

COUNTY HIGHWAY ENVIRONMENTAL COMPLIANCE

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CTAS Environmental Consultant



COUNTY OFFICIALS ORIENTATION PROGRAM 2024

ENVIRONMENTAL COMPLIANCE RESPONSIBILITIES

In the US, more than 39,000 local governments make daily decisions with environmental impact.

Examples:

- Siting Private and Public Development
- Public Infrastructure Planning and Funding
- Drinking Water and Sewer
- Waste Management
- Decisions about Land Use—
Accommodating population growth and accompanying transportation, housing, workforce and education needs



HOW WILL YOUR COMMUNITY GROW?

Costs

Pollution Mitigation

- Cleanup and Development of Brownfields
- Waste Water and Solid Waste

Infrastructure Improvements

- Capital Improvements
- Development and Reuse
- Preparedness

Regulatory Compliance

Needs

Strong Economy

- Workforce and Employment Training
- Good Jobs
- Affordable Places to Live
- Stronger Communities

Cost Effective Government

- Affordable Public Works Services



Challenge to balance needs and costs—
both current and future

CTAS CAN HELP...WE HELP COUNTIES UNDERSTAND REGULATIONS AND IMPLEMENT PROGRAMS

Departments and Programs:

- Solid Waste Departments
- Highway Departments
- Public Works Departments
- Stormwater Departments
- Planning Departments
- Regional and State Transportation Organizations



TENNESSEE ROAD STATISTICS

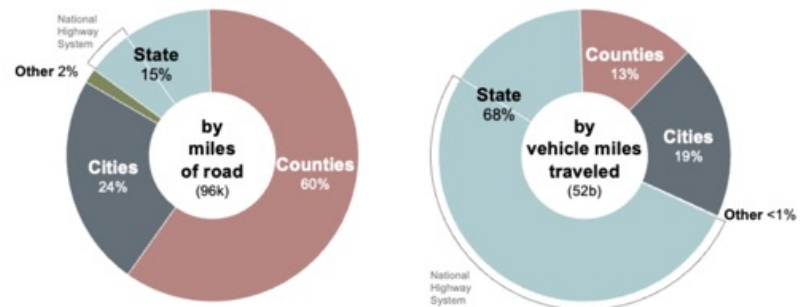
Tennessee has over 96,000 Miles of Roads

- Counties own 60% of Public Roads

Tennessee has over 20,000 bridges

- Counties own 48% of the bridges

Locals Own Most of Tennessee's 96,000 Miles of Public Roads but Most Travel Occurs on State-Owned Roadways
Tennessee Roadways by Jurisdiction (2020)



*The Sycamore Institute's estimates represent a proportional distribution of vehicle miles traveled (VMTs) based on available Federal Highway Administration data about VMTs, road mileage, and ownership of roads by functional classification.
Source: The Sycamore Institute's analysis of data from the U.S. Department of Transportation

SycamoreTN.org

and

<https://www.tn.gov/tdot/about/transportation-system-overview.html>



FEDERAL ACTS WITH REGULATORY AUTHORITY OVER ROAD/BRIDGE CONSTRUCTION AND MAINTENANCE

Siting Regulations/Screening

- National Environmental Policy Act (NEPA)
- Historic and Archeological Preservation

Health Regulations

- Safe Drinking Water Act
- Resource Conservation and Recovery Act (Solid and Hazardous Waste)
- FIFRA (Chemicals—application and disposal)

Land and Water Usage

- Water Pollution Control Act (Clean Water Act)
- National Flood Insurance Act
- Endangered Species Act



CLEAN WATER ACT 1972



COUNTY OFFICIALS ORIENTATION PROGRAM 2024

Administered by EPA, but day-to-day regulation mainly carried out by states

EPA sets water-quality ratings, a waterbody rated less than Class B is considered “Impaired”

EPA also establishes water quality standards, such as swimmable and fishable (Class A and B)

Requires states to list the designated uses of a water body

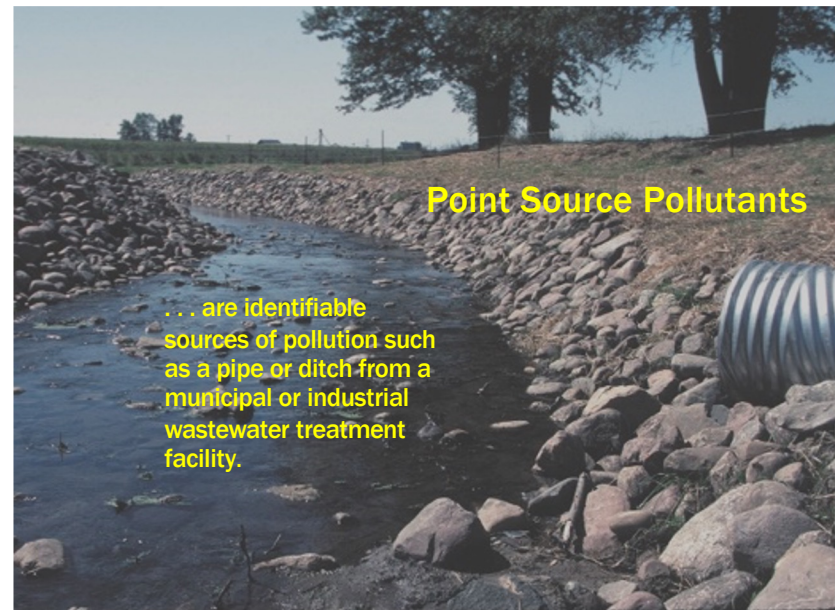
In Tennessee, TN Department of Environment and Conservation (TDEC) has this task

CLEAN WATER ACT ORIGIN

In 1972, most water pollution originated from what was called “point sources”.

The Act required improvement to sewage treatment plants and issuing of “pollution permits” or NPDES permits (National Pollutant Discharge Elimination System) for industries.

This regulated the source of the discharge.

