claim that the steep slopes and compacted soils of roadsides “are inhospitable to many native plant species”. This may not be an optimum environment, but these plants typically are able to survive as well and often better than other adapted species.

“Two broad concerns with the current TDOT seeding mixes are:  
1. Little consideration exists for the difference in regional climatic and soil conditions across the state that tends to warm weather grasses. 2. No native or adapted forbs or grasses are included in the seed mix to foster the development of a more diverse herbaceous roadside community. While some anecdotal publications suggest the value of establishing native grass communities on rights-of-way, there are no systematic studies that document the planting and development of diverse grass communities in roadside conditions. For this reason, TDOT is encouraged to work with their university-based research communities to develop studies similar to those being conducted by TxDOT that will address appropriate seed mixes for re-vegetation of roadsides, along with cultural practices that will assist in sustainable roadsides. Until these studies can be completed, suggested interim seed mixes have been proposed to better recognize the various differences in soils [and] climatic conditions of the state.”

**WWF & HRWA:** This last sentence appears to be missing a word (and). Such “lack of studies” appears to be a poor case for inaction regarding use of native plants in a seed mix. Let us explain.

Native plants are more able to survive in balance in the specific climate of a region than any “adapted” species. This statement regarding a ‘lack of studies’ is particularly disturbing when in fact there is a preponderance of evidence and

publications that have demonstrated the benefits of native plants along roadsides. For example, Ries, Debinski, and Wieland have published on the benefit of roadside native plants as habitat corridors for butterflies (Leslie Ries, Diane M. Debinski, and Michelle L. Wieland (2001) Conservation Value of Roadside Prairie Restoration to Butterfly Communities.

Conservation Biology 15 (2), 401–411). Moreover, Roadside Use of Native Plants by Bonnie L. Harper-Lore, Maggie Wilson (Published 2000, Island Press, ISBN 559638370) details more benefits of roadside application of natives. Such benefits cited include erosion control; reduced watering, fertilizing, and mowing costs; habitat for a number of plant and animal species; and beautification of the local ecological character. The logic presented above regarding concern about the viability of native plants, and then suggesting concern about the lack of native seeds and warm weather grasses present in the current mix appears to us to be confusing and contradictory.

Furthermore, the “Recommended Interim Seed Mixes for TDOT” presented in Table 3-4 contain only exotic seeds, e.g. Sudangrass, German Millet, Korean lespedeza, Bermudagrass, and Italian Ryegrass. We recommend that native seeds be required as the basis of the seed mix. We understand that non-native plants have their place in erosion control, such as in forming a cool season initial cover crop, but we feel that the basis of the permanent mix should be native. If availability of native seeds is limited at this time in the quantities required for TDOT, we suggest establishing a phased implementation in which increasing percentages of natives required in seed mixes.

Finally, one of the suggested seeds in the table is Crown Vetch. While sometimes planted for erosion control (as was Kudzu originally), crown vetch is an invasive species that can aggressively form dense monocultures and crowd out other vegetation, while not providing as satisfactory erosion control as a native/adapted grass matrix. As a foremost priority, it is recommended that crown vetch be removed from the suggested seed mix.

**TDOT Response:** Please see the seed mix discussion and the recommendation for research.

It is erroneous to disregard the micro climatic and successional considerations that result in a sustainable plant community. Generally, desirable native species are “climax” species. These species only show up and thrive after many years of soil topsoil building and preparation by pioneer plants. Then in order to maintain these grasses it is almost imperative that burning take place to remove heavy thatch layers and take out woody invaders. If we look at the majority of the Tennessee landscape, we would find that the climax vegetation community is hardwood forest or savannah. The dominance of woody material in a climax community would represent an unacceptable safety hazard on the roadside. Therefore, we are already in the conundrum of having to maintain a sub-climax herbaceous community of plant materials. The pioneer period of succession is from 1-10 years, closer to the high end. The sub-climax period is from 10 to 100 years and climax is >100 years. Given this scale the most a roadside can be expected to obtain before another disturbance is a sub-climax community.

Because of the safety requirements, structural characteristics, i.e. compaction, of the roadside most native herbaceous species will have a difficult time establishing and persisting.

#### Section 4.1.1 Materials for Temporary Erosion Prevention on Construction Sites

##### Page 4-4

“Compost composed of manure or biosolids do not function well for erosion control because they are composed of fine material that will not bond together well.”

**WWF & HRWA:** Additionally, it should be noted that composts composed to these substances may present a human health problem through bacterial contamination via runoff to receiving waters. Further, these materials are very nutritionally rich, and can cause eutrophication of waters by adding limiting nutrients (phosphorus, nitrogen) and thus depleting dissolved oxygen and degrading aquatic life. We believe that these attributes should be noted in the section, and recommend that these materials be used with caution, if at all.

**TDOT Response:** See earlier note about proper composting.

“Sometimes temporary erosion vegetation was referred to as a cover crop. . In general...”

**WWF & HRWA:** This sentence contains a typographical error (extra period).

**TDOT Response:** Corrected.

#### Section 4.1.2 Materials for Sediment Control

##### Page 4-7

“In difficult cases, flocculants may be used to help precipitate fine or charged particles from suspension.”

**WWF & HRWA:** We believe that it is unclear specifically what types of flocculants are being presented. We recommend that an environmentally sensitive variety be specified for storm water.

**TDOT Response:** We understand the department is developing a list of approved PAM materials to use as flocculants.

“In most situations proper installation and maintenance of sediment control BMPs will reduce sediment loss to acceptable levels if adequate upstream erosion prevention controls are in place, but there is no way to accurately predict actual field performance.”

**WWF & HRWA:** In general, based on the statement above, we believe there should be more emphasis on proper installation and maintenance of sediment

control BMPs. Specific to the above statement, there exists some ambiguity to “acceptable levels;” specifically, how is this defined? Further, there is some doubt regarding the statement that “there is no way to accurately predict actual field performance”. Although exact field behavior is not possible to predict, there is a good degree of predictability to such engineering methods through empirical results in the field and laboratory. This caveat should be adjusted to reflect the role and necessity of proper management techniques.

**TDOT Response:** Training being developed does this, along with the inspection program and QA process.

“Flow controls include interceptor ditches or swales that collect runoff from areas that drain into disturbed portions of the site and convey it to a suitable discharge point in pipes or improved channels.”

**WWF & HRWA:** Vegetated swales and infiltration basins improve flow control by reducing velocity and hydraulic loading; these should also be listed as BMPs. Although vegetation filter strips are listed as a BMP in Table 4-4, vegetated swales should also be mentioned. The former are utilized to slow sheet overland flow, whereas vegetated swales slow channel flow. It should be suggested that both be used in conjunction with native vegetation.

**TDOT Response:** For temporary construction BMPs it is difficult to establish a vegetated swale that will give sufficient treatment to be of any use. It is true that vegetated swales offer good water quality benefit and that the vegetated road side, borrow ditches and swales are a water quality asset but these are more permanent storm water quality assets. When temporary channel liners are used permanent vegetation is always seeded into the channel as the vegetation emerges there is an added water quality benefit but it is a secondary benefit until it has completely established and covered the water course which may not happen until well after the construction is complete. Infiltration basins are not a suitable BMP during the construction phase of the project since they will clog. Note that under their MS4 permit, TDOT will be required to develop a menu of post construction BMPs such as vegetated swales and infiltration basins.

## Section 5 Maintenance of Storm Water Quality Management Practices

### Page 5-1

“Maintenance is the key to long term success of storm water BMPs on a construction site, and this Section addresses the short and long term maintenance of storm water BMPs.”

**WWF & HRWA:** We fully agree with this statement, and are happy that TDOT has made this observation. Maintenance is not only something that need so be conducted, but we also suggest emphasizing enforcement for successful pollution prevention.

**TDOT Response:** This is consistent with the recommendations and intent of the SSWMP recommendations.

### Section 5.2.1 Blankets and flexible channel lining materials

#### Page 5-2

"If rills are present the material should be rolled back the rills filled and the materials replaced Reseeding should be done as needed."

**WWF & HRWA:** We believe there are several typographical errors in this statement. It should read "If rills are present, the material should be rolled back, the rills filled, and the materials replaced. Reseeding should be done as needed."

**TDOT Response:** Corrected.

### Section 5.2.2 Silt Fence, silt fence with wire backing

#### Page 5-2

"Silt fence is effective if it is placed on the contour."

**WWF & HRWA:** We are somewhat confused by this statement. It should specify that silt fence is effective if placed parallel to the contour, or perpendicular to the slope.

**TDOT Response:** We agree, the wording should be 'along the contour'.

### Section 5.2.4 Other in-channel silt traps

#### Page 5-2

"After major events, trash and debris trapped in the rock should be removed since subsequent flows may dislodge rock from the top of the check."

**WWF & HRWA:** We suggest Section should specify that trash and debris be removed and properly disposed.

**TDOT Response:** Agree.

### Section 5.2.5 Vegetated barriers

#### Page 5-3

"If vegetation buffer strips are used between construction sites and high quality waters..."

**WWF & HRWA:** We recommend that vegetation buffer strips be required between all construction sites and high quality waters. Further, we recommend that buffer strips be required along all waterways, not just high quality waters. A progressive step-wise increase in the size of the riparian buffer zone, such as increasing the buffer zone down stream proportional to the size of the surface area drained,

should be implemented. Additionally, we recommend the width of the buffer be proportional to the slope of the upstream drainage; steeper catchments require more buffer than a more gradual pitch. We propose using a system that has been adopted by Williamson County, which uses 50 feet on either side for one acre or less of drainage, 75 feet if one to five acres are drained, and 100 feet of buffer for more than five acres of drainage. Additionally, we recommend that construction activities, such as road building or cut and fill storage, be conducted outside FEMA designated 100-year floodplains.

**TDOT Response:** Buffer width is often tied to the available ROW. And buffers are not necessarily the best filter for sediments because a great deal of the effectiveness has to do with the condition of the actual ground cover, plants, litter, spacing, etc. It would seem far more important to focus on combinations of structural and non-structural BMPs that will prevent sediment loss than trying to prescribe the buffer width. Note: See other comments related to buffers.

### Section 5.2.6 Inlet protection

#### Page 5-3 Inlet protection:

“For this reason it is imperative that these structures be cleaned and checked regularly.”

**WWF & HRWA:** Since the maintenance of these structures is so important, as mentioned, we recommend that inlet cleaning be part of the weekly inspection process.

**TDOT Response:** This would not make a great deal of sense unless there were rainfall events that generated sediment losses. The reason for the twice-weekly inspections is to identify maintenance needs and to see that maintenance is accomplished.

### Section 5.2.8 Disposal of sediment removed

#### Page 5-3 Disposal of sediment removed:

“These materials can be easily mobilized and re-deposited if left on the surface. Collected sediments should be placed in pits or spread over the surface and immediately seeded to prevent remobilization.”

**WWF & HRWA:** We concur with this statement in principle. However, we do not recommend that these materials, which have been previously displaced and have proven themselves most mobile, be spread out over the surface without some additional erosion control device besides seeding.

**TDOT Response:** Exposed areas whether fill or waste needs to be protected to prevent sediment loss. The most practical means can be utilized for disposal and stabilization.

### Section 5.2.10 Permanent vegetation

#### Page 5-4

“The single most important maintenance tool on the roadside is mowing. Most native grasses are tall bunch grasses that will not tolerate frequent mowing. Lower mower heights will result in roadsides dominated by low growing weedy adapted grasses and other adapted undesirable plants. Good stands of native and adapted grasses mowed at the proper heights will help prevent the invasion of woody species, which eventually constitute a safety hazard.”

**WWF & HRWA:** The language in the above Section is a bit ambiguous: is the Section advocating mowing, but not too low? What should be the desired heights? Clarification would provide more consistent and desired results and be less ambiguous.

**TDOT Response:** There is ongoing research on mowing heights. Results from some of the work done so far are inconclusive. It seems that mowing timing, antecedent moisture, all figure into the equation along with height. In general, 6 inches is a good start but even this is dependent on the species. There really needs to be regional research done as recommended to better understand how to use mowing as a part of the overall process of managing the successional process so that sustainable native grass communities develop from the initial stabilization efforts.

### Section 5.2.11 Storage Yards and Staging Areas

#### Page 5-4

“Storage tanks for chemicals and petroleum products must have perimeter containment.”

**WWF & HRWA:** We recommend that “perimeter containment” be defined more exactly, or perhaps refer to a construction (e.g. ASTM) standard to a perimeter containment. In addition, some sort of containment to prevent petrochemicals originating from machinery from entering waters should be included in this section.

**TDOT Response:** Containment is often a function of equipment type, location, available materials, and contractor preference. Given the variety and the need to accommodate contractor preference, specifying a particular containment does not seem practical or desirable.

### Section 6.1 Construction Sites Monitoring Current Practice

#### Page 6-1

“Review the turbidity and total suspended solids standards and test methods and other applicable protocols used by other states and local governments.”

**WWF & HRWA:** We recommend that numerical or quantitative values, such as a percentage of difference based on ambient values, be utilized in turbidity and TSS standards. Of the 53 jurisdictions (50 US states plus the Virgin Islands, Puerto Rico and Washington, DC), 32 have some type of numeric criteria for sediment and 23 states have both standards for turbidity and suspended solids. For example, the state of Alabama states: The position of some of the regional states is as follows:

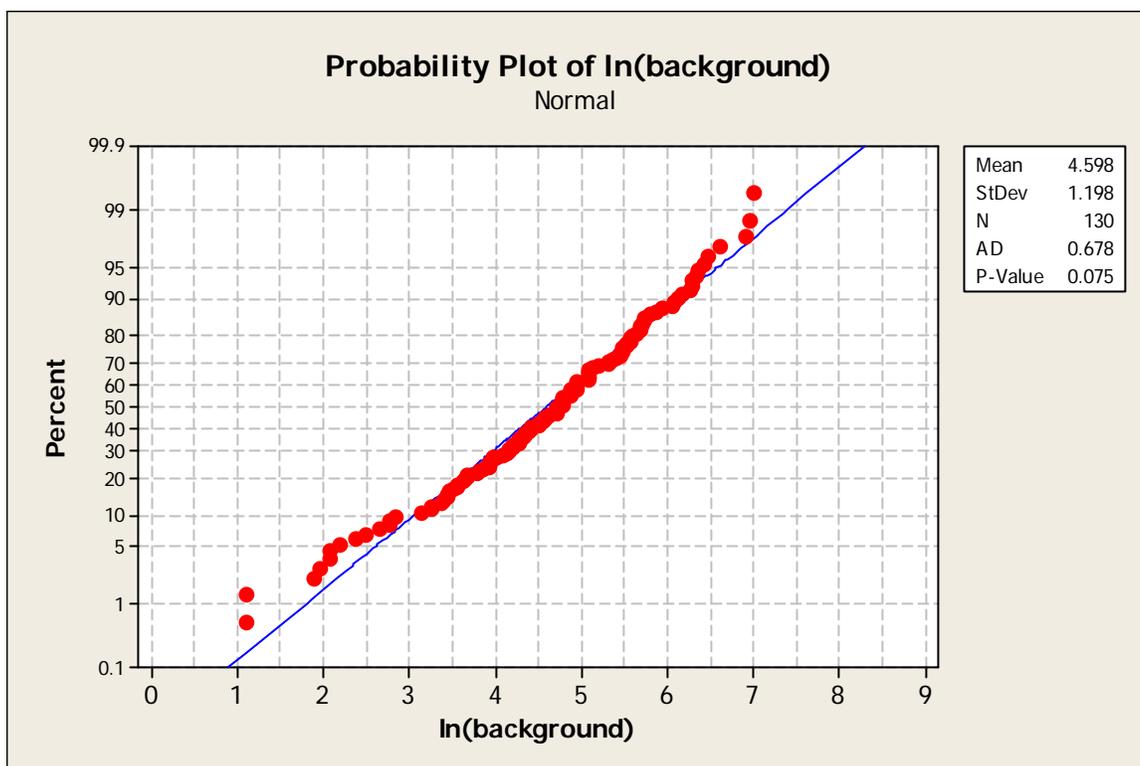
“Turbidity: there shall be no turbidity of other than natural origin that will cause substantial visible contrast with the natural appearance of waters or interfere with any beneficial uses which they serve. Furthermore, in no case shall turbidity exceed 50 Nephelometric units above background. Background will be interpreted as the natural condition of the receiving waters without the influence of man-made or man-induced causes. Turbidity levels caused by natural runoff will be included in establishing background levels.”

