

# Washington State Department of Transportation

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## Standard Operating Procedures for Data Collection in Total Maximum Daily Load Areas

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Version 1.0

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Data collection in Total Maximum Daily Load (TMDL) areas is conducted in response to requirements in WSDOT's NPDES Municipal Stormwater Permit (Ecology, 2009). Instructions presented herein are adapted from published information or were developed by in-house technical experts. Their primary purpose is for internal use by WSDOT's TMDL and Stormwater Features Inventory groups. Procedures described may vary from those used by other WSDOT groups.

WSDOT's TMDL data collection procedures do not supplant official published definitions or methods.

Distribution of this document does not constitute an endorsement of a particular procedure or method. Any reference to specific equipment, software, manufacturers, or suppliers is for descriptive purposes only and does not constitute an endorsement of a particular product or service by the authors or WSDOT.

Although WSDOT follows these standard operating procedures in most cases, there may be instances in which WSDOT uses an alternative methodology, procedure, or process.





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## Acronyms and Abbreviations

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AOI	area of interest
BMP	best management practice
Coordinator	Stormwater and Watersheds Program, Stormwater Features Inventory Coordinator
Crew Lead	Stormwater and Watersheds Program, Stormwater Features Inventory Field Crew Lead
Data Steward	Stormwater and Watersheds Program, SFID Lead/Data Steward
DMI	distance measuring instrument
Ecology	Washington State Department of Ecology
Esri	Environmental Systems Research Institute, Inc.®
EPA	Environmental Protection Agency
ESO	Washington State Department of Transportation, Environmental Services Office
Field Lead	Stormwater and Watersheds Program, Stormwater Features Inventory Field Lead
GIS	Geographic Information System
GNSS	Global Navigation Satellite Systems
GPS	Global Positioning System
Headquarters	WSDOT Headquarters building in Olympia
IDDE	illicit discharge detection and elimination
MS4	municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
PDF	Portable Document Format
permit	Washington State Department of Transportation Municipal Stormwater Permit, National Pollution Discharge Elimination System and State Waste Discharge Permit for Large and Medium Municipal Separate Storm Sewer Systems
SFI	Stormwater Features Inventory
SFID	Stormwater Features Inventory Database
SOP	standard operating procedures
TMDL	Total Maximum Daily Load
TMDL Lead	Stormwater and Watersheds Program, TMDL Lead
TSS	total suspended solids

WLA                      Wasteload allocation

WSDOT                 Washington State Department of Transportation

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# Standard Operating Procedures for Data Collection in Total Maximum Daily Load (TMDL) Areas

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## 1 Background

The *Standard Operating Procedures for Data Collection in TMDL Areas* was developed in response to WSDOT's 2009 NPDES Municipal Stormwater Permit (permit), issued by the Washington State Department of Ecology (Ecology). Among other elements, the permit requires WSDOT to implement its programmatic approach (shown in [Figure 1](#)), which includes discharge inventory, illicit discharge detection and elimination (IDDE), identification of potential sources of the pollutant(s) of concern, and identification of maintenance issues. Data collection activities described in this standard operating procedure (SOP) are intended to achieve compliance with Total Maximum Daily Load (TMDL) requirements included in Special Condition S6 of the permit. [Appendix 3](#) of the permit lists specific action items assigned to WSDOT from applicable TMDLs. Action items listed in WSDOT's permit are modified at least every 18 months.