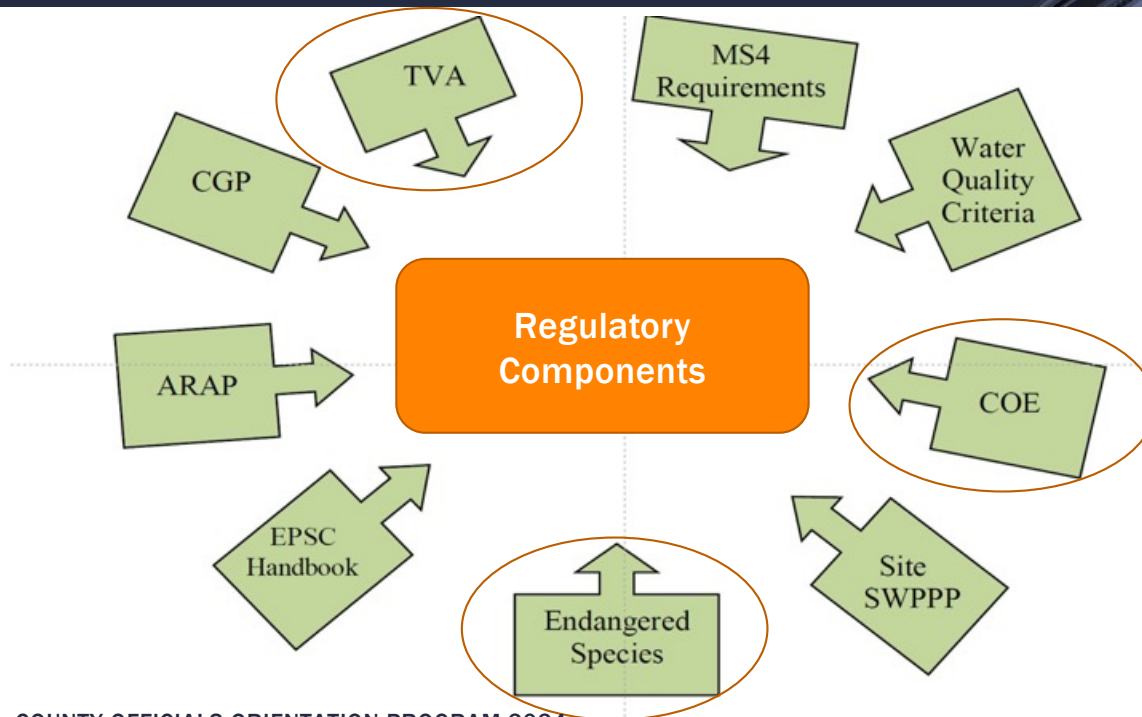


WATER POLLUTION CAUSES/SOURCES EXPANDED OVER TIME



Overtime, more focus on the “Cause” of Water Pollution

SITE SUITABILITY/FEDERAL CONSTRUCTION SECTIONS



Corp of Engineers, Endangered Species, TVA Shorelines

MOST RULES ADMINISTERED BY STATE AGENCIES

The Commissioner shall have the power, duty, and responsibility to...post or cause to be posted such signs as required to give notice to the public of the potential or actual dangers of specific uses of such waters.

Tennessee Water Quality Control Act

EPA allows states to set standards for use other than drinking.

- Must have a plan to maintain water quality
- Protect against the degradation of high-quality waters and water bodies that already meet the fishable/swimmable standards
- Clean up polluted or impaired waterways



DESIGNATED WATER USE

Highest designation:
'fishable and swimmable'

Most sensitive use takes
precedence

Economic and social
effects of designating the
water body maybe
considered



Drinking
water



Industrial



Agricultural



Human
Contact



Swimming



Fish for
eating

WATER QUALITY



At least 50 percent of America's waterways are not fit for swimming or fishing.



Bacteria and sediment are the most common pollutants in rivers and streams.



Water Pollution comes from Point sources: Stationary and easily identified. "End of pipe"



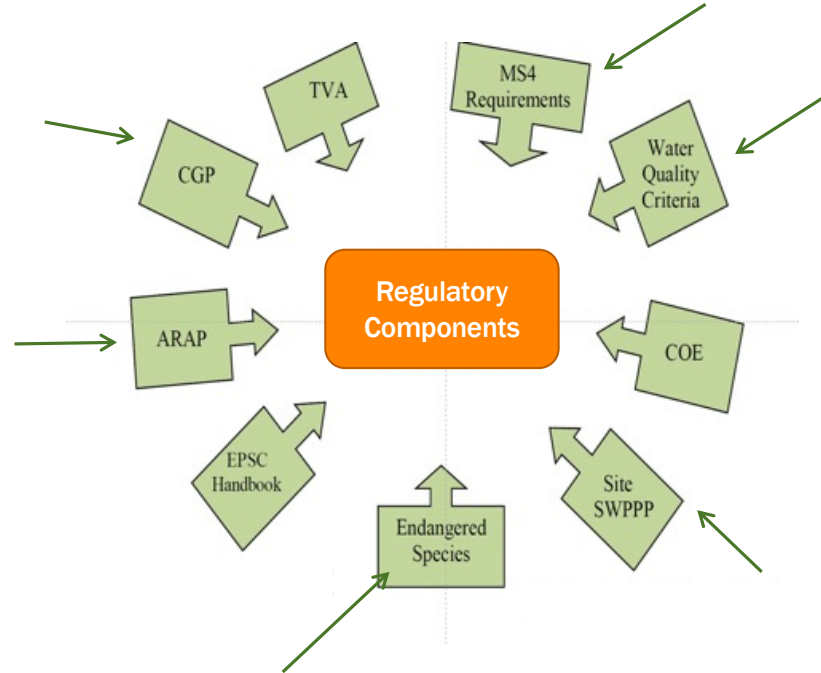
Water Pollution also comes from Nonpoint Sources: Dispersed and not in a fixed location. Harder to identify, measure, control.



CWA PROGRAMS IMPACTING LOCAL GOVERNMENTS

There are multiple programs within the Clean Water Act

- Section 201—Construction of Public **Sewage Treatment** Plants
- Section 208—Standards and plans for controlling pollution
- Section 303(d)—Allowed **"Total Maximum Daily Loads for pollutants"**
- Section 319—**Grants** for control of nonpoint pollution
- Section 402—**Stormwater** and **NPDES** Permits
- Section 404—**Wetlands**



Most areas of concern for Highway Departments are related to “discharge” and Erosion and Sediment Control



Regulatory Agencies: TDEC, TVA, Corps of Engineers, Dept of Agriculture, MS4's

STORMWATER RUNOFF—NONPOINT “DISCHARGE”



Between 70-80 percent of water pollution comes from nonpoint sources.



Examples:

Agricultural practices	Forestry practices	Road building and construction	Runoff from <u>Impervious surfaces</u>	Onsite septic systems	Lawns and golf courses	Motor vehicles	Mines
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NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)--PERMITS FOR STORMWATER DISCHARGE

Phase I of this federal program was implemented in 1990.

Phase I used a permit system to **regulate storm water discharges from larger cities and construction projects.**

In 2000, TDEC expanded Phase I by requiring counties, cities, and additional other parties to implement programs and practices to **control stormwater runoff (Phase II).**

This primarily **applies to the ~20 larger counties and cities within.** If you are named, you need a Permit and Plan.