**WWF & HRWA:** Adopting numeric standards will give all parties (e.g. contractors, TDOT, citizen groups) a measurable goal that is easily interpreted and enforced.

**TDOT Response:** Comment noted.

*Turbidity Standards* – The adoption of a turbidity standard for construction site runoff is an attractive option from an administrative perspective, because it potentially provides a quantitative measure of whether the BMPs on a construction project are achieving their desired results. However, there are a number of difficulties in determining what the turbidity standard should be and what form it should take. The two main issues are described below.

*Turbidity of Runoff in Undisturbed Watersheds* – The USGS sampling program, which is being funded by TDOT, includes a large number of measurements of turbidity in undisturbed, control watersheds. These turbidity measurements indicate a large variability from storm to storm. Figure 1 illustrates the cumulative probability distribution of measurements (converted to natural log) made during this monitoring program. See Figure 1 below.



**Figure 1 Natural Log of Turbidity in Undisturbed Watersheds**

Figure 1 indicates that the observed values follow a log normal distribution and are highly variably, ranging from about 3 to 1100 NTU, with a median value of 110 NTU. Consequently, the adoption of a single standard that would apply to construction site discharges does not recognize the natural variability of the receiving water.

*Lack of Data on Environmental Impacts* – Recognizing that some shift upwards of the observed turbidity values in undisturbed watersheds from construction activities is likely unavoidable, the question is how large of a change could be assimilated by the receiving water with sustaining substantial or lingering impacts to channel morphology, habitat, and species health. Evaluating the relationship between construction site runoff sediment loads, turbidity and other factors to ecosystem health is another objective of the USGS monitoring program. At the current time there is insufficient data to determine how a 10%, 50%, or 100% increase in turbidity compared to the natural variability of an undisturbed system would impact the receiving water system.

The bottom line is that it would be desirable to complete the USGS monitoring and data evaluation before establishing a standard for construction site runoff. In addition, whatever standard is developed needs to recognize that runoff events occasionally contain naturally high turbidity levels.

### Section 6.1.1.1 Current Program

#### Page 6-1

“Determine if in-place EPSC measures are adequate to prevent sedimentation and damage to area streams.”

**WWF & HRWA:** We may be interpreting the statement above differently than TDOT intends. It appears that if this statement is purely results-driven, than the current system is inadequate. However, if this determination is to evaluate if technology, techniques, maintenance, and / or inspection / enforcement are adequate on an individual basis, then this statement has merit. We recommend a greater clarification.

**TDOT Response:** This statement describes part of the USGS’s scope of work that was required in the Consent Order. This assessment is based on a combination of in-stream assessment of habitat and morphology as well as an evaluation of the effectiveness of installed controls through monitoring at project outfalls.

“Suspended –sediment samples are collected at representative outfalls (just below current EPSC structures).”

**WWF & HRWA:** The term ‘representative outfalls’ should be clarified in this context. It is unclear to us if it is to mean all current EPSC structures, or just a ‘representative sampling.’

**TDOT Response:** Representative outfalls consist of the discharges to all the monitored receiving waters. These outfalls consist of runoff that may have been treated by a combination of control measures.

### Section 6.1.1.3 Program Assessment

#### Page 6-3

“These are relatively inexpensive samplers, but have one major drawback—samples can only be collected during the initial part of the storm when the water level is rising. This means that the entire storm cannot be sampled and, consequently, data cannot be used to estimate the total amount of sediment leaving the site or being conveyed downstream.”

**WWF & HRWA:** We recommend, as indicated in this Section later, “the best and most comprehensive data would be provided by installing automatic samplers at all monitoring sites..”

This would provide the best data and allow for better overall management of the site and EPSC design at other future sites. Improved monitoring would be greatly beneficial in evaluating the impacts of construction activities.

**TDOT Response:** Comment noted. The USGS has expressed concern about the feasibility of installing automatic samplers at many of these locations because of difficulties in accurately measuring flow, access, and other factors.

"The suspended sediment-monitoring program could also be improved by installing samples and flow meters upstream of the roadway."

**WWF & HRWA:** We agree with this statement. We would support conducting at least some grab samples to determine background and upstream concentrations.

**TDOT Response:** Agree.

"...another potential objective of this monitoring program is to establish the effectiveness of individual EPSC practices based on monitoring at eight sites across the state."

**WWF & HRWA:** Requiring notes on the surrounds, conditions, and EPSCs at the site could facilitate more effective management. We suggest that perhaps involving civil and environmental engineering students from universities of the state to perform analysis on these data would become an effective partnership for an empirical database on EPSC efficacy.

**TDOT Response:** Comment is noted and will be evaluated.

"The USGS monitoring program at existing and future sites should be refocused on determining the amount of impact that TDOT construction activities have on the receiving waters, rather than the performance of individual EPSC measures."

**WWF & HRWA:** We concur with the refocus stated above. Monitoring should be results driven, allowing research and industry to find most efficient means to achieve those results. However, such monitoring is an absolute necessity in order to successfully evaluate the impacts of construction activities, and that the importance of monitoring should not be underscored.

**TDOT Response:** Agreed. Comment noted.

#### Section 6.1.3.4 Sampling Frequency

##### Page 6-10

**WWF & HRWA:** The state of Georgia appears to have a well-defined sampling regime, and we recommend that TDOT adopt a sampling regime that is also well defined.

**TDOT Response:** Would need to be consistent with the State's General Construction Permit requirements.

#### Section 6.1.3.5 California

##### Page 6-11, 6-14

"In practice, little monitoring is done for non-visible pollutants. Most contractors assert that the subject materials are not exposed to storm water, so no sampling is required."

**WWF & HRWA:** We recommend that TDOT adopt standards for non-visible pollutants in storm water, as has the state of California. We recommend that some sampling regime be established, even if materials are supposedly not exposed to storm water. Non-visible pollutants, such as oils, are often washed into receiving waters even resulting from very small storm events. We recommend establishing sampling regimes and standards for non-visible pollutants in storm water.

**TDOT Response:** Compliance with the General Construction Permit will be followed. However, as noted in California, little monitoring is done for non-visible pollutants.

#### Section 6.1.3.6 Washington State

##### Page 6-15

“The Washington Department of Ecology is also concerned with pH at construction sites because these sites typically use or have alkaline materials (concrete, cement, mortar, etc.).”

**WWF & HRWA:** We would support TDOT adopting rules to monitor pH and keep such materials out of water bodies until fully cured.

**TDOT Response:** Comment noted.

#### Section 6.1.4.1 Standards for Sediment and Turbidity

##### Page 6-15

“One of the initial problems is that the vast majority of states have not adopted numerical standards for discharges from construction sites.”

**WWF & HRWA:** We believe that numerical standards will allow for consistent application of erosion and storm water pollution control procedures, helping the watershed and making the monitoring and inspection process smoother. It is strongly recommended that TDOT adopt numerical or above-ambient standards for storm water discharges.

**TDOT Response:** It is not TDOT’s role to define numeric standards for storm water discharges.

#### Section 6.1.4.3 Georgia

##### Page 6-17

“In practice, enforcement actions by regulators in Georgia are complaint driven. The experience is that a field inspections triggered by downstream complaints easily identifies failed or inappropriate controls without the need for water quality monitoring.”

**WWF & HRWA:** Complaints should not form the basis for environmental enforcement if resources are to be protected. Proactive monitoring and vigilance is recommended. For example, in areas of less population density, there are fewer people to notice – and then file a formal complaint – about storm water runoff.

**TDOT Response:** Agreed. The purpose of the SSWMP is to ensure that TDOT's program is proactive.

### Section 6.1.5 Visual Evaluation of Sediment Deposits

#### Page 6-23

“Visual observation is not a satisfactory way to quantify the relative performance of different types of EPSC measures.”

**WWF & HRWA:** We strongly agree with this statement, which underscores the importance for the need for numerical standards. Measurable, quantitative, results-drive regulations are the crux of the issue. We strongly support this statement, for the reasons cited above. We believe that numerical standards will allow for consistent application of erosion and storm water pollution control procedures, helping the watershed and making the monitoring and inspection process smoother. It is strongly recommended that TDOT adopt numerical or above-ambient standards for storm water discharges.

**TDOT Response:** This is not an issue of adopting or recommending standards, but is a recommendation about the appropriate protocols for testing and comparing individual EPSC measures in a comprehensive evaluation program.

### Section 6.2 Use of Flocculants and Polymers

#### Page 6-24

**WWF & HRWA:** While these types of remedial actions can be an important tool, focus should remain on keeping erosion from occurring at all. Polymers should be employed as a last step in a comprehensive erosion control plan.

**TDOT Response:** This last statement is not entirely correct. Polymers should be used on sites that have a high content of colloidal clays that take several days to settle out of suspension without adding a flocculant. They should be used as a preventative BMP instead of as a reactive BMP.

#### Section 6.2.2.1 Identification of Types of Polymers/Flocculants

##### Page 6-25 Cationic Polymers

**WWF & HRWA:** Due to the more toxic nature of these polymers, we recommend that their use be prohibited. Several other states, such as Michigan and Virginia, do not allow use of cationic PAM.

**TDOT Response:** We agree. Cationic polymers will not be used on TDOT projects.

### Section 6.2.3.2 Sampling Criteria

#### Page 6-30

“Cationic forms of PAM are not allowed for use under this guideline due to their high levels of toxicity to aquatic organisms. Emulsions shall never be applied directly to storm water runoff or riparian waters due to surfactant toxicity. (Emulsions shall not be applied directly to storm water runoff or riparian waters).”

**WWF & HRWA:** We concur with this statement. We also recommend establishing toxicity requirements for surfactants used in solutions.

**TDOT Response:** TDOT will establish application rate (and application) guidance for polymers.

### Section 6.2.4 PAM Uses and Applications

#### Page 6-31

“Physical ground cover should be used and PAM added to improve performance. Sediment reduction should be achieved first, then turbidity reduction with PAM.”

**WWF & HRWA:** We strongly agree with these statements by TDOT. Emphasis should be placed on positive and productive abatement techniques and preventative measures over application of chemicals to remediate.

**TDOT Response:** Agreed.

### Section 6.2.8 State Agency Storm Water Programs

#### Page 6-34, 6-35

**WWF & HRWA:** We recommend that TDOT adopt Virginia’s use of PAM. Their use appears to be most progressive in protecting water resources.

**TDOT Response:** TDOT will adopt application rates and guidance based upon the most current polymer research available.

### Section 7.2 Recommendations for improvements to current ROW guidelines

#### Page 7-2, 7-3

“Develop a written policy that timber removal, grading, and other land disturbance activities are not allowed once the sale is final.”

**WWF & HRWA:** We recommend clarifying this statement, for i.e. removal by whom?

**TDOT Response:** Removal from any parties: previous landowner or TDOT. The sentence will be clarified as follows: "Develop a written policy that timber removal, grading, and other land disturbance activities by anyone other than TDOT or their representatives are not allowed once the sale is final."

"If improvements that are to be removed are located immediately adjacent to a spring, stream, wetland, or other waters of the state the ROW personal should contact the Regional Environmental Coordinator for guidance on additional measures that should be used to protect the waters of the state during removal"

**WWF & HRWA:** We recommend strengthening the language in the sentence from 'should contact' to 'must contact.'

**TDOT Response:** Agreed.

"Add emphasis on balancing the earthwork during design for the project. This will not always be possible but large waste or borrow quantities are expensive and can cause environmental impacts during construction."

**WWF & HRWA:** We agree with this positive statement by TDOT. We believe that topsoil should be required to be retained on site to the extent practicable, except to adjust for deficit or surplus. Additionally, it should be noted that the spread of noxious weed seeds can be exacerbated through topsoil transport from different sites.

**TDOT Response:** No response needed.

#### **Section 7.4 Recommendation for additions or revision of current procedures related to storm water infiltration and associated health and safety issues of temporary and permanent basins**

##### **Page 7-4**

"An inspection plan and maintenance plan for permanent facilities should be developed. The guidelines indicate the emergency overflow should be designed for a 100-year storm. Downstream impacts should be investigated to determine if a larger event (500 year) failure would be catastrophic. The consequences of an embankment failure should always be investigated and considered in the final design."

**WWF & HRWA:** We concur with these statements. Inspection and maintenance plans need to be developed and followed. A definition for the term 'catastrophic' should be noted in this Section to eliminate confusion.

**TDOT Response:** The last 2<sup>nd</sup> and 3<sup>rd</sup> sentences will be modified as follows:  
“Downstream impacts should be investigated to determine the consequences of an embankment failure during a large storm event should be investigated and considered in the final design.”

## Section 8.1 Project Sequencing

### Page 8-1

“The clearing, grubbing and scalping of excessively large areas of land at one time is an unnecessary invitation to sediment problems.”

**WWF & HRWA:** We strongly agree with this statement and commend TDOT for this observation. However, we also feel it important to stress the lack of a need to clear the entire right of way as a matter of course. Often this is done as standard practice, but is not necessary. Clearing only what is required will reduce erosion and costs, as well as increase the esthetic value of the end product.

**TDOT Response:** Agreed. Clearing is generally only done to the limits of grading, not to the limit of the ROW unless there is a safety concern from vertical obstructions in the clear recovery zone.

## Section 8.2 Minimization of High Risk Locations and Activities

### Page 8-2

“Since topsoils are also a seed source, imported soils should come from sites in the immediate area with similar vegetation associations.”

**WWF & HRWA:** This sentence contains a typographical error: ‘imported solids’ should read ‘imported soils.’ In addition, this Section should stress that noxious weed seeds can be transported via imported topsoil, creating a future maintenance and ecological problem.

**TDOT Response:** See correction. It is always important to know the source of imported soils. At this time, Tennessee only has two species recognized as noxious weeds and TDOT actively works to control them so that they do not spread on the roadside.

## Section 8.5 Buffer Areas for Aquatic Resources

### Page 8-4

“For the purpose of protecting water quality, stream buffers can assume a variety of configurations that include not only native, but adapted vegetation. Adapted plants provide effectively the same water quality benefits and native vegetation, and their removal would only increase the amount of disturbance near the receiving water.”

**WWF & HRWA:** This sentence contains a typographical error and should read ‘benefits as native vegetation.’ Although this statement is a valid point, and no one is recommending exacerbating sedimentation through greater disturbance, the value of native vegetation in this Section is downplayed. Native plants often exhibit root systems far more extensive than adapted species, and can hold together soils much more effectively. For example, reed canary grass, and adapted species, may grow over six feet tall, but has roots less than a foot. Native grasses and sedges have roots typically deeper than the plants are tall. See figure in picture adapted from the USDA’s Illinois Native Plant Guide:

<http://www.il.nrcs.usda.gov/technical/plants/npg/NPG-rootsystems.html>

**TDOT Response:** The typographical error will be corrected.

#### **Table 8-1 Creek Setbacks based on Drainage Area**

**WWF & HRWA:** We recommend that TDOT adopt the policy of using a graduated creek setback allowance based on the drainage area of the basin as indicated. We recommend the width of the buffer be proportional to the slope of the upstream drainage; steeper catchments require more buffer than a more gradual pitch. An example of such a system is in use in Williamson County, which requires 50 feet on either side for one acre or less of drainage, 75 feet if one to five acres are drained, and 100 feet of buffer for more than five acres of drainage. Additionally, we recommend that construction activities, such as road building or cut and fill storage, be conducted outside FEMA designated 100-year floodplains.