The MS4 Permit as it's known, effectively creates a local utility to manage stormwater and the impacts of land clearing.



MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4'S)

Modern systems are Separate, meaning Sewage is collected separate from Stormwater.

Areas covered by SSS's often have a municipal separate storm sewer system (MS4) to collect and convey runoff from rainfall.

The stormwater is typically untreated and directed back to waterways. Nationwide, there are almost 16,000 systems.

MS4 operators must obtain a NPDES permit.

CSO's and SSO's are permitted as point sources of water pollution.



WHO NEEDS AN NPDES STORMWATER CONSTRUCTION PERMIT?

Operators of construction sites involving clearing, grading or excavation that result in an area of disturbance of one or more acres, and activities that result in the disturbance of less than one acre if it is part of a larger common plan of development or sale.

Permitted activities have included housing subdivisions, commercial and industrial buildings, golf courses, utility lines, sewage treatment plants, and roads. Various land clearing activities such as borrow pits for fill material have also been covered under this general permit.



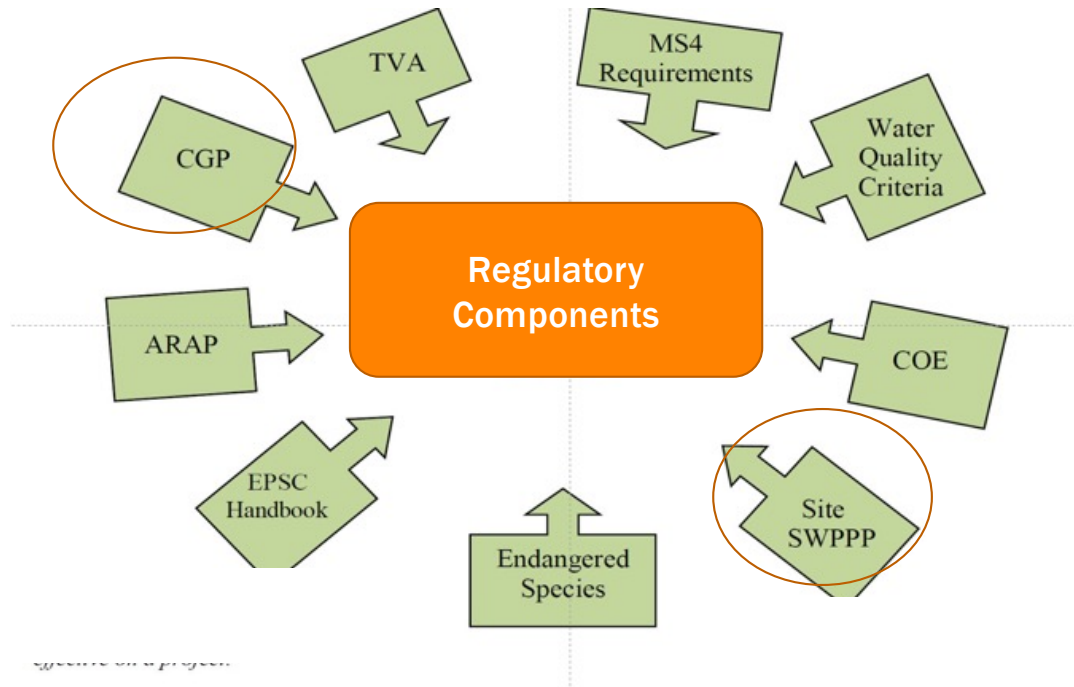
STORMWATER POLLUTION PREVENTION PLAN (SWPPP) COVERAGE

Your local MS4 (Stormwater Program) likely has the authority to inspect your facility as part of their permit requirement.

Under this coverage, Highway Departments will need to obtain and follow the terms of a SWPP plan.



CONSTRUCTION GENERAL PERMIT AND SITE SWPPP



NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) CONSTRUCTION GENERAL PERMIT (CGP)

NPDES permits are required by the U.S. Environmental Protection Agency, but are administered within this state by TDEC, or by a Qualified Local Program (QLP).

A construction permit is necessary for all construction activity that involves the grubbing, clearing, grading or excavation of **1 acre or more**.

Even if the construction activity is less than **1 acre**, a NPDES construction permit is still required if the overall project development site includes over **1 acre**.

The applicant must fill out a Notice of Intent (NOI) form and also submit a Stormwater Pollution Prevention Plan (SWPPP). Application fees typically range from \$250 up to \$7500, depending on the amount of acreage developed.

Two options for obtaining authorization to discharge or “permit coverage”: general permits and individual permits.



CLEAN WATER ACT SECTION: NPDES COVERAGE FOR COUNTY PUBLIC WORKS PROGRAMS

Construction, Conveyances, and Stream Alteration

To obtain authorization to discharge under a construction general permit, a discharger submits to the permitting authority a **Notice of Intent (NOI)** to be covered under the general permit.

An NOI is **not a permit** or a permit application, but by submitting the NOI, the discharger acknowledges that it is **eligible for coverage** under the general permit and that it **agrees to the conditions** in the published general permit.

Discharges associated with the construction activity are **authorized consistent with the terms** and conditions established in the general permit.



CONSTRUCTION GENERAL PERMIT WITH "SWPPP"

6635 SWPPP.pdf

Received: 9/12/19

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Water Resources
William R. Snodgrass Tennessee Tower, 312 Rosa L. Parks Avenue, 11th Floor, Nashville, Tennessee 37243
1-888-681-6333 (TDEC)

Notice of Intent (NOI) for General NPDES Permit for Stormwater Discharges from Construction Activities (TNR100000)

Site or Project Name: Brookdale Road Extension	NPDES Tracking Number: TNR
Street Address or Location: Brookdale Road, Blount County TN	Construction Start Date: September 2019
Site Description: Site grading, drainage for the extension of Brookdale Road	Estimated End Date: December 2019
County: Blount	Latitude (dd.ddd): 35.7662
MS4 (if applicable):	Longitude (-dd.ddd): 83.9994
Check box if a SWPPP is attached: <input checked="" type="checkbox"/> Check box if a site location map is attached: <input checked="" type="checkbox"/>	Acres Disturbed: 3.256
Check the appropriate box(es) if there are streams and/or wetlands on or adjacent to the construction site: Streams <input checked="" type="checkbox"/> Wetlands <input type="checkbox"/>	Total Acres: 3.256
Has a jurisdictional determination been made by the USACE or EPA identifying waters of the United States? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Note: If yes, attach the jurisdictional determination	
If an Aquatic Resource Alteration Permit (ARAP) has been obtained for this site, what is the permit number? NR(1):	
Receiving waters: Laurel Bark Branch	
Site Owner/Developer (Primary Permittee): (Provide person, company, or entity that has operational or design control over construction plans and specifications) Blount County Highway Department	
For corporate entities only, provide correct Tennessee Secretary of State (SOS) Control Number: (an incorrect SOS control number may delay NOI processing)	
Site Owner or Developer Contact Name: (signs the certification below) Jeff Headrick	Title or Position: Highway Superintendent
Mailing Address: 1221 McArthur Road	City: Maryville State: TN Zip: 37804
Phone: (865) 681-0301 Fax: ()	E-mail: jheadrick@blounttn.org
Optional Contact:	Title or Position:
Mailing Address:	City: State: Zip:
Phone: () Fax: ()	E-mail:
Owner/Developer(s) Certification: (must be signed by president, vice-president or equivalent, or ranking elected official) (Primary Permittee)	
I certify under penalty of law that this document and all attachments were prepared by me, or under my direction or supervision. The submitted information is to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. As specified in Tennessee Code Annotated Section 38-16-722(a)(4), this declaration is made under penalty of perjury.	
Owner/Developer Name (printonly): Jeff Headrick	Signature: [Signature] Date: 9/16/19
Owner/Developer Name (printonly):	Signature: Date:
Contractor Certification: (must be signed by president, vice-president or equivalent, or ranking elected official) (Secondary Permittee)	
I certify under penalty of law that I have reviewed the document, any attachments, and the SWPPP referenced above. Based on my inquiry of the construction site owner/developer identified above and/or my inquiry of the person directly responsible for assembling this NOI and SWPPP, I believe the information submitted is accurate. I also agree that the NOI, if approved, makes the above-described construction activity subject to NPDES permit number TNR100000, and that control of my activities on-site are thereby regulated. I am aware that there are significant penalties, including the possibility of fine and imprisonment for knowing violations, and for failure to comply with these permit requirements. As specified in Tennessee Code Annotated Section 38-16-702(b)(6), this declaration is made under penalty of perjury.	
Contractor name, address, and SOS control number (if applicable): Blount County Highway Department, 1221 McArthur Road	Signature: [Signature] Date: 9/16/19
OFFICIAL STATE USE ONLY	Received Date: Reviewer: Field Office: Permit Tracking:

6635 SWPPP.pdf

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Notice of Termination	Appendix B
Construction Storm Water Inspection Certification	Appendix C
Quad Map/Soils Map/Location Map	Appendix C
SWPPP	Appendix D

6635 SWPPP.pdf

Project Description & Existing Site Conditions

Enclosed is the NOI for the proposed extension of Brookdale Road. The project consists of approximately 3.256 acres of overall land disturbance in Blount County, Tennessee. The proposed will consist of extension of the existing Brookdale Road and associated road drainage.

The project site is located off Middlesettlements Road at the existing termination of Brookdale Road. All runoff from the subject property eventually drains to Laurel Bark Branch which is on the 303(d) list for siltation. Existing drainage patterns are delineated on the Pre-Developed Drainage Plan. The site drainage controls include a construction entrance, silt fence, inlet and outlet protection, diversion ditches, temporary seeding, and permanent seeding.

The site consists of Type B and Type C Soils.

- Fc - Farragut silty clay loam, eroded sloping phase
- Dh - Decatur silty clay, 12 to 25 percent eroded slopes, severely eroded

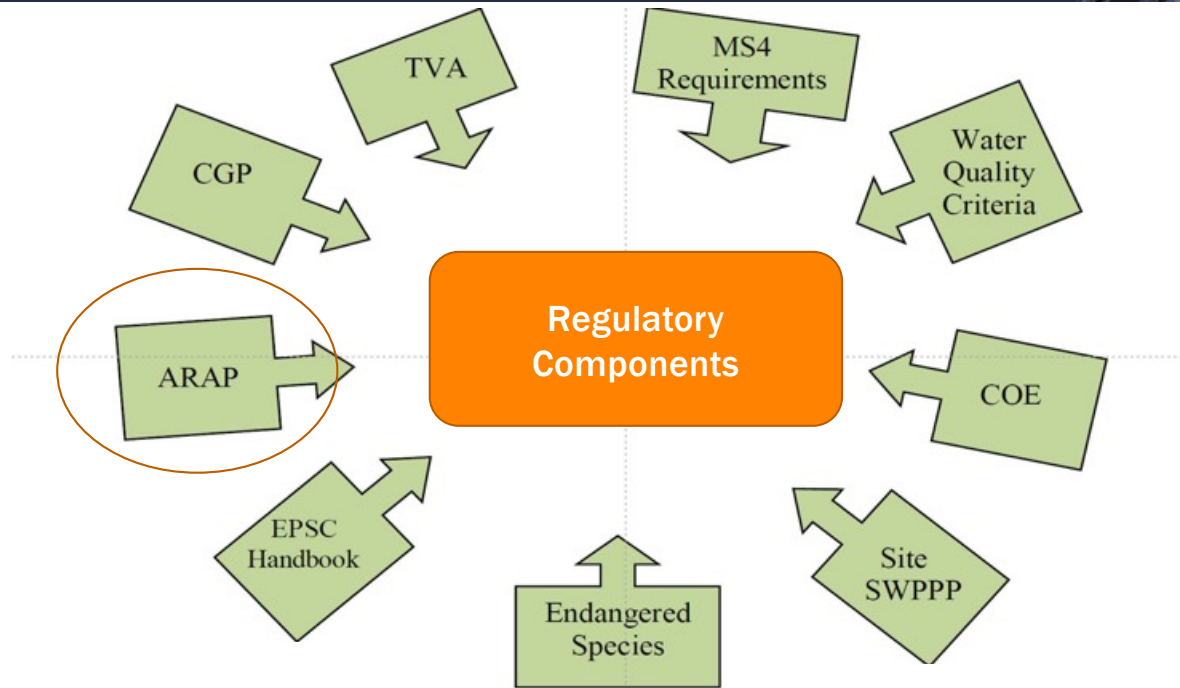
303(d) Special Requirements

Storm water discharges from the site eventually enter Laurel Bark Branch which is on the TDEC 303(d) list of impaired streams. Erosion control has been designed for draining to a listed 303(d) impaired water of the state for sediment. The following list pertains to this project for 303(d) requirements and inspections:

- Inspections shall be conducted twice a week 72 hours apart and before anticipated rain events.
- Inspections must be performed by qualified inspector (TNEPSC Level One certified, no exceptions or equivalency).
- Inspections will include all disturbed areas, sediment control structures, outfall points and streams located on site.
- Inspections will be properly documented according to the requirements of section 3.5.8.2 of the TNCGP.
- If inspections find that maintenance (i.e. failure of control or improper installation) is required, action to correct must be taken before the next storm event but no later than 7 days after identification.
- If inspections find that controls are properly installed maintained but provide inadequate protection, the project engineer shall modify the SWPPP within 7 days of identification. These changes shall be implemented on site within 14 days.
- Inspector shall maintain a rain gauge on site.