**TDOT Response:** See other responses related to buffers.

“The buffers should remain undisturbed and be allowed to contain both native and adapted plant species at a density appropriate for the type of vegetation.”

**WWF & HRWA:** We recommend that adapted species only be used in buffer strips if already present or as a supplemental cover crop. Any permanent seeding should be done with natives. Native plants often exhibit root systems far more extensive than adapted species, and can hold together soils much more effectively. For example, reed canary grass, and adapted species, may grow over six feet tall, but has roots less than a foot. Native grasses and sedges have roots typically deeper than the plants are tall. Native root systems are vital to stream bank stability. The Natural Resources Conservation Service reports that:

“The fundamental basis for encouraging use of native plant species for improved soil erosion control in streams and storm water facilities lies in the fact that native plants have extensive root systems which improve the ability of the soil to infiltrate water and withstand wet or erosive conditions.”

**TDOT Response:** Comment noted.

## Section 9.5.2 Community Outreach

### Page 9-5

“The following programs are targeted for community outreach with the goal of environmental stewardship...”

**WWF & HRWA:** We recommend that in addition to those already on the list, that watershed groups and promotion of native vegetation and habitats be included.

**TDOT Response:** Please see discussion of native and adapted species in earlier responses.

## II A. Comments on Tennessee Department of Transportation Environmental Division, Mitigation Practices Chapter

### Section 1 Introduction

#### Page 1-1

“Natural resource features, such as streams, springs, wetlands, and protected species, are identified and measures are recommended to avoid these sensitive areas, if possible.”

**WWF & HRWA:** The language in this Section should be strengthened to read:

“Natural resource features, such as streams, springs, wetlands, and protected species, are identified and measures are recommended to avoid these sensitive areas to the greatest extent practicable.”

**TDOT Response:** The sentence has been changed as follows:

Natural resource features, such as streams, springs, wetlands, and protected species, are identified and measures are recommended to avoid these sensitive areas to the greatest extent practicable.

### Section 2.1.2 Stream Relocations

#### Page 2-2

“Stream locations less than 50 ft. should not require detailed measurements and design as this is considered a transition zone and if often need to direct flow into a culvert.”

**WWF & HRWA:** This sentence contains two typographical errors: ‘if’ should read ‘is’; ‘need’ should read ‘needed.’ We recommend that this transition distance be reduced to a maximum of 30 feet to reduce unmitigated Section of stream location and avoid turning streams adjacent to roads from becoming ditches.

**TDOT Response:** The typographical errors have been corrected. However, the 50’ transition zone has been previously agreed upon by TDOT and TDEC.

“Three general cross-sections should be measured for design of the channel. ... Each cross-section should provide the following data...”

**WWF & HRWA:** We recommend that the number of cross-sections measured for stream relocation is given on a per length basis (e.g. three cross-sections per fifty feet). The existing language is somewhat ambiguous. Additionally, there should be photographs taken of the stream prior to relocation as a tool for restoration.

**TDOT Response:** The number of cross-sections indicated in this section is a minimum recommendation. The Environmental Design Group, to be established, will establish additional guidance and will likely require additional measurements to aid them in natural channel design. Photographs of every stream are taken during the ecology and environmental boundary studies.

“Channel side slopes should be 2:1 or less (if possible) and seeded. Plant two alternating rows of trees on 12-foot centers on both sides of the new channels. Trees should be quality root seedlings between 18” and 24”.”

**WWF & HRWA:** We recommend that side slopes be further reduced to 4:1 maximum for type of application, which is recommended by the University of Maryland Extension office (<http://www.riparianbuffers.umd.edu/fact/FS729.html>). The planting of trees in areas where they are not indigenous may be ecologically damaging. Open floodplains are often naturally vegetated with native sedges, grasses, and reeds without any trees. Trees should be planted if they were previously established.

**TDOT Response:** The 4:1 slope from the Maryland Fact Sheet referenced by the web page is taken out of context. It states that “live staking is an appropriate stabilization method on streams with moderate streambanks (4:1). Streams throughout Tennessee and the southeast typically have natural streambanks that are on average 2:1 or steeper. These undercut banks and steeper banks provide aquatic habitat. Constructing a stream channel with 4:1 channel slopes would create unnatural streams.

Trees should be planted on all relocations, even if the existing stream or floodplain had no trees. They provide stability, habitat, detritus for the stream, and numerous other benefits. Virtually all streams in Tennessee contain trees on their streambanks unless they were unnaturally removed. As such, all stream relocations should be replanted with trees. It should be noted that TDEC typically requires tree planting as an ARAP permit condition.

#### Section 2.1.4 Vegetation

##### Page 2-4

“If required by the permit(s), the old channel must remain for a specified time to allow for emigration of aquatic organisms.”

**WWF & HRWA:** We recommend that a policy be established to allow for the successful emigration of aquatic organisms by specifying a time for which the old channel shall remain. This will require consulting TDEC and aquatic biologists regarding the necessary time for which the old channel must remain.

**TDOT Response:** We concur. During SSWMP implementation, TDEC will be consulted to develop a policy addressing this issue.

“All work for excavation in the stream channel area including erosion prevention and sediment control and diversion, unless

specifically shown on the erosion prevention and sediment control plan.”

**WWF & HRWA:** We are unclear what this sentence is conveying. It would be helpful to clarify.

**TDOT Response:** This sentence has been removed from the document, as it was inadvertently left in from previous edits.

## Table 1: Tree Specifications

### Page 2-5

**WWF & HRWA:** We notice that this table lacks any names of tree species. It should be filled in, and reviewed prior to final implementation. We recommend that indigenous species be used.

**TDOT Response:** Tree planting specifications should be specific to each stream and region of the state, and should consider the mix of trees present on the stream prior to the mitigation project. Native trees are used but are specified at the time of the ecology and mitigation study and are based upon trees found along the stream during these studies.

“All species should be mixed and applied at a 1:1:1 ratio (10 pounds per acre).”

**WWF & HRWA:** The given ratio holds three values, but four species are given potentially causing confusion. We recommend some clarification.

**TDOT Response:** The statement has been modified in the Mitigation Practices chapter to:

All species should be mixed with equal ratios. (10 pounds per acre each).

## Section 2.1.7 Stream Relocation Considerations (Planning, Design and Construction)

### Page 2-13

**WWF & HRWA:** We recommend that much greater emphasis be placed on replacement if and only if necessary, avoiding mitigation in favor or conserving existing resources.

**TDOT Response:** The Environmental Procedures Manual (Section 3.3.2.6) and the Program Rationale, Evaluations, and Recommendations (Section 1.4.1.2) documents both indicate that the priority is to avoid and then mitigate environmental impacts. The document in question is the Mitigation Chapter, which addresses streams, wetlands, etc, once the planning and environmental processes have determined that avoidance cannot occur and that some type of

mitigation is required. These determinations would have occurred before the Mitigation Chapters are consulted.

## Section 2.2 Planning and Design

### Page 2-25

“Unlike canals and ditches, natural streams are inefficient carriers of water.”

**WWF & HRWA:** Although this statement may be true from an anthropocentric perspective, we feel that it sets a poor tone: one could also argue that canals and ditches are ‘inefficient’ supporters of habitat, or that they ‘steal’ water from the basin. Although well intentioned (judging by the sentences that follow this one), we recommend that the language reflect a more ecologically sensitive perspective.

**TDOT Response:** Comment noted.

“The riprap should extend up the bank as high as the water surface of the design flood...”

**WWF & HRWA:** The size of the design flood is not specified; this sentence could use clarification.

**TDOT Response:** The design flood frequency is specified in Chapter 10 of the Drainage Manual prepared by the TDOT Design Division.

## Section 2.4.1 Mitigation for Permanent Wetland Impacts

### Page 2-30

“Wetland mitigation may be in the form of restoration, creation, enhancement, or preservation...”

**WWF & HRWA:** This statement is potentially very harmful. There should be a no net loss of wetlands. Preserving another wetland is a very positive action and should be promoted—but preservation must occur regardless. Mitigation for destroying wetland should be accompanied by the creation of a new wetland. Ideally, wetland mitigation should be a two-sided approach: hydrological and ecological. The change in the hydrology should be mitigated on site to avoid further disruptions to the watershed by conveying more water faster. We agree with TDOT that ecological mitigation is best accomplished through a wetland banking system, as suggested in the section. However, both aspects must be addressed.

**TDOT Response:** Comment noted.

### Section 2.4.2 Mitigative Measures for Temporary Wetland Impacts

#### Page 2-31

“When temporary impacts must occur, remove and stockpile the top 12” of topsoil from the affected area within the ROW prior to construction.”

**WWF & HRWA:** This statement does not appear consistent with another portion on ‘TDOT mitigative measures for temporary work in wetlands and streams’

#### Page 3-38

“After the area for the haul road is cleared and grubbed, the top 6-inches of topsoil from this area should be removed and stockpiled in an adjacent upland site and protect from potential erosion.”

The rules should be consistent throughout, and we recommend that the greater amount of soil be saved for future usage in mitigating the temporary wetland damages.

**TDOT Response:** The comment from page 3-38 referencing the top 6-inches of soil has been change to 12 inches to be consistent with the previous statement.

### Section 2.5.4 Special Conditions/Protection Guidelines for Various Federally Listed Aquatic Species (Fishes and Mussels)

#### Page 2-37

“Haul roads, work pads, and temporary crossings in streams containing endangered or threatened species should be avoided, unless previously approved by the USFWS and TWRA.”

**WWF & HRWA:** We recommend that these operations not be in place where they will be interacting with or impact endangered or threatened species, at any time.

**TDOT Response:** There are circumstances where the only means of accomplishing a task is to work in the stream, such as for the construction or replacement of a bridge pier. Therefore, consultation procedures are in place with the USFWS that cover these temporary impacts. Every effort will be made to avoid in-stream work, but there are times when it is unavoidable.

“No work will be allowed in the water. No equipment, concrete debris, paving materials, litter, bridge falsework, demolition debris or other materials should be allowed to fall into or be placed in the waterway.”

**WWF & HRWA:** We strongly agree with this statement with statement. This statement underscores the need for establishing a buffer zone to enforce these rules.

**TDOT Response:** None necessary.

“If sediment is observed in the waterway because of the construction, the work should cease until EPSC measures are repaired.”

**WWF & HRWA:** This statement is not direct enough: observed by whom? Must it be proven to be attributed to the construction conclusively? This is an example that demonstrates the need for quantitative values (or value above ambient conditions) to establish if work needs to be ceased.

**TDOT Response:** This section contains notes for plans to protect endangered species when work is located near a known occurrence. The Comprehensive Inspections program and training modules will address how to best react to EPSC failures on these projects as well as all TDOT construction projects. However, it should be noted that training emphasis will be placed on *avoiding* EPSC failures through pro-active maintenance and SWPPP updates.

“Staging areas and equipment maintenance areas (particularly for oil changes) should be located at least 200 feet from the stream banks to minimize potential for wash water, petroleum products, or other contaminants from construction equipment to enter the stream.”

**WWF & HRWA:** We recommend that the staging area (particularly for oil changes) have a drainage system away from the stream that keeps petrochemicals out of storm water. The staging area should possess a perimeter containment system, referenced earlier, to contain any fugitive chemicals within the region.

**TDOT Response:** TDOT currently follows the Tennessee Construction General Permit and TDEC’s Erosion and Sediment Control BMP Manual as they apply to staging areas. For clarification, the following sentence was included in that section:

Additionally, the staging area should not be located along a drainage conveyance that flows directly to the stream.

“Erosion control mats will be placed on slopes greater than 2:1.”

**WWF & HRWA:** We recommend that erosion control mats be utilized also on shallower slopes; anything steeper than 3:1.

**TDOT Response:** This statement is a minimum requirement. Natural streams often have stable banks that are at a 2:1 or steeper slope. In such cases, it would be unnatural to replace disturbed banks with flatter (3:1) sloped banks. However, where the soils or stream condition prevent stabilizing slopes at 2:1 or steeper (such as in west Tennessee, generally), then the slopes will be flattened and stabilized.

“When a visible increase in turbidity is observed in the waterway, construction should be stopped until the source can be determined.”

### Section 2.5.5 Special Conditions/Protection Guidelines for Various Federally Listed Terrestrial Species (Plants, Bats, and Migratory Birds)

#### Page 2-41

**WWF & HRWA:** The term “visible increase” is not a sufficiently definable measure; further demonstrating the need for quantitative values for sediment and TSS.

**TDOT Response:** Agreed, but currently there is no water quality criteria for turbidity in Tennessee. This sentence is meant to be used as a trigger for site personnel to review the EPSC measures and look for corrective measures that need to be employed.

“Construction should be done outside the breeding or flowering season.”

**WWF & HRWA:** We recommend that this statement explicitly include nesting and chick rearing as part of the breeding season. In addition, the species for these animals and plants of concern should be specified.

**TDOT Response:** Nesting and chick rearing, if applicable for a given species impacted by a project, are covered in the Biological Assessment (BA) that is prepared for the project. The BA is submitted to the USFWS for consultation on a given species, and if nesting and chick rearing is a requirement for a given project, it will be included and direction given by the USFWS.

### Section 3.3 Water Quality Permit and Sensitive Areas Field Boundaries

#### Page 3-2

“High visibility construction fencing will be used as follows:...”

**WWF & HRWA:** We suggest also including delineation of buffer zones as a recommended use of visibility fencing in the above list of uses.

**TDOT Response:** Agreed. We have added a statement to this section that high visibility fencing will be used to delineate buffers.

### Section 3.4 Temporary Stream Diversions

#### Page 3-3

“All projects should be planned to minimize the time that the watercourse will be diverted.”

**WWF & HRWA:** This statement could benefit from clarification. For example, what can be done to ensure that the time diverted is minimized?

**TDOT Response:** The section referenced is a lead-in paragraph. The sections following include more detailed information about diversion construction, as do the notes on the standard drawings referenced in these sections. While these sections

and notes detail construction and maintenance concerns, each erosion prevention and sediment control plan for in-stream work will more specifically address construction schedules and sequencing.

#### Section 3.4.1.4 Maintenance

##### Page 3-4

“Routinely inspect bypass pump and temporary piping to ensure proper operation.”

**WWF & HRWA:** We recommend defining / establishing the term “routinely” for this application’s context.

**TDOT Response:** The Comprehensive Inspections Program document more completely covers inspection frequency. The general recommendation for inspection frequency is twice per week, as required by the TN Construction General Permit. However, when actively pumping or bypassing a stream, inspections should be performed daily for the proper functioning of the equipment and diversion. This section of the Mitigation Chapter has been revised to include daily inspections of streams being by-passed or pumped.

#### Section 3.4.4.4 Maintenance

##### Page 3-11

“There may be certain times of year, especially in the summer, when fabric-lined diversion channels may cause thermal pollution.”

**WWF & HRWA:** During these times of year, we recommend that temperature and dissolved oxygen levels be monitored regularly (for example, early in the morning and late in the afternoon). These measurements will help ensure that should the water quality levels degrade, action can be taken as not to impair aquatic organisms.

**TDOT Response:** Comment noted. TDOT will investigate this.

#### Section 3.5 Culvert Staking and Installation for Streams

##### Page 3-13

“For adequate reproduction and fish passage, it is essential that there be no barriers to migration.”

**WWF & HRWA:** In addition to the concerns about shallow water and drop-offs, we recommend that light-tubes be installed where long culverts are needed to allow for migration patterns to proceed through the culverts. This simple design feature increases migration passage by allowing natural light to penetrate to the water, more like a natural stream.

**TDOT Response:** For culverts greater than 500 ft., the use of light tubes could be considered on a case-by-case basis. Problems associated with light tubes include damage from maintenance activities, particularly mowing. Open grates installed to provide light are not a potential solution as this provides a direct conduit for runoff to reach the stream.

“Typically there is a need to widen the inlet and outlet for wingwall construction, so this area of the stream should be re-established to pre-construction dimensions once complete.”