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STREAM ALTERATION PERMIT-ARAP



AQUATIC RESOURCE ALTERATION PERMIT (ARAP)

This permit is necessary for any alteration, modification or impact within or adjacent to waters of the state, which also includes wetlands and sinkholes.

Waters of the state are normally defined as any blue-line stream shown on a USGS quadrangle map, or any point adjacent or downstream from the start of a blue-line stream shown on a USGS quadrangle map.

State of Tennessee requires that an ARAP must be submitted and approved prior to any activity which could potentially damage or degrade waters of the state.



WATER PERMIT (ARAP) FOR THE ALTERATION OF WET WEATHER CONVEYANCES

Conveyances: “Man-made or natural watercourses, including natural watercourses that have been modified by channelization, that **flow only in direct response to precipitation runoff in their immediate locality**, whose channels are above the groundwater table, and in which hydrological and biological analysis indicate that, **under normal weather conditions, ...there is not sufficient water to support fish, or...organisms** whose life cycle includes an aquatic phase of at least two months.”



TDEC-WPC Hydrological Determination Guidance



ALTERATIONS OF WET WEATHER CONVEYANCES

Alterations to wet weather conveyances do not require submittal of an application or written authorization prior to commencement of work provided the alteration is performed in accordance with the terms and conditions:

- 1) No **discharge** of waste
- 2) Placement of materials will not impair surface water
- 3) **Sediment** shall be prevented from entering waters of the state
- 4) Erosion and sediment **control measures** shall be designed according to the size and slope of the disturbed drainage area
- 5) Erosion and sediment control measures shall be **in place** and functional before operations begin
- 6) Check dams utilized where runoff is concentrated
- 7) Appropriate steps taken to ensure **petroleum products** or other chemicals are prevented from entering waters of the state.
- 8) Work shall not commence until the permittee has obtained all necessary authorizations
- 9) Permit does not authorize impacts to cultural, historic or archeologic features or sites.
- 10) Permit does not authorize access to private property.
- 11) Permit does not authorize adverse impact to formally listed state or federal threatened endangered species or their critical habitat.
- 12) The permittee is responsible for obtaining coverage under NPDES General Permit for Storm Water Discharges from Construction Activities where clearing, grading or excavation results in an area of disturbance of one or more acres, or activities that result in the disturbance of less than one acre if it is part of a larger common plan of development or sale.

The fine print!



WATER PERMIT (ARAP) FOR CONSTRUCTION OR REMOVAL OF MINOR ROAD CROSSINGS

Coverage: This general permit authorizes the **construction and/or removal of minor road crossings of streams, via bridge, culvert, pipe, or fords.**

This permit also authorizes other similar transportation crossings such as railroads and linear crossings of greenway trails.



“SPECIAL CONDITIONS”

- 1) Road crossings, including transition channels, endwalls, aprons, or rip rap, that either individually or cumulatively exceed a total length of 200 feet of impact in the same water body are not covered.
- 2) Non-linear crossings such as vehicle maintenance or storage building, parking lots, cul-de-sacs and turn arounds are not covered.
- 3) Riprap areas must mimic the existing/proposed contours of the stream channel
- 4) Road crossing that may significantly alter the hydraulics of the stream (under-sizing or over widening) not covered.
- 5) Bottom of culverts shall be constructed below the stream bed elevation.
- 6) The crossing shall be culverted, bridged or otherwise designed to prevent the impoundment of normal or base flows on the upstream side, and not result in a disruption or barrier to the movement of fish or other aquatic life.
- 7) The Width of the fill shall be limited to the minimum necessary for the crossing.
- 8) Where a crossing is removed, natural channel characteristics shall be replicated and stabilized using clean rock, riprap anchored trees or other non-erodible materials.



GENERAL AQUATIC RESOURCE ALTERATION PERMIT FOR MAINTENANCE ACTIVITIES

This general permit authorizes the maintenance of existing, currently serviceable structures or fills, such as dams, intake and outfall structures, utilities, culverts, and bridges in waters of the state. “

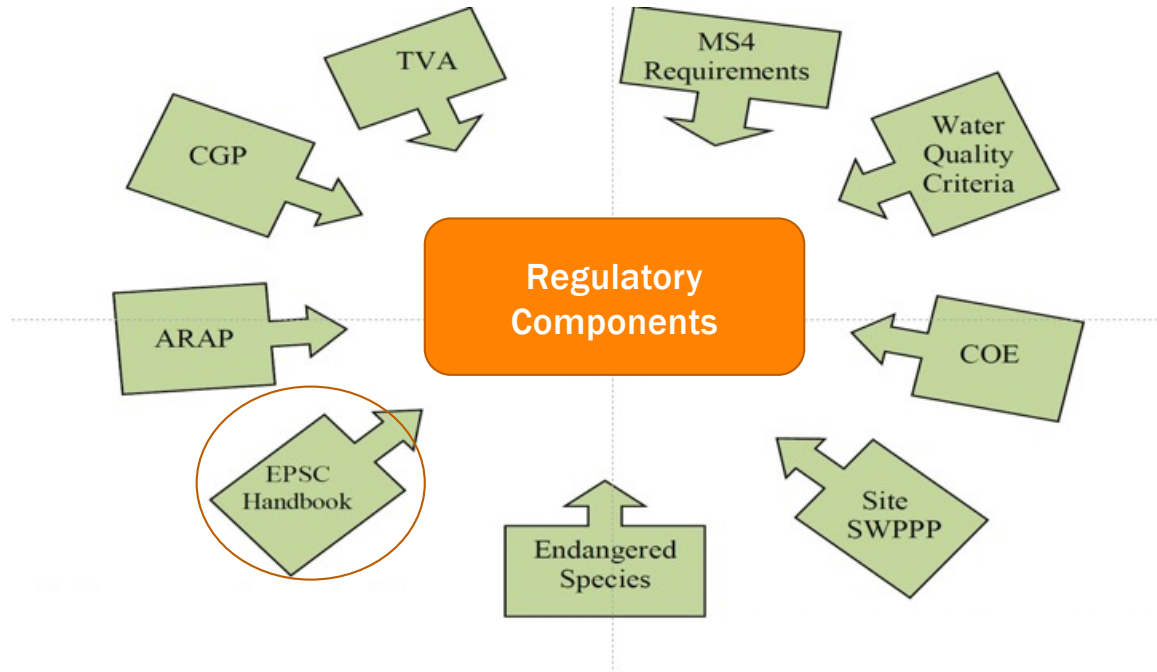
Currently serviceable" means useable as is or with some maintenance, but-not so degraded as to essentially require reconstruction.



“SPECIAL CONDITIONS”



- The length of the pipe or culvert structure may not be increased.
- The capacity or diameter of the pipe or culvert may be increased during replacement, providing it does not result in channel widening or other channel destabilization.
- Increasing dam height, resulting in increased impoundment footprint or change in downstream water quality is not covered.
- Dewatering of impoundments to conduct dam maintenance must be performed in a controlled manner designed to minimize the release of accumulated sediments into downstream waters.

SEDIMENT AND EROSION CONTROL



EROSION PROCESSES

Geologic vs. Accelerated Erosion

Geologic	Accelerated
Natural Process	Caused by Humans - Agriculture, mining, forestry and development (land disturbance)
30%	70%
	

Impacts of Erosion and Sedimentation



Sediment transport



Pollutant runoff



Slope failure



Flooding



CONTROL MEASURES

Principles of Erosion & Sediment Control

Erosion Control - first line of defense. "If there is no erosion, there can be no sediment."

- Prevents damages associated with both erosion and sediment control
- The only practical approach in some instances (e.g., very fine sediments)



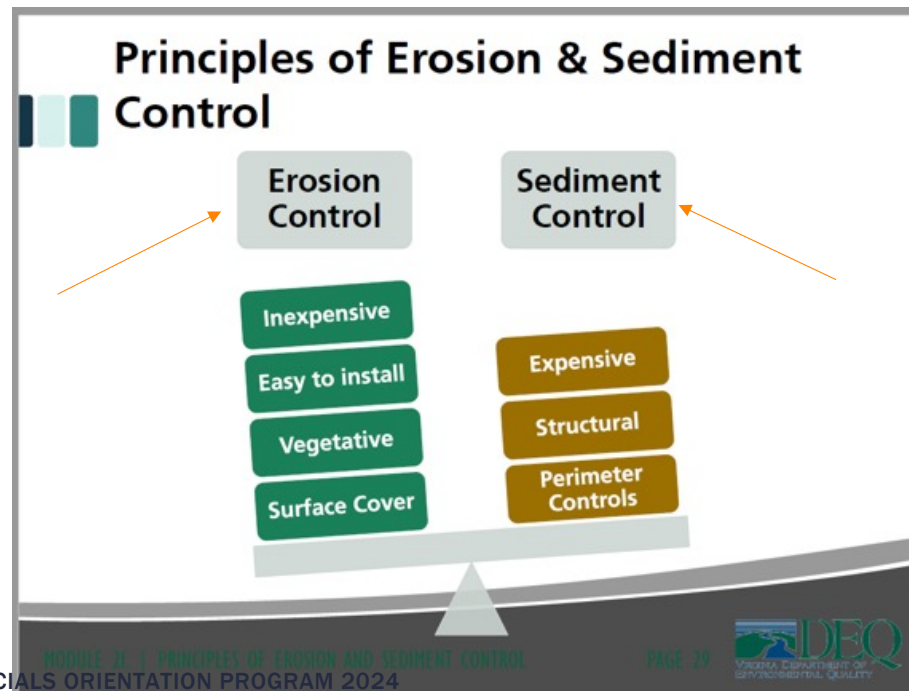
Principles of Erosion & Sediment Control

Sediment Control - subordinate to erosion control practices; second line of defense.

Coordination of erosion control, sediment control, & management of stormwater leaving the site is necessary for a well-integrated program!

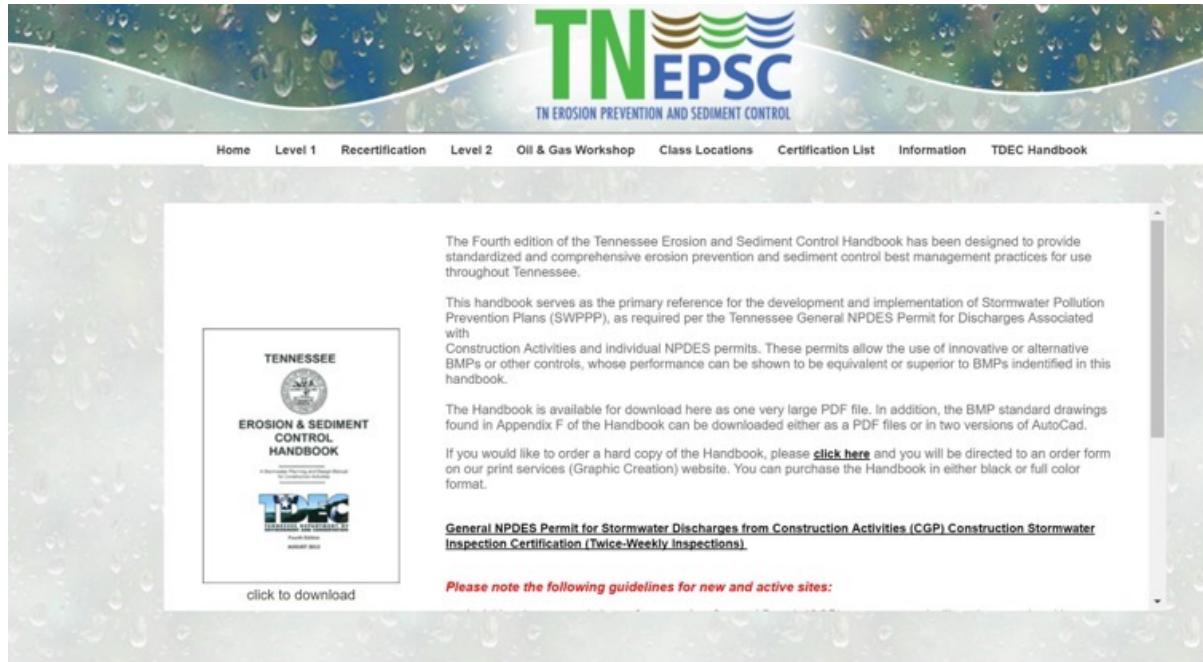


PAY NOW OR PAY LATER?