**ETI Corporation (Stacey Morris, P.E.):** I have observed many installation where the existing stream was 8-12 feet wide and the box culvert size needed to handle the Rood flows was as much as 3 barrels at 18' span per barrel (total span over 50 feet). The Draft SSWMP wording seems to require (in a case such as I cited) the backfilling of the majority of the new culvert opening to achieve the pre-construction dimensions. This appears to be impractical to accomplish and would likely result in roadway flooding for the design storm event.

**TDOT Response:** Agreed, wording has been changed in the ED Mitigation Chapter document to the following:

Typically there is a need to widen the inlet and outlet for wingwall construction, therefore, a floodplain shelf approximately 1.0 ft. higher than the base low flow stream channel should be established and stabilized with native shrubs and grasses.

The intent was to re-establish a low flow channel so that the base stream flow will be contained within a channel of similar dimensions to the undisturbed upstream and downstream reaches. The original dimensions should not be restored as this may impede flood flows but a floodplain shelf approximately 1.0 ft. higher than the base flow channel should be constructed. One method of accomplishing this is to install sills as presented in Section 3.5.4.

Our experience indicates the existing stream channel is most likely “sized” by nature to accommodate approximately the 2-year storm event. The roadway design for the culvert is usually in the 10 to 50 year design storm range. ETI believes this portion of the Draft SSWMP should be revisited and modified to accommodate current normal practice OR the current normal practice and TDOT Culvert Standards modified to achieve the objective stated in the Draft SSWMP.

The current normal practice results in severe stream habitat degradation and siltation due to over widening stream channels. As stated above, the upper portions of the stream could be excavated to provide flood storage capacity, but the base channel dimensions should remain the same with a floodplain shelf established along one or both sides of the stream at the culvert inlet and outlet.

Changed sentence to read as follows:

No widening of the streams base low flow channel should occur at the culvert inlet or outlet.

### Section 3.5.1 Pipe/Culvert Extensions

#### Page 3-14

“Riprap should consist of clean rock or masonry material free of debris or pollutants.”

**WWF & HRWA:** This statement should specifically state that asphalt cannot be used as riprap, and that any concrete used must be fully cured to prevent raising water pH.

**TDOT Response:** We agree that asphalt is not an acceptable alternate for riprap. TDOT’s standard specifications more fully describe riprap specifications and cover this issue.

“Maintain EPSC measures until groundcover or vegetation is well established.”

**WWF & HRWA:** This statement is too open-ended and could be broadly interpreted. We suggest expressing how must it be maintained and what constitutes ‘well established.’

**TDOT Response:** Stabilization is defined in other documents.

“Within jurisdictional waters and wetlands, all temporarily disturbed areas should be restored to the pre-project conditions and planted with appropriate plant species.”

**WWF & HRWA:** We recommend that the temporarily disturbed wetlands be planted with native plants. Additionally, if actual plug-plants are to be used, which is recommended (rather than seeding), it should be explicitly stated.

**TDOT Response:** Agreed. The wording in this section was changed to address.

### Paragraph 3.5.6.3 Construction

#### Page 3-24

“No widening of the stream channel should occur at the culvert inlet or outlet.”

**ETI Corporation (Stacey Morris, P.E.):** Please refer to the above response paragraph. This statement needs to be revisited in the Draft SSWMP.

**TDOT Response:** Please refer to the above response.

### Section 3.8 Haul Road Installation and Removal

#### Page 3-38

“...top 6-inches of topsoil...”

**WWF & HRWA:** This inconsistency described above (Section 2.4.2) between 6 inches of topsoil and 12 inches of topsoil. Please refer to the Comment for Section 2.4.2.

**TDOT Response:** Agreed and changed to 12 inches.

## II B. Comments on Tennessee Department of Transportation Environmental Division, Draft Environmental Procedures Manual

### Section 2.1 Preliminary Alternatives Development

#### Page 2-1

“Although not specified by the Technical Advisory, Tennessee Department of Transportation (TDOT) generally discusses in the EA the alternatives that were initially considered but dropped from further study after they were determined unreasonable.”

**WWF & HRWA:** We recommend that the TDOT specifically be required to summarize alternatives that were initially considered. A brief summary containing some of the reasons for the chosen alternatives would help stakeholders understand the rationale for a given course of action.

**TDOT Response:** This summary is covered in the EA.

### Section 3 Early Project Planning Coordination

#### Page 3-1

“TDOT supports early coordination between the Divisions. In an effort to ensure that this coordination is happening effectively and efficiently, and Interdisciplinary Project Planning Team (IPPT) should be established. TDOT also strongly supports interagency coordination.”

**WWF & HRWA:** We strongly concur with recommendation and believe that TDOT is presenting a very progressive idea with this statement, which we fully support. We believe that the sooner planning and coordination—including environmental planning—occurs, the more efficient, cost effective, and ecologically sound are the results.

**TDOT Response:** Agreed.

### Section 3.2.1.1 Natural Resources (Modified)

#### Page 3-3

“Until the proposed TMDL's are approved by EPA, they are not regulatory documents”,

**Sierra Club (Brian Paddock):** That's technically and legally correct, but it's a little misleading because TDEC has had very rapid EPA approvals of TMDLs in a matter of just a few weeks in some cases and has had very few TMDLs that have been set back for further work by EPA, and so the status of a TMDL as a

regulatory document that would require extra steps in environmental compliance, may change very rapidly in the course of a project and that potential and the need to monitor whether TMDLs have kicked in particularly with respect to sediment pollution limitations, needs to be monitored actively in real time during this environmental planning stage of the project.

**TDOT Response:** TDEC notifies stakeholders, including TDOT, about the development and finalization of TMDLs. Also, TDEC's TMDL website will be monitored so streams with finalized/approved TMDLs will be identified during project development processes.

### Section 3.3.1.1 During Construction

#### Page 3-3, 3-4

**Sierra Club (Brian Paddock):** Yes, it talks about industry standards for channel design are the two- and ten-year storm events, because they produce the most erosion, and my comment would be there that, because of climate change, we are seeing a difference in both the frequency and size of storm events and we're beginning to see patterns where much heavier amounts of water are being delivered in a storm event, and where the assumption, for example, on a ten-year storm is that you have one chance in ten in any given year that you'll have a storm that heavy, and we're now seeing situations where we are having those storms in a greater frequency sometimes multiple times in a given year. So the industry standard there may not be keeping up with what meteorology and climate change science is telling us, and that we probably need to have a system both at the department of environment and department of transportation that keeps the frequency and size of these storm events in mind and keeps up to date what those really look like, because the assumption that we have made for the last 35 years about the frequency and size of storm events is simply changing as our weather changes.

**TDOT Response:** Current designs are based upon average meteorological data over 50 or more years. When those data are updated or revised, TDOT will use the newer data.

### Section 3.2 Interagency Coordination

#### Page 3-2

"Early identification of environmental resources that may be affected by the project is important to facilitate efficient project planning and design."

**WWF & HRWA:** We strongly concur with recommendation and believe that TDOT is presenting a very progressive idea with this statement, which we fully support. We believe that the sooner planning and coordination—including environmental planning—occurs, the more efficient, cost effective, and ecologically sound are the results.

**TDOT Response:** Agreed.

### Section 3.2.1.1 Natural Resources (Modified)

#### Page 3-2, 3

“U.S. Department of Agriculture (USDA) soil surveys for the project area are checked.”

“The NWI maps must be used with caution as they do not show all wetlands; many sites no longer exist and newly developed sites are not shown on the maps. In addition, much of the information depicted on the maps has not been verified in the field.”

**WWF & HRWA:** We recommend that field verification of soils, wetlands, and streams be required in the design stage to minimize the amount of rerouting required. Maps are good for preliminary planning, but field verification should be required.

**TDOT Response:** Environmental data is collected via mapping and other avenues early in the project planning process, called the Ecology Report. A field review is conducted for the Ecology Report to identify streams, wetlands, and other features. More detailed field studies are performed once the general alignment has been identified.

### Section 3.3.1.2 After Construction

#### Page 3-4, 3-5

“Projects that affect 1 acre or more should have hydraulic evaluations prepared for each outfall collecting runoff from the TDOT project.”

**WWF & HRWA:** We agree with the need for a hydraulic evaluation, and support TDOT’s initiative to do so. We agree in principal that TDOT should adopt consistent standards for storm water design, particularly when projects may pass through multiple jurisdictions (as mentioned on Page 1-12). We recommend TDOT evaluate the standards for each jurisdiction affected and adopt the standards that are most protective of aquatic fauna and water quality for use as a consistent protocol throughout the entire project.

**TDOT Response:** See previous comments on same issue (Section 1.3.3 of Program Rationale).

“TDOT should follow their own guidance on storm water design and communicate these design standards and goals to each jurisdiction crossed by the project.”

**WWF & HRWA:** We agree in principal that TDOT should adopt consistent standards for storm water design, particularly when projects may pass through multiple jurisdictions. We recommend TDOT evaluate the standards for each jurisdiction affected and adopt the standards that are most protective of aquatic

fauna and water quality for use as a consistent protocol throughout the entire project.

**TDOT Response:** See previous comments on same issue (Section 1.3.3 of Program Rationale).

### Section 3.3.2.1 Study Process for Natural Resources

#### Page 3-5

“The field survey includes an area of 250 feet on either side of the centerline of each proposed alignment; however, for a bridge and approach projects, the field study must include an area 150 feet on either side of the centerline of each proposed alignment, to include any area needed for temporary detours.

**WWF & HRWA:** This Section is somewhat ambiguous, and may be better described with the addition of a diagram. If nothing else, it should be reworded to avoid confusion and possible mistakes.

**TDOT Response:** Ecology consultants are given very detailed instructions for performing the field surveys. This section provides general guidance.

### Section 3.3.2.2 Channels

#### Page 3-6

“Biologists examine all defined channels within the direct project impact area and will use the TDEC approved stream determination protocols, once developed, for making any watercourse determinations.”

**WWF & HRWA:** We also recommended that any unmarked ephemeral, wet-weather conveyances, or seasonal streams be marked on the maps and noted. These hydrologic features often are very important ecologically and legally in construction projects.

**TDOT Response:** The statement “biologists examine all defined channels...” covers ephemeral wet weather conveyances and season streams.

### Section 3.3.2.5 Reports

#### Page 3-8

“Once the final alternative is selected and design plans are received, studies are repeated in more detail to ensure that nothing has been missed and to prepare detailed minimization and mitigation strategies and documents.”

**WWF & HRWA:** This Section is very vague; specifically what studies are to be conducted? How is it to be ensured that nothing has been missed?

**TDOT Response:** This statement generally describes the next step in collecting environmental data called the Environmental Boundaries survey.

### Section 3.3.2.6 Impact, Avoidance and Minimization

#### Page 3-9

“Ecology Section staff coordinates stream mitigation design with the Environmental Division’s Environmental Design Group to ensure that natural channel design is considered to avoid in-lieu fees.”

**WWF & HRWA:** We recommend that the language in this Section be strengthened such that natural channel design is given a much higher priority over in-lieu of fees payment. “Considered” provides a weak sense of authority. This Section gives the appearance that the in-lieu fees program is viewed as the first option for mitigation. This program, while beneficial, should be used to compensate for unavoidable damages.

**TDOT Response:** As noted in Section 1.4.1 of the Program Rationale Document, TDOT’s priority in the planning and NEPA process will first be avoidance of wetland and stream impacts, second to minimize these impacts, and finally to mitigate for stream and wetland impacts. When avoidance is not possible, TDOT has a monetary stake in stream mitigation practices. When a stream channel is lined with riprap, TDOT must pay into the stream mitigation program AND install rip rap in the stream. We believe that natural channel design is more cost-effective and protective of water resources and, once the EDG is created and functioning, this fact will become more apparent, creating a financial incentive to create natural channels.

### III. Comments on Manual for Management of Storm Water Discharges Associated with Construction Activities

#### Section 2.1 TDEC Requirements and Responsibilities

##### Page 3

“The Compliance Oversight Unit approach appears more focused t handling problems at construction sites after they have been identified rather than preventing the problems before the occur. Emphasis must be placed on prevention.”

**WWF & HRWA:** We agree with recommendation. Emphasis should be on prevention rather than remediation to minimize damages and costs.

**TDOT Response:** Agreed.

“Several systematic problems are not addressed by this approach: a. The authority to gain compliance at the site level has not been addressed.”

**WWF & HRWA:** We recommend that the Compliance Oversight Unit be authorized to force immediate compliance to applicable regulations, employing such methods as stop-work orders if needed.

**TDOT Response:** The Compliance Oversight Unit was part of the inspection program proposed by TDEC. However, TDOT took a different approach and developed the Comprehensive Inspection Program that requires that TDOT self-monitor their projects. The stop work authority will rest with the Stormwater Compliance Officer (identified as Stormwater Coordinators in the document).

#### Section 2.2.1 TDEC Inspection and oversight

##### Page 3

“While these permits.”

**WWF & HRWA:** This sentence is a typographical error.

**TDOT Response:** Fixed.

#### Section 2.5.1 Inspections

##### Page 4

“TDOT designated field personnel are responsible for performing twice weekly inspections during the period when construction is active. Inspections must be done twice each week and performed at least 72 hours apart.”

**WWF & HRWA:** We recommend that an inspection also be required after any storm event that contributes more than 0.5 inches of rain to the area. Attention and methods should be drawn to managing and providing some treatment for the “first flush” (typically considered the first quarter to half inch of rainfall) of a storm event, which conveys the vast majority of pollutants. Concern with larger storm events should focus on water quantity, whereas the smaller and more frequent events need focus on water quality issues. Additionally, materials and methods for keeping storm water pollution originating from road chemicals (oils, greases, salt, etc.) out of receiving waters should be addressed. These pollutants are usually not considered in storm water pollution prevention plans, but pose a real threat to water quality and aquatic life.

**TDOT Response:** We feel that the inspection requirements in the CGP provide a good basis to perform inspections. It should be noted that most of the construction sites will have EPSC inspectors on them at least twice weekly (per the CGP) and likely more often, as the inspectors will be TDOT staff assigned to construction sites in the region. Note, the terminology “first flush” typically applies to post-construction BMP design, not construction BMPs.

#### Section 3.4.1.4 Offsite discharge controls

##### Page 9, 10

“because these structures divert or actually cross...”

**WWF & HRWA:** This sentence contains a typographic error: ‘because’ should be capitalized: ‘Because.’

**TDOT Response:** Fixed.

“Permits issued by the Corps do not usually have specific EPSC requirements but they can effect the placement of EPSC measures.”

**WWF & HRWA:** This sentence contains a typographical error: ‘effect’ should be spelled ‘affect’.

**TDOT Response:** Fixed.

#### Section 3.4.2.1 Temporary Surface Protection

##### Page 10

“The CGP requires that ‘temporary or permanent soil stabilization at the construction site (or phase of the project) must be completed not later than 15 days after the construction activity in that portion of the site has temporarily or permanently ceased.’”

**WWF & HRWA:** A more defined use of the term “temporary” would be useful so as not to create confusion regarding compliance issues.

**TDOT Response:** See the definition of temporary stabilization in the CGP.

### Section 3.4.2.2 Permanent Surface Protection

#### Page 11

“Permanent surface protection is usually an appropriate seed mix for the project location.”

**WWF & HRWA:** We recommend that native seed mixes be required as an ‘appropriate’ seed mix due to their natural growth in the area. Benefits commonly cited include erosion control; reduced watering, fertilizing, and mowing costs; habitat for a number of plant and animal species; and beautification of the local ecological character.

**TDOT Response:** See discussion on native seeding on page 3.

### Section 4.4.1 Velocity Controls

#### Page 17

“Berms made of yard waste or bio-solids have also shown some promise in reducing sheet flow velocities on slopes. However, composts with high phosphorous leaching potentials can be problematic near any nutrient-impaired or threatened water body.”