TN EROSION PREVENTION AND SEDIMENT CONTROL PROGRAM

<https://tnepsc.org/handbook.asp>

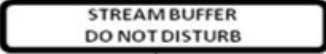


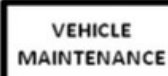
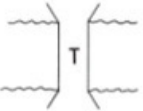


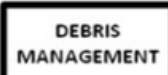


The screenshot shows the TN EPSC website with a navigation menu: Home, Level 1, Recertification, Level 2, Oil & Gas Workshop, Class Locations, Certification List, Information, TDEC Handbook. The main content area features a thumbnail of the 'TENNESSEE EROSION & SEDIMENT CONTROL HANDBOOK' with a 'click to download' link. Text on the page states: 'The Fourth edition of the Tennessee Erosion and Sediment Control Handbook has been designed to provide standardized and comprehensive erosion prevention and sediment control best management practices for use throughout Tennessee. This handbook serves as the primary reference for the development and implementation of Stormwater Pollution Prevention Plans (SWPPP), as required per the Tennessee General NPDES Permit for Discharges Associated with Construction Activities and individual NPDES permits. These permits allow the use of innovative or alternative BMPs or other controls, whose performance can be shown to be equivalent or superior to BMPs identified in this handbook. The Handbook is available for download here as one very large PDF file. In addition, the BMP standard drawings found in Appendix F of the Handbook can be downloaded either as a PDF files or in two versions of AutoCad. If you would like to order a hard copy of the Handbook, please [click here](#) and you will be directed to an order form on our print services (Graphic Creation) website. You can purchase the Handbook in either black or full color format. **General NPDES Permit for Stormwater Discharges from Construction Activities (CGP) Construction Stormwater Inspection Certification (Twice-Weekly Inspections)** Please note the following guidelines for new and active sites:

Training for Workers who are engaged in Dirt Moving or Construction Activities



BEST MANAGEMENT PRACTICES (BMP'S)

STREAM PROTECTION PRACTICES		POLLUTION PREVENTION PRACTICES	
	7.41 Stream Buffers		7.16 Concrete washout
	Stream Diversion Channel		7.17 Vehicle maintenance
	7.43 Temporary Stream Crossing		7.18 Chemical storage
	7.44 Bioengineered Stream Bank Stabilization		7.19 Trash and debris

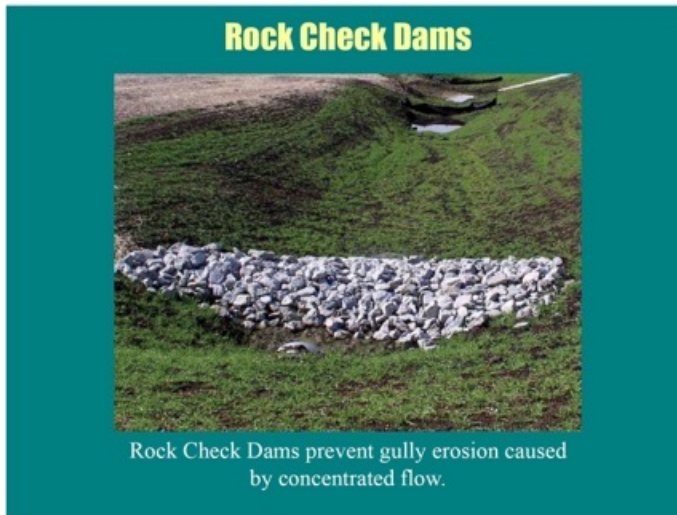
STREAM PROTECTION PRACTICES



7.43 TEMPORARY STREAM CROSSING


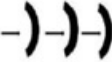

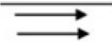



Definition A temporary stream crossing is a temporary structure installed across a flowing stream or watercourse for use by construction equipment.

BEST MANAGEMENT PRACTICES (BMP'S)



RUNOFF CONTROL PRACTICES	
→ ▶ → ▶	7.20 Check Dam
	7.21 Dewatering Treatment Practice
	7.23 Outlet Protection

	7.24 Slope Drain
	7.25 Tubes and Wattles
	7.26 Level Spreader
	7.27 Channels

Best Management Practices (BMP's)

Silt Fences







Silt Fences temporarily impound runoff and retain sediment on-site, often as perimeter control.

SEDIMENT CONTROL PRACTICES	
	7.28 Construction Exit
	7.29 Tire washing facility
	7.30 Filter Ring
	7.31 Sediment Basin
	7.32 Sediment Trap
	7.33 Baffles
	7.34 Silt Fence
	7.35 Inlet Protection

7.35 INLET PROTECTION



-  EXCAVATED INLET PROTECTION
-  HARDWARE CLOTH AND GRAVEL INLET PROTECTION
-  ROCK RING INLET PROTECTION
-  BLOCK AND GRAVEL INLET PROTECTION

Definition A temporary protective device formed around a storm drain drop inlet to trap sediment.

Purpose To prevent sediment from entering the storm drainage system, prior to temporary or permanent stabilization of the disturbed area.

Conditions Where Practice Applies Many different types of inlet protection devices are available. The types highlighted in this section are non-manufactured. Manufactured inlet protection devices are allowable alternatives, provided the following:

- At least 3600 ft²/acre of drainage is available to store sediment.
- No more than 1 acre of drainage to each measure - 0.5 acre drainage area per each measure is preferable.
- An overflow is provided to safely pass storm events larger than the 5-yr storm.



SUMMARY: HOW COUNTIES IMPLEMENT WATER QUALITY STANDARDS

Through **MS4's and Stormwater Ordinances**

Through **Zoning and Zoning Overlays**: local requirements for development to locate away from high-quality water bodies, impaired waterways, or wellhead protection areas.

- Restrictions on steep slopes, away from septic drain locations, utilization of setbacks and other siting criteria.

Through **Subdivision Regulations**: During and Post Construction Developers are required to have Stormwater management and Erosion and Sediment Controls.

Through **Public Works Best Practices**: Erosion Control and Pollution Prevention Measures, SWPPP, ARAP

Through **Development Permitting**: Required Construction and Post Construction Practices (CGP)

Through **Rural County Conservation Districts and Natural Resources Conservation Service (NRCS)**: Best Management Practices ("BMP's") for Agriculture



USING UAV'S (DRONES) IN PUBLIC WORKS APPLICATIONS

Unmanned aerial vehicles (UAVs) can survey and measure and provide detailed visual insight including

- Topographic maps
- Orthomosaic maps
- Corridor maps
- Earthwork surveys

Earthwork surveys can measure cut and fill and stockpiles

Can aid in planning for vegetation, debris, or other obstruction clearing



BENEFITS--IMPROVED DECISION MAKING

- **Faster Data Collection**
- **Real-time Site Monitoring**
- **Historical Project Review**
- **Legal and Safety Documentation**
- **Improved Worker and Site Safety**