**WWF & HRWA:** We recommend not using composts with high nutrient leaching potentials (particularly phosphorus and nitrogen) near any water body to avoid degrading water quality. Additionally, it should be noted that composts comprise of these substances may present a human health problem through bacterial contamination via runoff to receiving waters. Further, these materials are very nutritionally rich, and can cause eutrophication of waters by adding limiting nutrients (phosphorus, nitrogen) and thus depleting dissolved oxygen and degrading aquatic life and esthetic value. We believe that these attributes should be noted in the section, and recommend that these materials be used with caution, if at all.

**TDOT Response:** The SSWMP documents are consistent with this comment. See discussion of compost use and comments on EPA data sheets on Page 1. The potential hazards of nutrient pollution are covered in the SSWMP documents in relation use near surface water bodies.

## Section 5 Storm Water Management on Construction Sites

### Section 5 - 2.3 Maintain all EPSC Measures according to the BMP type

#### Page 23

“Maintenance of the EPSC measures is essential to protecting adjacent waters. Inspections are the primary tool for identifying maintenance needs. Inspections are made to find any BMP failures; however, inspectors are also charged with identifying any potential failure.”

**WWF & HRWA:** We concur with this statement; maintenance and inspections are needed. An appropriate enforcement and follow-up protocol should be implemented upon finding a failing BMP. We recommend that TDOT adopt such a practice of requiring BMP repair within 24 hours if discovering non-functionality. This rule must also be accompanied by regular inspections: if non-functional BMPs are never “discovered”, then they may never be fixed.

**TDOT Response:** There is a recommended requirement by TDOT for immediate action meaning basically being sure there are sufficient BMPs in place to prevent any discharge. Then permanent repairs are to be accomplished per the CGP.

### Section 5 - 3.1.1 Availability of Downhill Backup

#### Page 24

**WWF & HRWA:** This Section stresses the importance of a backup in case of a BMP failure. We recommend that sizing (e.g. to handle a given sized design storm) the downhill backup be specified, perhaps increasing the size specified based in the area upslope drained.

**TDOT Response:** These are issues that must be addressed in the field on an ad hoc basis. It would be difficult to prescribe any design safety factor. What is important is that the design team understands the site and its sensitivity and design accordingly meeting or exceeding the CGP requirements. We believe that the arbitrary design standards requiring design for the 2 and 5 year depth are going to result in over design in some cases and in others result in bypass of more intense short duration storms. The best control of erosion and sediment is going to result from a good initial plan and conscientious management in the field. The long-term objective of these programs has to be education and engendering a strong water quality ethic.

### Section 5 - 3.1.4 Question Need for EPSC Measures

#### Page 25

**WWF & HRWA:** This Section addresses the fact that not all failing BMPs need to be repaired or replaced. We recommend that any BMPs that are no longer

deemed necessary be required to have approval by the Design Engineer to discontinue usage.

**TDOT Response:** The SSWMP documents are consistent with this comment in that the project supervisor or the Environmental Compliance Officer would be responsible for determining what BMPs were no longer needed.

## Section 5 - 6 Installation, Maintenance and Repair of EPSC Measures

**Revisions to Soil Binders and Tackifiers:** Internal review of by the design team (Dr. Richard McLaughlin) resulted in a revision to the BMP application description of Soil Binders and Tackifiers.

### Page 52 and 53

Soil Binders and Tackifiers – The change clarified the use of approved PAMs formulated for use of PAMs as supplemental soil binders to improve the performance of surface protection materials.

**Revisions to Standard Drawings:** Comments from the TDOT Design Division pointed out several changes in Standard drawings and new drawings that were not yet posted when the draft manual was prepared. All changes in the text of the Manual were in response to these comments.

### Page 58

Side or Curb Inlet Protection – revised the Standard Drawing Numbers to reflect the new drawings. The illustrations were changed to conform to the recommended BMPs.

### Page 61

Drop Inlet Protection – revised the Standard Drawing Numbers to reflect the new drawings. The illustrations were changed to conform to the recommended BMPs.

### Page 78

Added BMP Sheet for Rock Silt Screens – This BMP was omitted from the draft document. It has been included to reference the TDOT Standard Drawing.

## Section 5: Silt Fence BMP Fact Sheet

### Page 72

“Silt fence is easily the most used and abused of all the sediment control tools. It is often cited as erosion control and it is not. It is frequently installed improperly.”

Since silt fences are such a popular tool, yet so often abused, we recommend that the silt fence Section place great emphasis and detail on proper installation and application. Furthermore, we recommend that silt fence, once installed, be

inspected in its entirety by the Design Engineer or a TDEC official. Additional training and communication will be needed to ensure consistent compliance. We suggest that inspector specific training be required, and combined with mandatory contractor training (with field and laboratory courses) on erosion control.

**TDOT Response:** The manual covers silt fence in some detail as do the training materials being developed. We believe that this has been addressed.

## Section 5: Compost Filter Socks BMP Fact Sheet

### Page 84

“Common Problems...”

**WWF & HRWA:** We recommend that another problem listed be possible nutrient leaching (particularly phosphorus and nitrogen) from the compost causing eutrophication and degradation of the receiving waters. Even though the section states that, “fine mulches from biosolids, or manure based composts are not acceptable filler for compost socks”, compost of any sort should be used with caution near high quality waters.

**TDOT Response:** We believe that is covered in the discussion of compost, Page 2.

## Section 5: Sand and Gravel Bag Berm Fact Sheet

### Page 93

**ETI Corporation (Stacey Morris, P.E.):** Describes Sand and Gravel Bag Berms as being an effective tool in controlling concentrated Rows and states

“They aid in sediment control by reducing the velocity of runoff, retaining sediment laden water and allowing for sedimentation and discharge of less sediment-laden storm water.”

It has been our observation in the field that sand and gravel bags (especially sand bags) do not effectively capture sediment in roadside ditches and channels. The sand bags effectively “dam” the sediment-laden water, but do not allow sufficient flow-through the bags and thus the sediment-laden water quickly overtops the bags and runs on down gradient. ETI believes sand and gravel bags have a use on construction sites for sediment control in some cases, but not for concentrated flow such as cited in the Draft SSWMP. ETI believes this structural control in the SSWMP should be revisited, Comprehensive inspections Program.

**TDOT Response:** Please see response on the issue of sand and gravel (S&G) bags. There does not appear to be any disagreement with this comment. We specifically state that bags do not filter that the secondary sediment control benefit is due to detention. The issue of 90th percentile storm is important but it is really for TDEC to consider, TDOT's current design recommendations (Ch 10, Drainage Manual) comply with the current CGP requirements. Below is the text of the description. The fourth sentence specifically states that S&G bags do not provide

filtration. They provide only a secondary benefit of sediment control by the detention of water behind the bag. They are included in the section on flow controls not sediment control.

**Description:**

Sand or gravel bags are made from durable, weather resistant geotextile fabric. The fabric pores must be tight enough to retain the filler material. The bags usually measure about 24" x 12" x 6". These bags do not provide filtration. They aid in sediment control by reducing the velocity of runoff, retaining the sediment-laden water and allowing for sedimentation and discharge of less sediment-laden storm water. Ends of bags must be tightly abutted and overlapped to direct flow away from bag joints. When used as check dam, in general, the maximum spacing between dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam. Location and quantity of dams are generally shown graphically on the erosion control plans. Dams must be constructed so there is a lower portion in the center of the dam to direct flow

## Section 5: Diversions / Interceptors BMP Fact Sheet

### Page 97

**WWF & HRWA:** We recommend that diversions / interceptors be planted with hearty native vegetation. This increases the infiltration capacity of the structure (deep roots create preferential flow paths for infiltrating water in the vadose zone), as well as slowing the velocity of the water and trapping sediments within the structure by providing physical barriers. This integrates some of the benefits of a vegetated buffer in to the interceptor (creating somewhat of a vegetated swale).

**TDOT Response:** Depending on the application of interceptors and diversions, they may not be permanent controls and would therefore not benefit from planting with native vegetation. The short term of a construction project will not result in the establishment of vegetation that will create vadose zone. However, where diversions or interceptors are designed as permanent structures, permanent stabilization of the control will be required. See previous discussions on native vegetation on page 3.

## Section 5: Vegetated Buffer BMP Fact Sheet

### Page 101

"Established grass is the most desirable buffer material."

**WWF & HRWA:** We recommend that native vegetation be stressed more heavily in this section. The benefits of native vegetation are numerous; their heartiness in droughts, extensive root systems that hold together stream banks, providing habitat, etc.

**TDOT Response:** See native vegetation discussion on page 3.

## Section 6 - 1.1 Inspections

### Page 115

“The inspections include twice weekly inspections to meet the requirements of the CGP and routine (Monthly/quarterly) QA/QC inspections to be conducted by TDOT approved consultants that have been certified by TDOT for inspection.”

**WWF & HRWA:** We recommend that this Section be very explicit (even if somewhat redundant) how the twice-weekly inspections are to be performed (e.g. at least 72 hours apart, after a half inch rain, etc.). This will reduce future confusion in regards to implementation.

**TDOT Response:** This is covered in the comprehensive self-monitoring document and in the training materials being developed. It is the intent of TDOT to follow the CGP and the detailed guidance provided within the CGP. Internal TDOT materials, such as the Construction Manual, will reference the CGP to prevent confusion when a new CGP is adopted.

## Section 7 - 2.2 Formal Inspections

### Page 120

“TDEC and or EPA may conduct a formal inspection of a construction site and the SWPPP documents at anytime.”

**WWF & HRWA:** We recommend that officials conduct random formal inspections to ensure compliance at all times, as indicated. However, it is also recommended that TDEC be required to perform at least one formal and random inspection sometime throughout the project duration.

**TDOT Response:** We cannot mandate an inspection schedule to EPA or TDEC. However, either agency is welcome to inspect TDOT projects at any time.

## Section 7 - 3.2 Criminal Penalties

### Page 121

“Each day such a violation occurs is punishable by a fine of \$50 and up to 30 days in prison.”

**WWF & HRWA:** We recommend that the fine for violations be increased to several hundred dollars each day as the existing amount does not provide an adequate deterrent for negative neglect.

**TDOT Response:** TDOT cannot change penalties assessed by TDEC for compliance with the CGP and its requirements.

### Missing EPSC Measure: Haybales

**TDEC (Paul Schmierbach and Robby Karesh):** There continues to be concern that haybales are in the standard drawings. It is understood that there are remnant projects ongoing that use these measures because they were previously in the design and bid documents. It is desired that verbiage be added to the manual and standard drawings noting that if these measures fail, they will be upgraded to other more suitable measures. Are there any written instructions to this effect for site inspectors or QA/QC teams? Maybe providing a written policy on how haybales are being viewed would address this issue. If not, a detailed response to the comments in the document will be easier. Interestingly enough, the TDEC Level I class does not expressly state that haybales are not allowed. Instead, they say that haybales are not a recommended BMP. In addition, other MS4s allow haybales for E&SC. An E&SC inspection report was developed by a MS4 this week that expressly asked if haybales were installed correctly.

**TDOT Response:** TDOT no longer allows haybales as sediment controls on newly let projects. On projects approved previously, haybales may have been included in the bid package and are therefore allowed in the field until they fail, at which time they must be replaced with other measures such as rock silt screens. TDOT will clearly address this issue in trainings. Haybales are being removed from the standard drawings.

### Drainage Areas for Rock Check Dams

**TDEC (Paul Schmierbach and Robby Karesh):** A concern was expressed over the drainage area allowed for rock check dams. It is believed that it allows for drainages up to 10 acres. There seems to be a concern that this would be the only measure installed in a drainage area and that additional internal controls would not be installed.

**TDOT Response:** TDOT designs plans with *systems* of BMPs, not just one final/primary BMP. This issue will be handled in training--training for designers and inspectors. Good EPSC planning involves systems of BMPs and redundancy.

#### **IV. Comments on GIS Data**

**No comments received.**

## V. Comments on Procedures for Providing Offsite Waste and Borrow on Tennessee Department of Transportation Construction Projects

### A. Area of Borrow/Waste Pits and Total Disturbed Area

**Tennessee Road Builders Association (TRBA):** *Will the area of the borrow/waste pits be counted against the over total disturbed area (50 acres maximum) for the project?* According to the Chattanooga field office of TDEC, you are allowed a maximum of 50 acres of disturbed area for each permitted area. Therefore, if the borrow/waste pits were permitted separately from the project their areas would not be counted against the total disturbed area of the project. This interpretation was to be verified from the Nashville office.

**TDOT Response:** The General Construction Permit does specify a maximum active area of 50 acres on a construction site at any given time. By permitting the borrow and waste site as a separate project, the 50 acre limitation for the main construction site will not include the area of the borrow and waste site.

### B. Complexity of Permitting Procedures in New SSWMP

**TRBA:** *Permitting procedures outlined in the new SSWMP seem to be more complex than the permitting procedures required by TDEC.* Borrow/waste pits that are not included within the limits of the right-of-way and not covered by the CGP must be permitted separately. It is the responsibility of the contractors to obtain permission from landowners and obtain all necessary permits required (State and local). The regulating authorities (TDEC and some city and county agencies) require a Notice of Intent (NOI), a comprehensive Storm Water Pollution Prevention Plan (SWPPP) and permitting fees. The NOI and SWPPP address all aspects and environmental concerns for the site seeking coverage. State law (under the Tennessee Water Quality Control Act and its amendments) gives the regulatory agencies authority to enforce compliance of the permits through civil and criminal penalties. The cost of the permits and cost of compliance of these permits are the responsibility of the landowner and the contractor. Since DOT is not issuing the permits, they should only require that the required permits are obtained and proof of permits submitted as part of the contract requirements. Contract language may be added to ensure that compliance of the permits is required. The DOT project closeout process should include a Notice of Termination (NOT) for all off Right-of Way work.

**TDOT Response:** The procedures identified are similar to what is required for TDOT to permit a project. The NOI and SWPPP relate the Construction General Permit that is administered by TDEC for the construction storm water component of the project site. The intent of the Environmental Evaluations (Ecology Report) as described in manual is to ensure that all "Waters of the State" (i.e. streams, wetlands, springs etc), endangered species etc. are identified on the project site. This information can then be incorporated into the "site plan" so that they are either not impacted by the construction or properly permitted before they are

impacted. If "Waters of the State" are impacted by the project then several additional permits such as ARAP, USACE 404, TVA 26A etc. may be required. This manual will be applied uniformly across the state so that all waste and borrow areas are properly designed, permitted and constructed.

As an alternative, the Contractor may get a letter from TDEC indicating that the site has no jurisdictional waters and does not require regulatory permits or mitigation for use as a borrow and waste area, but will still be required to determine if endangered species are present on the site.

## VI. Comments on Training Requirements

### A. Training

**TRBA:** Will DOT accept TDEC's Level 1 course for the Courses 1 and 2?

**TDOT Response:** No

**TRBA:** Will TDEC accept DOT's training for their required courses?

**TDOT Response:** It is very likely that TDEC will accept the training but that will ultimately be TDEC's decision.

**TRBA:** Is it possible to have only one course acceptable to both agencies?

**TDOT Response:** For TDOT roadway projects, that is the goal to work with TDEC to ensure that they are satisfied with the content of the TDOT training. TDEC can elect to continue requiring their separate training.

### B. Inspections

**TRBA:** Will the contractor compliance history for the project ranking include the contractor's complete history or only the history on DOT projects?

**TDOT Response:** Only the history on DOT projects. The history on DOT projects is the basis of ranking. However, review of non-DOT projects may be considered.

**TRBA:** If through inspections, additional erosion control features are needed, will these items be paid for (provided the current structures have been installed correctly per plans and specs)?

**TDOT Response:** The Department will pay for additional controls on the main roadway site. However, on waste and borrow sites, the TDOT inspector will indicate if the contractor is in compliance with the SWPPP and the contractor will be responsible for paying for and correcting any deficiencies.

**TRBA:** If additional features are needed, will there be an authorization process to allow for immediate installation and approval?

**TDOT Response:** Yes. See response above. The Project Engineer and the Environmental Coordinator must be notified.

## VII. Comments on Comprehensive Inspections Program: QA/QC and Weekly Inspections Program Recommendations

### Section 1.0 Recommendations Summary

#### Page 2

“TDOT should implement a self-monitoring program that incorporates site inspections, inspection oversight, and program reporting and documentation. It is proposed the TDEC serve a regulatory oversight role in this program, reviewing TDOT implementation of the program as appropriate.”

**WWF & HRWA:** We strongly concur with this recommendation, and applaud TDOT for taking such steps. We would encourage TDOT to work with TDEC on developing a program and allowing oversight of it. This proposal strikes a good balance between action and oversight between the two agencies.

**TDOT Response:** Agreed.

### Section 2.0 Existing QA/QC Program

#### Page 3

“Furthermore, the QAQC site assessment has become more like an inspection than an actual QAQC site assessment, because the ability to affect site changes has shifted away from the weekly site inspector and more towards the QAQC site assessment team.”

**ETI Corporation (Stacey Morris, P.E.):** I have observed this in some isolated cases, but by and large this statement (in my experience! is not true). The TDOT Project Supervisor - Construction has a significant amount of influence with the project construction contractors. The ability to affect site changes depends almost entirely on the understanding, dedication, and attention to detail of the Project Supervisor. If the TDOT Project Supervisor understands the need for site changes, the changes usually are implemented expeditiously.

**TDOT Response:** It is true that the Project Supervisor holds a significant amount of influence over a construction site. As the training program is rolled out, project personnel responsible for EPSC will have a better understanding of EPSC measure application, installation and maintenance. This understanding will help EPSC inspectors get site changes made more efficiently and effectively in the field, with support from the Stormwater Compliance Officers.

## Section 5.0 Recommended Long-Term Self-Monitoring Approach

### Page 6 (Step 3)

“Maintenance activities identified during inspections should be categorized as major or minor. Major maintenance items should include repairs or maintenance to be performed on measures located at or adjacent to streams where there is a potential for discharge into the stream. Minor maintenance items include those measures located interior to the project that do not directly discharge into streams and the failure of which would likely not cause off-site sedimentation into a stream. Major maintenance items should be completed within 24 hours after the need has been identified, and minor maintenance items should be completed before the next rain event but in no case more than 7 days after the need has been identified.”

**ETI Corporation (Stacey Morris, P.E.):** I heartily agree with classifying maintenance activities as major and minor. This would greatly help the TDOT Project Supervisor and construction contractor prioritize maintenance activities.

**TDOT Response:** Agreed.

### Page 8 (Step 6)

“Modify contract language for contractors that specifically includes disincentives for EPSC violations. Include language to require contractors to attend the inspector training and to attend site inspections with TDOT personnel.”

**ETI Corporation (Stacey Morris, P.E.):** Including disincentives for EPSC violations is a very good idea. In order to implement this action, it appears an objective scoring system of some kind should be developed to remove the subjectivity in implementing the disincentives. Also, if the contractor is going to be penalized for violations, how about including incentives as well if he does an outstanding job?

**TDOT Response:** TDOT agrees. TDOT has been working on a program that will evaluate performance of a contractor for environmental compliance or non-compliance on a project. TDOT is also working on a program for utilizing tools such as liquidated damages for non-compliance on construction projects in lieu of incentives and disincentives.

### Pages 5, 7, 8, 9

“Therefore, our recommendation on a long-term approach for TDOT is to develop a self-monitoring program similar to the programs implemented by Caltrans and NCDOT, with routine program calibration and training coordinated with TDEC. Inspector training for TDOT and TDEC field staff should be developed and implemented to get both staffs on the “same page”.

**WWF & HRWA:** This should be followed by training for the Contractor staff. We agree with this recommendation, and it reflects one of the general observations included at the beginning of these comments. Additional training and communication will be needed to ensure consistent compliance. We suggest that inspector specific training be required, and combined with mandatory contractor training (with field and laboratory courses) on erosion control.

**TDOT Response:** We are moving in that direction with the training programs being created for inspection and contractor staffs.

“Storm Water Coordinators. Add 8 additional positions to the TDOT Environmental Division to perform Quality Control project assessments”,

**WWF & HRWA:** We concur this with recommendation. It is a positive step that TDOT recognize the need for additional personal. Additional personnel will be required for enforcement—regulations are often meaningless without enforcement and inspections. We recommend that at least this number of positions be filled.

**TDOT Response:** Agreed.

“Develop a tracking mechanism to compile, analyze and report insufficiencies documented by weekly inspectors and QA teams.”

“Focus on the objective of preventing failures rather than correcting failures.”

**WWF & HRWA:** We strongly agree with these recommendations and see that they are positive areas on which TDOT can focus. Communication is the key to success, and that quality control mechanisms represent an engineering ideal of constant improvement.

**TDOT Response:** Agreed.

## Appendix A Summary of the State of Practice in DOT Construction Storm Water Compliance Programs in the U.S.

### Page 14 (Minnesota):

“Non-functional BMPs require repair or replacement within 24 hours of discovery.”

**WWF & HRWA:** We recommend that TDOT adopt such a practice of requiring BMP repair within 24 hours if discovering non-functionality. This rule must also be accompanied by regular inspections: if nonfunctional BMPs are never “discovered”, then they may never be fixed.

**TDOT Response:** It is TDOT’s position that since the goal is to prevent or halt the movement of soil off the construction site, that BMP repair prior to the next rain event is a better standard than to require repair within 24 hours.

## VII. Comments by TDEC Division of Natural Areas

**Silas Mathes, TDEC Division of Natural Areas:** The Division of Natural Areas (DNA) respectfully asks that you consider the following comments regarding the Tennessee Department of Transportation Statewide Stormwater Management Plan (SWMP). DNA acknowledges that you are currently finalizing the SWMP, but we feel strongly that the relatively minor changes we are proposing for the SWMP will aid in the protection of rare species, and also enhance coordination efforts between TDEC and TDOT.

First, DNA appreciates the obvious effort evident in the December 2006 draft of the SWMP. The SWMP will clearly have an instrumental role in protecting water quality and streamlining TDOT's permitting and other regulatory obligations.

DNA's comments focus on two subject areas of the SWMP--the first is how the SWMP refers to rare species, while the second involves SWMP species recommendations for site stabilization and stream buffers. Proposed changes to specific wording in the SWMP are denoted by strikethrough formatting and red text. Blue text adjacent to SWMP sections indicates rationale for changes, and recommended additions.

### Comments Regarding Rare Species

**Silas Mathes, TDEC Division of Natural Areas:** In the *TDOT Environmental Division Environmental Procedures Manual* Sections 3.2-3.3 and in the *TDOT Environmental Division Mitigation Practices* document, Section 2.5, we ask that the language referring to rare species be standardized, and that procedures for review of rare species records better reflect practices currently used by DNA, TWRA, and TDOT. Specifically, documents should consistently use the term "state and federally listed" instead of "Endangered", "Threatened and/or Endangered", or "T&E". The term "Threatened and/or Endangered" excludes many species that are afforded legal protection by the State of Tennessee.

The following table describes the different categories for state and federally listed species and may help to clear up any confusion:

Term	Definition
State and Federally Listed	Umbrella term for protected species listed, or proposed for listing by federal and/or state agencies
Federally Endangered	Species listed by the Federal Government as Endangered
Federally Threatened	Species listed by the Federal Government as Threatened
Federally Proposed Endangered	Species proposed for listing by the Federal Government as Endangered
Federally Proposed Threatened	Species proposed for listing by the Federal Government as Threatened
Federal Candidate for Listing	Species being evaluated for listing by the Federal Government
*State Endangered	Species listed by the State of Tennessee as Endangered
*State Threatened	Species listed by the State of Tennessee as Threatened
*State Deemed in Need of Management	<i>Animal species listed by the State of Tennessee (TN Wildlife Resources Agency) as needing protection.</i>
*State Species of Special Concern	<i>Plant species listed by the State of Tennessee (TDEC-DNA) as needing protection.</i>

\*Note: For state listed animals, TWRA is the principal regulatory authority, while for state listed plants, TDEC-Division of Natural Areas is the principal regulatory authority.

**Silas Mathes, TDEC Division of Natural Areas:** For the *TDOT Environmental Division Environmental Procedures Manual* Sections 3.2.1.1 we propose the following revisions:

**3.2.1.1 Natural Resources (Modified)**

A natural resources check can be completed during environmental screening or it can be conducted as part of the technical studies done for the NEPA document, which is discussed later in this chapter. TDOT or consultant biologists initially review the *TDOT GIS data sets maintained on the TDOT Intranet* to note any potential encroachments on major streams or on identified wetlands, springs, caves, sinkholes or depressions. ~~Records endangered and threatened species (or species proposed for this listing)~~ provided by TDEC are consulted for listings of federally listed, state listed, or proposed listed plant and animal species. TDOT staff accesses a copy of TDEC's *natural heritage database* in a GIS format for these records. If appropriate, TDOT may send the consultant a map and accompanying information derived from data supplied to TDOT by the TDEC Division of Natural Areas. Alternatively, TDOT may require that the consultant request the information directly from the Division of Natural Areas. In the latter case, the Division of Natural Areas will charge the consultant a fee per project for this information. *(DNA asks that TDOT and its consultants use this option sparingly.)*

<sup>1</sup>Tennessee Scenic Rivers designated under the Tennessee Scenic Rivers Act of 1968. The TDEC website for Tennessee scenic rivers is <http://www.state.tn.us/environment/dna/scenicrivers>; and

TDOT Response: Agreed and recommendations incorporated into document.

**Silas Mathes, TDEC Division of Natural Areas:** For Section 3.3.2, we propose the following changes:

### **3.3.2.1 Study Process for Natural Resources**

Ecological evaluations are conducted by consultants or by ED's Natural Resources Office – Ecology Section biologists or by consultants. Both terrestrial and aquatic surveys must be conducted by qualified biologists. Biologists must be familiar with the regulations listed above and with the ED's Scope of Work for Ecological Studies (2004).

The initial step in assessing natural resources is a records check (described in Section 6, Records Check for Environmental Screening).

The next step is a field review performed by a qualified biologist where all alternative alignments are considered. The field survey includes an area of 250 feet on either side of the centerline of each proposed alignment; however, for a bridge and approach projects, the field study must include an area 150 feet on either side of the centerline of each proposed alignment, to include any area needed for temporary detours. Biologists identify the presence or absence of:

Wetlands;

Types of plant and animal species that occur in the area;

~~Threatened and endangered species (federal and state listed)~~  
State and federally listed species;

~~Critical habitats for threatened and/or endangered species~~ state and federally listed species;

**TDOT Response:** Agreed and incorporated changes except the last comment since state listed species do not have designated critical habitats. Sentence now reads: "Critical habitats for federally listed species".

### **3.3.2.4 Endangered Species State and Federally Listed Species**

The first step in the process of investigating ~~threatened and endangered (T&E)~~ state and federally listed species is to send coordination letters requesting species lists to the FWS and TDEC's Division of Natural Areas using the specific format provided by the ED Ecology Section. ~~(This sentence may need to be reworded. Because TDOT possesses the same rare species data as DNA, TDOT sends coordination letters to DNA only when further clarification is necessary.)~~ A biologist and/or a botanist reviews records maintained by the TDEC Natural Areas Division, as well as other applicable sources (such as

Tennessee Valley Authority, TVA) and incorporates the listings in the Ecological Boundaries and Mitigation Memorandum.

An 8.5 x 11 inch topographical map showing the recorded locations of **state or federally listed species** ~~federal or state species listed as endangered, threatened, or deemed in need of management (protected species and species of special concern)~~ should be included in the memorandum. To determine the presence or absence of protected species, both terrestrial and aquatic, field reviews of the project area shall be conducted. Sufficient time should be taken at each site to reasonably determine the presence or absence of protected species and any suitable habitats.

A description of any ~~protected species or federally designated critical habitats~~ **state or federally listed species or their critical habitats** observed during the field survey are included in the memorandum. The memorandum also documents the presence or absence of suitable habitats ~~for federally or state~~ **state or federally** listed species appearing in FWS correspondence or TDEC data. It addresses all protected species recorded within a ~~one~~ **four**-mile radius of the project, stating whether suitable habitats for each species occur within the project impact zone and the likely project impacts on each. The memorandum includes records for all aquatic species recorded within ~~four~~ **five** miles (**Water Pollution Control considers state or federally listed species 5 miles downstream of potential impacts.**) downstream of all direct project impacts and differentiates whether the project is likely to physically harm the identified species, whether the identified species are likely to be affected by sedimentation only, or whether the identified species are unlikely to be affected by the project. (**DNA would also encourage TDOT to conduct a record search for state or federally listed species within a four-mile radius. This search can be used as a tool in order to better understand what species and habitats might be present at or downstream of the site.**)

**Silas Mathes, TDEC Division of Natural Areas:** **For example, a state or federally listed species may have been observed upstream of a project, and thus, may be present in reaches of stream at or below the project. Records located upstream or in nearby tributaries may indicate the need to search the site for those species and habitats.)**

If the FWS provides a list of **federally** protected species in response to the request for information, or if federally protected species are located within the project impact area, a separate Biological Assessment (BA) is prepared following the guidelines issued pursuant to Section 7(c) of the Endangered Species Act. If suitable habitat for a **federally** listed species is present, either simple or complex field studies will be required to determine impacts. (**Provide a short sentence defining a simple field study... DNA would ask that if surveys are performed, they target not only federally listed, but state listed species and habitats as well.**) Complex studies include scuba surveys or mist netting and are usually conducted by consultants with specialized expertise and the appropriate FWS license. Occasionally, complex studies are conducted by other agencies, and the results

provided for inclusion in the BA. The completed BA shall be transmitted by ED to the FWS via the FHWA. The BA contains a reference to the date of the species list provided by the FWS, as well as the complete project route, termini, county, and log mile description. A conclusion is made in the BA as to whether a project will have no effect on each **federally** listed species, or whether it may affect each species. If it is determined that the project may affect the species, a further determination is made whether the effect is likely to be adverse or not. If the effect is likely to be adverse, TDOT immediately requests the initiation of formal consultation with FWS via the federal action agency.

Include a brief paragraph similar to the FWS paragraph above that describes coordination with TWRA (state-listed animals), and with DNA (state-listed plants) when necessary. While this coordination is referenced in *Environmental Division Mitigation Practices*, we feel that it is important to emphasize the coordination here as well.

**TDOT Response:** Agreed to this comment. Section was re-written by Mike Williams with TDOT Ecology Section to better explain the current procedure between TDOT, TWRA, TDNA, and USFWS. The following replaced Section 3.3.2.4.

#### 3.3.2.4. State and Federally Listed Species

The first step in the process of investigating state and federally listed species is to send a coordination letter requesting a species list to the FWS. Next, a TDOT biologist will conduct a database review of the occurrence records maintained by the TDEC Division of Natural Areas (DNA), as well as other applicable sources (such as Tennessee Valley Authority, TVA) to determine if there are known occurrences of state or federally listed species near a proposed project. When a species review indicates there are known occurrences for state listed animals near a project, the TDOT biologist shall coordinate with TWRA to address these species. TDOT biologists will provide TWRA with the list of species that were noted during the database review as well as a brief project description; TWRA personnel review this information and provide comments regarding the potential project impacts to the listed species. The TWRA may also provide direction and notes that will protect the species of concern.

When the species review indicates state listed plants are near a project, the TDOT biologist shall determine if coordination with the DNA is required and only coordinate with DNA if it is believed a listed plant may be impacted by the proposed project or if additional information is needed regarding a state listed plant. If coordination is warranted, TDOT biologists will provide DNA with the list of plant species that were noted during the database review as well as a brief project description; DNA personnel review this information and provide comments regarding the potential project impacts to the listed species. The DNA may also provide direction and notes that will protect the species of concern.