USE CASES



ACCURATE AND COMPREHENSIVE DATA

COST AND TIME-SAVING

MAINTENANCE AND ASSET INSPECTION

POST PROJECT DOCUMENTATION

**HIGHWAY INFRASTRUCTURE
MANAGEMENT**

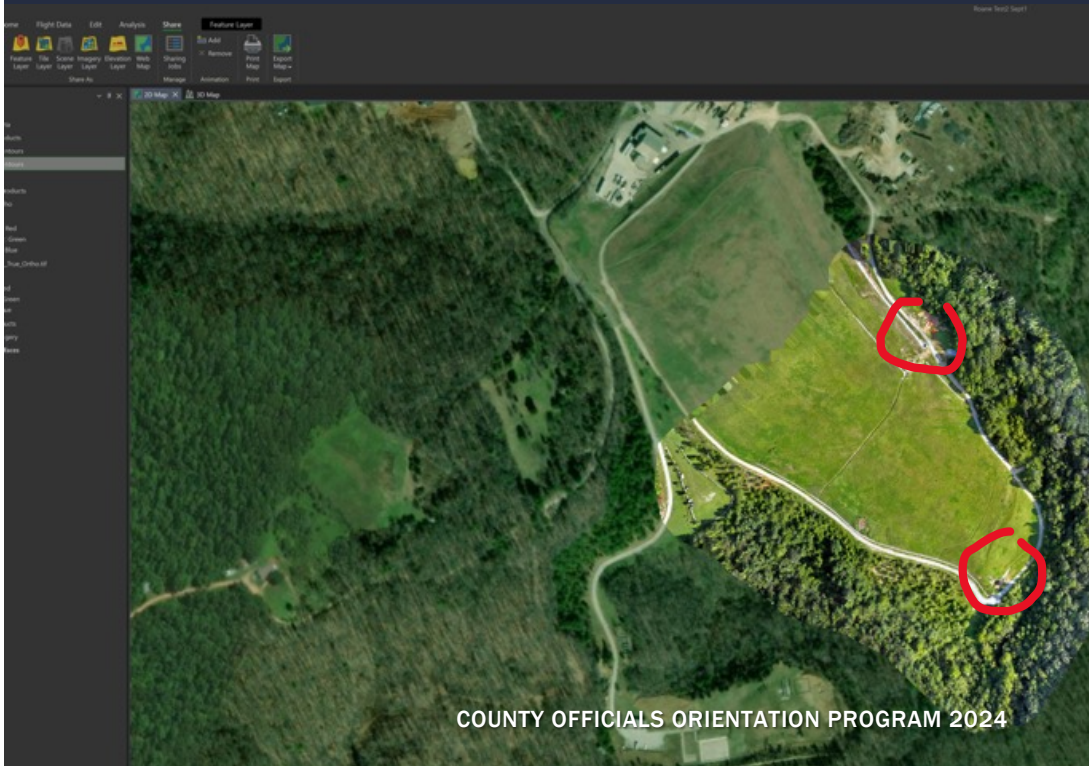
BRIDGE INSPECTION

**PAVEMENT CONDITIONS AND ROAD
DISTRESS MONITORING**



Flight Planning Tool. This is the flight plan for the lower section. Mapping 15 acres. The image resolution is estimated to be .5 in/pixel with flight mapped from 200 ft.

USING FLIGHT DATA TO MAKE A LANDFILL MAP (ORTHOMOSAIC)



Results from flight:

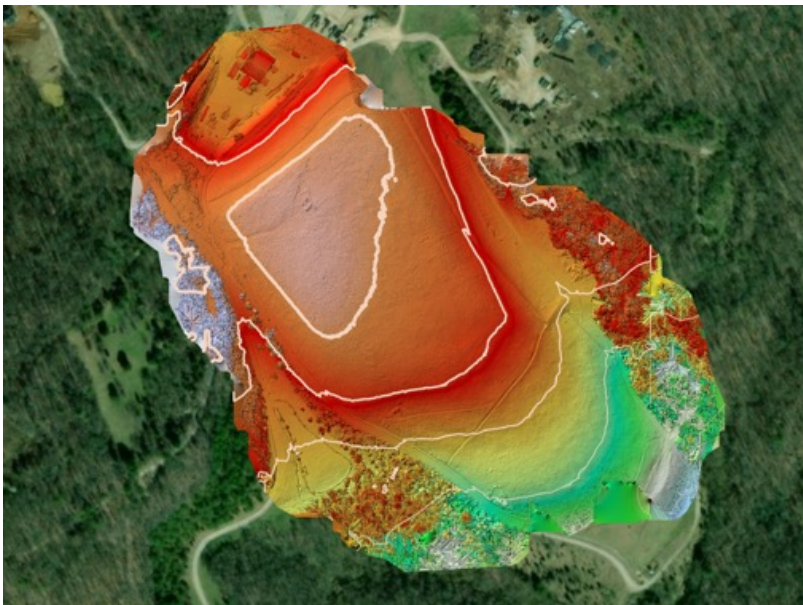
You can see the map image created by the drone overlaying a Google Earth Base Map. The improved clarity of the trees and structures is evident from this scale.

See next slide for closeup of areas marked red.

THESE IMAGES ARE TAKEN FROM 200 FT ABOVE GROUND IN FLIGHT PATH WHILE THE DRONE IS MOVING AS FAST AS 31 MPH.



POST PROCESS-ELEVATION MODEL (DEM)



Other Options:

- Digital Surface Models
- Digital Terrain Models
- Videos
- 3D MODELS
- (Mesh)Thermal Imaging





718,861.02E 3,970,979.96N m

Extent Attribute Table Switch Selection Clear Selection Rotate Chart

Profile Graph 1



Note steep elevation fall here

Note low elevation/potential water holding area here.

Source	Color	MinZ	MaxZ	AveZ	Distance	SHAPE_Length
Digital Surface Model	205, 245, 122	234.984348	250.012138	244.432113	24.945856	24.945815
Digital Surface Model	230, 0, 0	234.948983	260.148922	242.931968	54.379053	54.379081
Digital Surface Model	0, 0, 255	234.157916	260.358642	244.439968	74.328304	74.328303
Digital Surface Model	0, 230, 169	234.493709	263.048189	242.488336	56.396123	56.3962

CTAS DRONE APPLICATIONS



COUNTY OFFICIALS ORIENTATION PROGRAM 2024

<https://gis.ctas.tennessee.edu/portal/apps/instant/portfolio/index.html?appid=580a6eb>

<https://cloud.pix4d.com/site/265458/dataset/1773376/map?shareToken=f634fe1c-0c6b-4780-bc4a-79078df95913>

CONGRATULATIONS ON YOUR ELECTION!

We are here for you.

How can we help?



ENVIRONMENTAL SERVICES

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