Information regarding the species review and coordination is then incorporated into the Ecological Boundaries and Mitigation Memorandum. An 8.5 x 11 inch topographical map showing the recorded locations of state or federally listed species should be included in the memorandum.

To determine the presence or absence of listed species, both terrestrial and aquatic, field reviews of the project area shall be conducted. Sufficient time should be taken at each site to reasonably determine the presence or absence of listed species and any suitable habitats.

Descriptions of any state or federally listed species or federally designated critical habitats observed during the field survey are included in the memorandum. The memorandum also documents the presence or absence of suitable habitats for state or federally listed species appearing in FWS correspondence or identified during the DNA database review. It addresses all listed species (terrestrial and aquatic) recorded within a four mile radius of the project, stating whether suitable habitat for each identified species occurs within the project impact zone and the likely project impacts on each, differentiating whether the project is likely to physically harm the identified species, whether the identified species are likely to be affected by sedimentation only, or whether the identified species are unlikely to be affected by the project. It is intended that the species review sufficiently address downstream aquatic impacts so as to meet the requirements of the TN Construction General Permit for Storm Water Discharges.

If the FWS provides a list of federally protected species in response to the request for information, or if federally protected species are located within the project impact area, a separate Biological Assessment (BA) is prepared following the guidelines issued pursuant to Section 7(c) of the Endangered Species Act. If suitable habitat for a federally listed species is present, either simple or complex field studies will be required to determine impacts. Complex studies include scuba surveys or mist netting and are usually conducted by consultants with specialized expertise and the appropriate FWS license. Occasionally, complex studies are conducted by other agencies, and the results provided for inclusion in the BA.

The completed BA shall be transmitted by ED to the FWS via the FHWA. The BA contains a reference to the date of the species list provided by the FWS, as well as the complete project route, termini, county, and log mile description. A conclusion is made in the BA as to whether a project will have no effect on each federally listed species, or whether it may affect each species. If it is determined that the project may affect the species, a further determination is made whether the effect is likely to be adverse or not. If the effect is likely to be adverse, TDOT immediately requests the initiation of formal consultation with FWS via the federal action agency.

**Silas Mathes, TDEC Division of Natural Areas:** We propose the following changes for the *TDOT Environmental Division Mitigation Practices*, Section 2.5:

### **2.5 Protected Species Mitigation Practices**

TDOT currently has access to TDEC Division of Natural Areas (DNA) ~~rare and endangered~~ species database. During the early planning stage of all projects, this database should be reviewed and any species within the project area identified. All

species present within a 4 **four** mile radius or within 4 **five** miles downstream (aquatic species) should be noted and become part of the planning and decision making process of alignment

selection. (For the reasons noted above, DNA recommends the use of a four-mile search radius as a tool to identify likely state or federally listed species in potentially impacted areas). Gray bats (*Myotis grisescens*) within 1.5 miles and Indiana bats (*Myotis sodalis*) within five miles of the project should be noted. Additionally, a letter is sent to the U. S. Fish and Wildlife Service (USFWS) requesting information regarding federally listed threatened and endangered (T&E) species near proposed project. The USFWS typically responds to TDOT with a letter indicating no known species occur in the project area, or they provide a list of federally protected species that must be addressed accordance with Section 7 of the Endangered Species Act. The USFWS will also report whether their database indicates the presence of wetlands in the project vicinity. They may also comment on stream crossings or relocations and need for BMPs.

The GIS dataset will include a layer for T&E state and federally listed species and maps documenting the location of the species of concern. This map layer should also become part of the project documentation running with the project from planning to completion of construction.

**TDOT Response:** Agree to recommended changes and incorporated into document.

### 2.5.1 Federally Listed Species – Informal Consultation

#### 2.5.1 Formal Consultation

For the two sections above, If consultation with USFWS triggers species surveys, DNA asks TDOT to also perform searches for state listed species likely to be in the area. (See comment above).

**TDOT Response:** Agreed, but is covered in Section 2.5.3, State Listed Species.

### 2.5.3 State Listed Species

As part of the project evaluation, TDOT biologists review the database maintained by the TDEC Division of Natural Areas' Natural Heritage Program (TDEC-NHP) for the presence of state and/or federally listed threatened or endangered species, as well as state listed deemed-in-need-of-management (deemed) species. All species present within a 4- four mile radius or and aquatic species within five miles 4-miles downstream and ½ mile upstream (aquatic species) are noted. (Again, please see the notes above regarding larger radius searches for rare species. An absence of observations in the TDEC-NHP database, does not necessarily imply that rare species are absent from a particular area. The database is properly used as a tool to determine state and federally listed species likely to be within an area—it should not be used to test for species absence.) If a listed or deemed state or federally listed (By default, almost all federally listed species are state listed as well.) species is noted within the project review limits, TDOT biologists coordinate with

the appropriate agency—Tennessee Wildlife Resources Agency (TWRA)—for animals and TDEC-NHP for plant species. TDOT biologists provide TWRA and TDEC-NHP with the list of species that were noted during the database review as well as a brief project description. TWRA and TDEC-NHP personnel review this information and provide comments regarding the potential project impacts to the listed species. **In situations where TDOT biologists need clarification on whether a project will impact state or federally listed plants, TDOT will also forward a species list and project description to TDEC-NHP. TDEC-NHP may provide comments on potential project impacts if it has further site-specific knowledge available.** The TWRA and TDEC-NHP may also provide direction and notes that will protect ~~the species of concern~~ **state and federally listed species.**

**TDOT Response:** Agree and changes incorporated into document.

State listed species documented as occurring within the distance requirements as noted above are also reported and become part of the environmental boundaries studies presented on Form N. Special considerations are given to state listed species on a case by case basis; however a formal biological assessment (BA) similar to the USFWS guidelines is not required for state listed species.

**2.5.4. Special Conditions/Protection Guidelines for Various Federally Listed Aquatic Species (Fishes and Mussels)**

**2.5.5. Special Conditions/Protection Guidelines for Various Federally Listed Terrestrial Species (Plants, Bats, and Migratory Birds)**

For the two sections above, all references to “T&E species” and “species of concern” should be replaced with “state or federally listed” to avoid confusion with various legal designations.

**TDOT Response:** Agree and recommended changes made.

**Silas Mathes, TDEC Division of Natural Areas:** For the *Procedures for Providing Offsite Waste and Borrow on TDOT Construction Projects* document, we propose the following changes:

## 2.2 Environmental Evaluations

A qualified environmental professional should verify the presence or absence of sensitive environmental resources on the proposed (candidate) waste or borrow area used. A list of TDOT pre-qualified Environmental Consultants can be found at the following link:

<http://www.tdot.state.tn.us/ConsultantInfo/FirmDisciplines.pdf>

To provide the necessary environmental documentation to the Construction Project Supervisor and Regional StormWater Coordinator, it will be necessary for the contractor to engage the services of a qualified environmental consultant to perform a jurisdictional determination of waters of the State or U.S. The

jurisdictional determination will identify the presence of any wetlands and surface waters within the impact limits of the proposed waste and/or borrow areas and associated access or haul roads. A review will also be required for the presence of state or federally listed species within a ~~4-mile~~ **four-mile** radius of the site ([see comments above for rationale](#)) and **five miles downstream of the site**. ~~If streams are crossed or directly impacted by the site, then a survey for listed species will need to be completed for areas within four miles downstream of the site.~~ [\(To avoid confusion and enhance coordination, this requirement should be consistent with the TN Construction General Permit for Stormwater Discharges\).](#)

- State listed species review should be through the TDEC Division of Natural Areas (DNA). The DNA offers site-specific data of known state and federal concern plant and animal species, ecologically significant sites, and certain conservation managed lands. DNA staff will prepare and send to the requesting entity a map of rare species documented within a one-mile radius of the project area, as well as a list of species documented from the surrounding area. A completed Project Review form must be submitted by the environmental consultant, along with a site map, to the DNA Data Manager. Data requests are usually filled within 10 working days and emailed or mailed to the receiving entity after payment is received. Contact the DNA Data Manager for more information. [\(This block of text is an almost verbatim copy of content on the DNA website and should be properly referenced\).](#)

[The “Reclamation Plan for Contracted Projects” form refers only to “Endangered Species”. The form should use the term “state and federally listed species” instead.](#)

### Comments Regarding Invasive Exotic Species and Stabilization Practices

**Silas Mathes, TDEC Division of Natural Areas:** For the *Program Rationale, Evaluations, and Recommendations for Erosion Prevention and Sediment Control Materials and Practices for TDOT Construction Projects* document, we offer the following comments.

#### Section 3.4.1 Seed Mixes for Tennessee:

**Silas Mathes, TDEC Division of Natural Areas:** This section suggests that Kentucky 31 Fescue (*Festuca arundinacea*) and bermudagrass (*Cynodon dactylon*) are not considered invasive species in Tennessee and are therefore suitable for use in roadside stabilization as an adapted species. However, Kentucky 31 Fescue and bermudagrass are considered invasive species by the Southeastern Exotic Pest Plant Council (<http://www.se-eppc.org/weeds.cfm>) and by the US Department of Agriculture (<http://plants.usda.gov/>).

#### Section 3.4.2 Use of Native Seed in Roadside Applications:

**Silas Mathes, TDEC Division of Natural Areas:** This section should include references for the assertions that sloped, compacted soils “are inhospitable to

many native plant species” and that native grass communities are “late successional or early climax”. Additionally, DNA uses mowing in several Natural Areas to successfully manage for grassland communities that contain state and federally listed plant species. This would appear to contradict the referenced Texas DOT study that concluded mowing causes roadside plots “to be invaded by weedy materials”.

Table 3-4 lists interim seed mixes, intended for use until research to determine the most suitable region-specific roadside grass mixtures (including native species) for Tennessee is complete. Species categorized as invasive are listed as part of the interim mixes. These invasives include the above Kentucky 31 Fescue and bermudagrass, as well as sericea lespedeza and others. DNA asks TDOT avoid using these invasive species and actively undertake field-based research to determine suitable native alternatives. Attached to this letter is a document that DNA submitted previously to TDOT regarding the use of non-invasive species. For more information regarding invasive species and alternatives, please contact Brian Bowen with our office ([Brian.Bowen@state.tn.us](mailto:Brian.Bowen@state.tn.us) 615-532-0436).

**TDOT Response:** Regarding native seed, there is no centralized agency that has THE list of invasives, so determining what species are exotic invasives is difficult. Their documents prove that. Some of their exotic plant info comes from the TN Exotic Plant Counsel, while other info comes from SE Exotic Plant Counsel and the Dept of Ag. They reference a "1994 Presidential Executive Memorandum (E.M." Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds: In researching this, it does state that certain practices will be implemented on federal lands and on federally funded projects "where cost effective and to the extent practical..." use native plants. We would imagine that federal funding documentation includes any requirements that come with the funding. Is this language included in agreements between the FHWA and TDOT? We couldn't find the other reference.

### Section 8.5 Buffer Areas for Aquatic Resources:

**Silas Mathes, TDEC Division of Natural Areas:** This section should include references for the assertion that grassy areas can improve water quality better than riparian buffer areas with dense canopy cover, and for the assertion that adapted plants provide water quality benefits on par with native vegetation. Under a strict interpretation of chemical water quality and sedimentation these assertions may be valid, but native riparian vegetation is an integral part of a stream ecosystem, providing the allochthonous inputs for nutrient spiraling and habitat for amphibious species (J.D. Alan, Stream Ecology, Kluwer Publishers, 1999). Because state laws protect the biological use of streams, it is important to consider the ecological role that native riparian vegetation plays in maintaining overall water quality. Therefore, DNA asks that these assertions not be used to set TDOT's buffer policy until a full literature review is performed.

This section also references Lower Colorado River Authority policies that base increasing buffer width on drainage area size. This strategy tends to de-emphasize the importance of buffers on headwater streams noted by EPA, TVA and others. DNA asks that TDOT acknowledge the importance of buffers on headwater streams when adopting a buffer policy.

**TDOT Response:** Regarding buffers, TDOT is applying them because of the CGP. The CGP buffers are temporary buffers that are only regulated through the CGP until such time that a Notice of Termination is issued. However, it isn't TDOT's intent to go in after the fact and disturb these buffers, and any buffer disturbances are more likely to be very limited in scope. So, TDOT's buffer application is accordance with the CGP buffer. **HOWEVER**, in response to the assertion that grassy buffers are not good for a stream, we offer the following:

A robust, diverse, multi zoned approach to aquatic buffers is the "best" approach and should include a grassed outer zone to provide a transition between the adjacent land use and the forested inner zone. References that support this can be found here:

- i. Roxane S. Palone, USDA Forest Service, and Albert H. Todd, USDA Forest Service. May 1997, Revised June 1998. Chesapeake Bay Riparian Handbook: A guide for establishing and maintaining forested riparian buffers.
- ii. Gilliam, J.W., D.L. Osmond, and R.O.Evans. 1997. Selected Agricultural Best Management Practices to Control Nitrogen in the Neuse River Basin. North Carolina Agricultural Research Service Technical Bulletin 311, North Carolina State University, Raleigh, NC.
- iii. TN Department of Environment and Conservation, March 2002. TN's Erosion & Sediment Control Handbook: A Guide for Protection of State Waters Through the Use of Best Management Practices During Land Disturbing Activities, Second Edition.

We have seen more buffers unravel where a good transition from urban areas to the forested zone has not been provided. The ground under the trees erodes and short cuts buffer treatment.

## VII. Comments by TDEC Division of Natural Heritage

### **Recommendations for TDOT Landscaping Alternatives: TDEC Division of Natural Heritage:**

The Division of Natural Heritage (DNH) observes at least five different management scenarios where landscaping with native plants can be addressed. These are the 1) areas planted under the T-DOT Wildflower Program, 2) areas along roadsides with high concentrations of natives (minimum exotics), 3) areas where crown vetch (*Coronilla varia*) is planted for erosion control, 4) areas that are primarily planted in exotic grasses that have a mix of exotic and native wildflowers, and 5) areas where invasive exotic pest plants are abundant along roadsides. The following discussion briefly addresses each of these management opportunities with references to webpage links where detailed information can be gathered.

#### **1) Areas planted under the T-DOT Wildflower Program**

**TDEC Division of Natural Heritage:** The DNH recommends that the T-DOT Wildflower Program in Tennessee be carefully reevaluated and drastically changed. The wildflowers planted under this Program are mostly exotics with several of them known to naturalize and spread. The exotic plant dame's rocket (*Hesperis matronalis*) is an invasive species listed under Category Rank 2 - Significant Threat ("Invasive Exotic Pest Plants in Tennessee") by the Tennessee Exotic Pest Plant Council. Other examples of exotics planted as a part of the T-DOT Wildflower Program include yellow cosmos (*Cosmos sulphureus*), clasping coneflower (*Rudbeckia amplexicaulis*), red corn poppy (*Papaver rhoeas*), garden cosmos (*Cosmos bipinnatus*) and shasta daisy (*Chrysanthemum maximum*). The current T-DOT Wildflower Program is not compliant with the 1999 Executive Order 13112 on Invasive Species, the 1994 Presidential Executive Memorandum (E.M) "Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds, nor Section 130 of the Surface Transportation and Uniform Relocation Act of 19987 (STURAA) amended 23 U.S.C 319. It is DNH's understanding that T-DOT is required to comply with the above-mentioned policies if T-DOT is using federal money.

**TDOT Response:** The wildflower program is not applicable to the construction EPSC. It is a separate program primarily aimed at roadside aesthetics. Wildflowers can however be included in initial seed mixes and some species are pioneers.

**TDEC Division of Natural Heritage:** It is the opinion of the DNH that all 700 acres dedicated to this program be planted in grasses and wildflowers native to Tennessee. The DNH would happily work with T-DOT to develop lists of species to create roadside wildflower mixes and provide information where seeds for these species may be purchased. The brochures "Landscaping with Native Plants in Tennessee" provide lists of species for the three major regions of the state and could be used to develop a mix of seed for each region. The brochures are available for downloading at the Southeast Exotic Pest Plant Council website <http://www.se-eppc.org> under Tennessee. Examples of seed mixes are provided below and were taken from the "The Nature of Roadsides and the Tools to Work

with It” published by the Federal Highway Administration. This publication can be downloaded at <http://www.invasivespecies.gov/docs/roadsides>. It is recommended that TDOT become familiar with this publication and implement its practices. A list of native seed specifications from this publication is also provided below. Also TDOT can benefit by following many of the guidelines and recommendations in the publication “Roadside Use of Native Plants”, edited by Bonnie Harper-Lore and Maggie Wilson of the Federal Highway Administration (Harper-Lore, Bonnie and Maggie Wilson, Editors, 2000. *Use of Native Plants on Roadsides, A Handbook*. Island Press, Covelo, CA.). A list of suitable native species for landscaping along roadsides and interstates in Tennessee is included in this publication.

**TDOT Response:** These references are not officially recognized by the Tennessee Department of Agriculture. The only official list we are aware of is the one shown on Table 5-1 of the Construction Manual. None of these plants are in the recommended list of grasses.

**TDEC Division of Natural Heritage:** In addition, DNH would advise T-DOT to consider looking at other state wildflower programs that successfully utilize only natives to their states (and often subdivided by region within the state). Good examples include the Illinois Program at <http://www.illinois.gov/firstlady/wildflowers>, the Iowa Program <http://www.iowalivingroadway.com/IRVM>, and the Texas Program <http://www.dot.state.tx.us/services/maintenance/wildflowers/default.htm>, Texas in Bloom.

## 2) Areas along roadsides with high concentrations of natives

**TDEC Division of Natural Heritage:** A second management scenario where landscaping with natives can be addressed are areas along roadsides with high concentrations of natives. These are remnant patches of native vegetation that occur throughout Tennessee along roadsides and interstates. These areas have high concentrations of native species and only minimal abundance of exotic species. These are usually a combination of forest edge species and open grassland species. These locations should be mapped in GIS using GPS and managed accordingly. Along with GIS mapping, locations should be recorded using mile markers on the interstates. Management is minimal for these areas and requires a once a year mowing treatment. These areas should be monitored for invasive exotic plants and those plants should be removed and controlled. These areas often are comprised of native grasses such as little bluestem (*Schizachyrium scoparium*), broomsedge (*Andropogon virginicus*), plume grass (*Erianthus* spp.) among many other native warm and cool season grasses. Wildflowers may include Joe pye weed (*Eupatorium fistulosum*), butterfly weed (*Asclepias tuberosa*), ironweed (*Vernonia* spp), phlox (*Phlox* spp), numerous species of native sunflowers (*Helianthus* spp), mustards, and many other natives in all sorts of color and size flowering throughout the growing season.

**TDOT Response:** These are very special circumstances and if judged significant should be managed. However, transportation agencies like TDOT do not have the resources or technical staff that would be required to manage these resources. Perhaps these areas could be turned over to other agencies like TDEC, Parks or

the Tenn. Wild Life Agency who would have the proper expertise and personnel to perform the necessary maintenance

### 3) Areas where crown vetch (*Coronilla varia*) is planted for erosion control

**TDEC Division of Natural Heritage:** Removing crown vetch from the current T-DOT planting regime is important because crown vetch is an invasive exotic pest plant that spreads into adjacent lands including state natural areas. It is also an invasive exotic listed under Category Rank 2 - Significant Threat ("Invasive Exotic Pest Plants in Tennessee") by the Tennessee Exotic Pest Plant Council. DNH would advise T-DOT to use native mixes designed for erosion control. Listed below is an example of a seed mix that could be used for erosion control in dry sites. A similar list is provided from a private seed company in Ohio (the Ohio Prairie Nursery, see website listing below). The species on this list are native to Tennessee and are available. DNH would advise T-DOT to augment such a mix with an annual rye, which is an acceptable exotic and would provide a quick cover to prevent early erosion. The DNH advises adding native cool season grasses like Virginia wildrye (*Elymus virginicus*) or oat grasses (*Danthonia* spp.) to seed mixes. The use of exotics to control erosion along highways and interstates has been a major source of spread of invasives in states throughout the US, remember that kudzu was used for erosion control along highways. Using federal dollars to plant invasive species along roadsides and interstates is a violation of the 1999 E.O.13112 on Invasive Species.

**TDOT Response:** We would agree that crown vetch is a problem plant that has been used principally stabilize steep slopes particularly in mountainous areas. It was not included in the interim list of species recommended to TDOT

### 4) Areas that are primarily planted in exotic grasses that have a mix of exotic and native wildflowers

**TDEC Division of Natural Heritage:** The third management scenario, where native landscaping can be addressed, are areas that are primarily planted in exotic grasses that have a mix of exotic and native wildflowers. These areas are the most pervasive and typical management areas along state highways and interstates. Management of these areas for landscaping with native plants require eradicating the exotic grass species and any other invasive exotics, followed by planting these areas with native species. The planting methods and developing species lists for this type of treatment would be similar to the same recommendations DNH has made in this report regarding the T-DOT Wildflower Program. Once invasive are eradicated, native planting is complete, and plants established, then mowing is done minimally on a once a year basis. These areas would also need to be mapped and monitored for invasive species.

**TDOT Response:** There is little agreement among native plant advocates and roadside managers as to what constitutes an invasive. The term exotic tends to be used to describe introduced plant species such as bermudagrass. Bermudagrass is a warm season tool on roadsides that tolerates drought, mowing, and provides a quick cover. Because it is shade intolerant it will succumb to taller native species if mowing heights are set to allow the persistence of taller bunch type natives.

We do believe that the use of adapted species on the roadside is the most practical interim solution coupled with a strong research program to understand what natives will establish on the roadside and how to do it. Again, our work suggests that it is very much time dependent and strongly related to the adjacent seed bank more than what is originally planted.

We recognize that work that has been done by the US Forest Service and National Parks in establishing genotype specific stands of natives on their roadsides. However, the expense of seed collection, planting procedures as well as short and long- term maintenance expense of this type of planting would be prohibitive at scale required for all TDOT highway construction projects.

### 5) Areas where invasive exotic pest plants are abundant along roadsides

**TDEC Division of Natural Heritage:** These are areas that have an abundance of invasive exotic pest plants along roadsides and serve as a source location for the spread of invasive exotics into adjacent lands including conservation areas like state natural areas, national and state parks, national and state forests, and national recreation areas. Examples of these plants include tree-of-heaven (*Ailanthus altissima*), princess tree (*Paulownia tomentosa*), mimosa (*Albizia julibrissin*), shrub honeysuckle (*Lonicera maackii*, *L. morrowii*), privet (*Ligustrum* spp), and Japanese honeysuckle (*Lonicera japonica*). The DNH would provide T-DOT a comprehensive list of these species. These locations and species should be mapped in GIS using GPS and then managed. Management records should be maintained and areas that are infested with invasives should be revisited during a five-year period, monitored, and retreated until the seed bank is depleted. Also, cogonagrass (*Imperata cylindrica*) which has yet to be reported in Tennessee but will likely be arriving soon from Alabama, Georgia, or Mississippi should be eradicated when it is first reported. Early detection and rapid response is imperative in stopping the spread of new invasives exotics from becoming established in the state. State highway and interstates are major corridors for new introductions. The DNH would offer its services to advise T-DOT on setting up this eradication and control program and would help provide T-DOT with GPS location information. The DNH requests that T-DOT implement the Federal Highway Administration's Guidance on Invasive Species issued August 10, 1999.

### Summary

**TDEC Division of Natural Heritage:** The DNH has made many recommendations in this report that outlines ways in which T-DOT can vastly improve its roadside management by landscaping with native plant species and eradicating and controlling invasive exotic pest plants. The DNH would also like to offer its expertise in the technical review of any seed mixes proposed for roadside planting. This report provides examples of native seed mixes and sources for purchase of native plant seeds, examples of other state programs where highway departments use only natives, and references to landscaping practices and seed mixes recommended by the Federal Highway Administration. The DNH is willing to participate in providing services to assist TDOT in implementing many of the recommendations in this report. It is also important that T-DOT become compliant with existing laws and policies.

## Seed Sources and Seed Availability

**TDEC Division of Natural Heritage:** It possible and desirable that local genotypes and seed sources from Tennessee can be utilized for roadside and interstate landscaping purposes. There is no capacity for local genotype seed production in Tennessee at this time; however, DNH strongly recommends that T-DOT commit resources, in a consortium approach with the many land managing agencies, to develop the state nursery system for production of native genotype seeds. Agencies such as DNH, Tennessee Wildlife Resource Agency, and State Parks would all benefit from this type of nursery system. A successful example of this type of approach can be observed in the Illinois Department of Conservation nursery system where local genotype seeds are grown out for use by state agencies. In the meantime the following nurseries are sources where the T-DOT currently can purchase quantities of native seed for the purposes described in the report. One must be aware that all species included in a mix may not be native to Tennessee.

**TDOT Response:** This is certainly an option. However, it seems to ignore the fact that there needs to be research done on what species can be expected to persist on the roadside, whether or not they are desirable from a maintenance point of view; for example, switchgrass is native but can become very difficult to mow and can be fuel source in fire hazard areas.

Native vegetation associations are desirable goal but it must be recognized that the highway infrastructure must be managed to prevent erosion of the roadside to minimize damage to the highway structure, prevent safety hazards and

avoid sediments that can clog drainage structures and pollute adjacent waters. Until we have sufficient knowledge of what natives will persist on the roadside and a cost effective means of achieving establishment of natives we believe that the recommended practices coupled with sound program of research are reasonable and do not present an environmental hazard.

Ohio Prairie Nursery - <http://www.ohioprairienursery.com>

Hamilton's – <http://www.hamiltonseed.com>

Sharp Bros - <http://www.sharpseed.com>

Shooting Star Nursery - <http://www.shootingstarnursery.com>

Roundstone Native Seed - <http://www.roundstoneseed.com>

Prairie Moon Nursery - <http://www.prairiemoon.com>

Ernst Conservation Seeds - <http://www.ernstseed.com>

Bamert Seed Company – <http://www.Bamertseed.com>

**Literature sources for mixes based on specific conditions can be found in the following**

“The Nature of Roadsides and the Tools to Work with It” published by the Federal Highway Administration - <http://www.invasivespecies.gov/docs/roadsides>

Harper-Lore, Bonnie and Maggie Wilson, Editors, 2000. *Use of Native Plants on Roadsides, A Handbook*. Island Press, Covelo, CA.

**SOME EXAMPLE SPECIES FOR A SEED MIX**

DNH seed mix recommendation (similar to mix listed by Ohio Prairie Nursery) for erosion control for dry sites.

**Grasses**

<b>Common Name</b>	<b>Botanical Name</b>
Big Bluestem	<i>Andropogon gerardii</i>
Indian Grass	<i>Sorghastrum nutans</i>
Switchgrass	<i>Panicum virgatum</i>
Little Bluestem	<i>Schizachyrium scoparius</i>
Side Oats	Gamma <i>Bouteloua curtipendula</i>
Canada Wild Rye	<i>Elymus Canadensis</i>
Virginia Wild Rye	<i>Elymus virginicus</i>
Eastern Gamma Grass	<i>Tripsacum dactyloides</i>

**Wildflowers**

<b>Common Name</b>	<b>Botanical Name</b>
Partridge Pea	<i>Cassia fasciculata</i>
Illinois Bundlesflower	<i>Desmanthus illinoensis</i>
Blackeyed Susan	<i>Rudbeckia hirta</i>
Purple Prairie Clover	<i>Dalea purpureum</i>
Purple Coneflower	<i>Echinacea purpurea</i>
Greyheaded Coneflower	<i>Ratibida pinnata</i>
Rigid Goldenrod	<i>Solidago rigida</i>
False Sunflower	<i>Heliopsis helianthoides</i>
Bergamot	<i>Monarda fistulosa</i>
Spiked Blazing Star	<i>Liatris spicata</i>
Rattlesnake Master	<i>Eryngium yuccifolium</i>
Roundheaded Lespedeza	<i>Lespedeza capitata</i>

**Other samples of seed mixes: from**  
 "The Nature of Roadsides and the Tools to Work with It"

<b>a. Dry Seed Mix (slope)</b>	<b>b. Mesic Seed Mix (lot)</b>	<b>c. Wet Seed Mix (ditch)</b>
little bluestem	little bluestem	Indiangrass
side oats grama	Indiangrass	switchgrass
Canada wildrye	Canada wildrye	Canada wildrye
prairie phlox	purple prairie clover	mountain mint
blazing star	blazing star	gayfeather
prairie coreopsis*	yellow coneflower	common oxeye
smooth aster	heath aster	New England aster
birdsfoot violet	spiderwort	blue vervain
leadplant	bergamot	Joepyeweed
stiff goldenrod	showy goldenrod	golden Alexander

\* may not be native to TN

### **Native Seeding Specification Tips:**

1. Eradicate weeds from planting site before planting.
2. Consider a line item for contractor to control weeds and clean equipment.
3. Plant as much diversity as possible, unless an adjacent native seed source exists.
4. Match site microclimates with distinct seed mixes as much as practical.
5. Most native species will establish more easily, if you specify a locally grown or collected source.
6. Order native seed when the contract is let to prevent unwanted substitutions.
7. Limit bids to experienced contractors and approved vendors for these projects.
8. Separate the planting contract from the general contract for best timing.
9. Extend the establishment period to three years and include patience.
10. Learn appropriate seed test criteria and seeding rates to avoid waste.

**NOTE:** The native wildflower mixes contain both native grasses and native flowers/forbs. They naturally grow together. Each mix has a variety of seasonal colors and textures to please the traveling public. The mixtures are all perennial and will return for repeat performances. While the cover crop performs erosion control, the other plants will slowly establish. Patience might be specified here. A minimum of three years is needed to approach the visual goal of the project.

**TDOT Response to DNA Re: Use of Native Grasses on the Roadside:** The Rational Document addresses the issue of Native Grasses. It acknowledges the objective of developing sustainable plant communities on the road side and notes that natives have a central place. It recommends that TDOT undertake a directed research program that will:

- Identify seed mixes of native species that
  - establish quickly and affect necessary erosion control
  - that will identify the native species regionally adapted to roadside applications
  - Assist in the development of seed sources
- Identify adapted species that provide erosion control and foster the development of environmental conditions that will support natives

- Develop planting procedures for vegetation establishment

While adapted species are not native they are not recognized by the state as invasive will become decreasers as the vegetation community evolves. Likewise, "Adapted Species" recommended interim seed mixes here have several properties that make them suitable to the roadside until the research on natives can begin to produce the needed guidance.

- Seed is readily available from commercial sources in the quantities needed for roadside stabilization
- They are turf-forming species, which provide early erosion control that cannot be achieved with native bunch grasses. Native grasses generally require 3 to 5 years to develop a layer of litter at the surface that protects the exposed soils between bunches.
- Depending on the cultural (mowing) practices, adapted species become decreasers due to shading of the taller native species.

It is critical to recognize that the roadside is an inhospitable environment to many native species that will be very slow to establish. Some key factors that must be considered are:

- Soils are compacted and the compaction needs to be preserved to protect the adjacent roadbed.
- Soils are droughty due to slope. The slope is essential to provide drainage away from the pavement for reasons of safety and to protect the integrity of the roadbed.
- The micro-environment is hotter due to the pavement
- The micro-environment is windier due traffic. This is a significant factor when the traffic stream has 10% or greater truck traffic.
- For reasons of cost and scale, the only available cultural tool is mowing.

It is vital TDOT's research program for the use of natives on the roadside is developed to address these factors. Any research that does not recognize these characteristics will not provide information that will be of use in the transportation arena. Research that is often cited regarding the use of natives has not taken these characteristics into account.

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