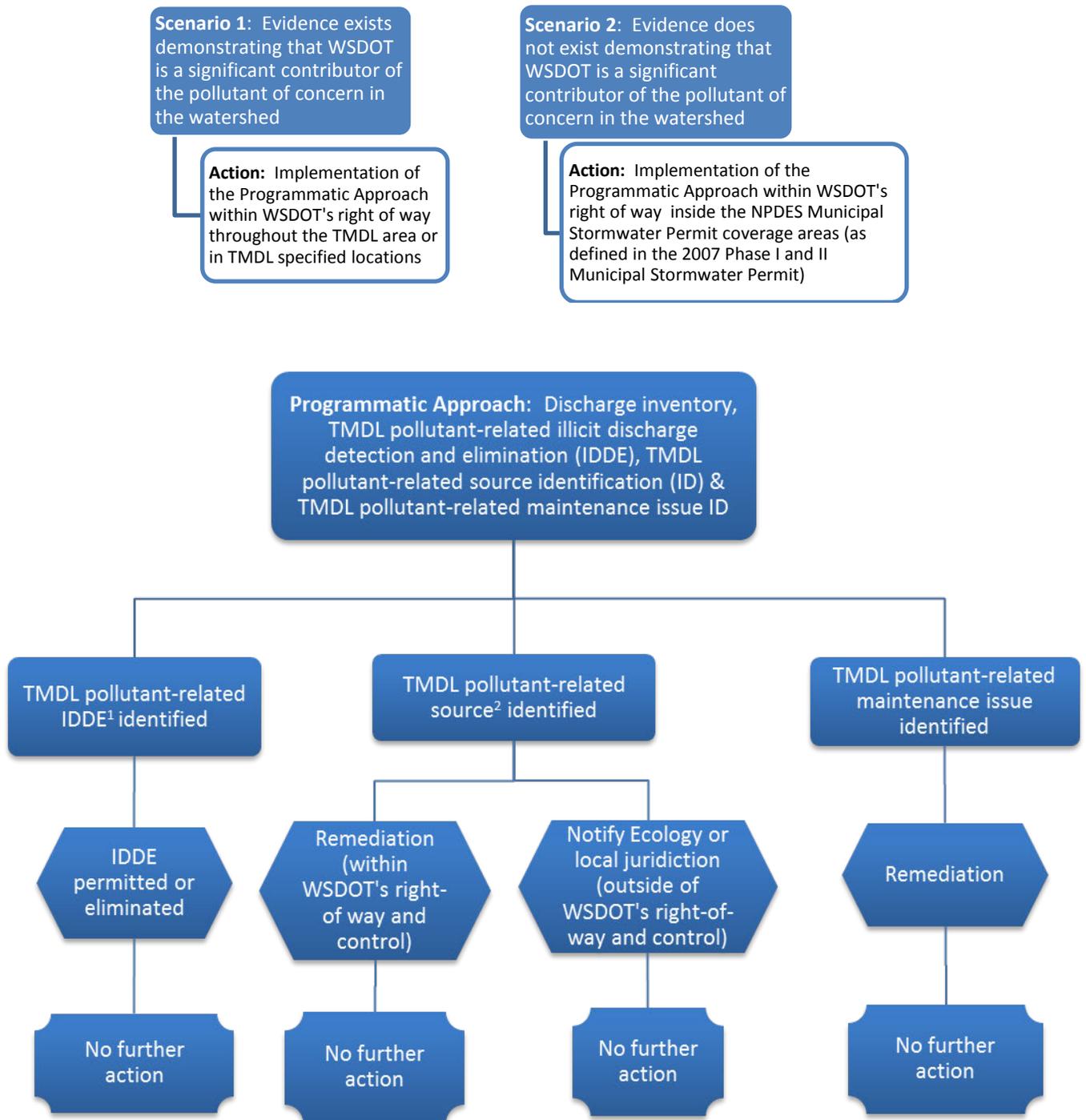
The purpose of this SOP is to provide WSDOT staff with descriptive methods for conducting TMDL area assessments and provide detailed descriptions of each process in sequential order. This SOP is supplemented by the following WSDOT documents:

- *Stormwater Features Inventory: Standard Operating Procedures for Field Safety* (WSDOT, 2013)
- *Stormwater Features Inventory: Standard Operating Procedures for Stormwater Discharge Point Inventory* (WSDOT, 2013)
- *Operating the Trimble® GeoExplorer® 6000 Series GeoXT™ handheld, using ArcPad® 10.0 with service pack 1 and GPScorrect™ 3.20 software* (WSDOT, 2012)
- *Stormwater Features Inventory Database: Standard Operating Procedures for Office Data Collection* (WSDOT, 2012)
- *Stormwater Features Inventory Database: Feature and Attribute Definitions* (WSDOT, 2012)
- *Standard Operating Procedures for Field Identification and Reporting Potential Illicit Discharges and Connections* (WSDOT, 2013)
- Chapter 5-5 of WSDOT's *Highway Runoff Manual* (WSDOT, 2011)
- Chapter 4 of WSDOT's *Maintenance Manual* (WSDOT, 2010)

TMDL assessment activities are managed through WSDOT's Environmental Services Office (ESO), Stormwater and Watersheds Program. Associated operational procedures are administered by the Stormwater Features Inventory (SFI) and TMDL groups. Associated technical systems are administered by WSDOT's ESO, Environmental Information Program, with direction from the Stormwater and Watersheds Program.

**Note:** The *Standard Operating Procedures for Data Collection in TMDL Areas* is a version-controlled document and is subject to modifications that reflect ongoing agency needs.

Figure 1 TMDL Programmatic Approach



<sup>1</sup> Based on visual observation.

<sup>2</sup> Only sources that enter a WSDOT conveyance and discharge to a surface water body included in the TMDL.

## 2 Personnel Qualifications/Responsibilities

As a member of the field or office staff, you must complete training using this SOP and the applicable documents listed in [Section 1](#) to ensure your understanding of the materials presented herein. Using SOPs will help you collect all data efficiently, safely, and consistently. Office staff must have experience using ESRI® ArcGIS® software (specifically ArcMap™). Field crews will receive on-the-job training from staff experienced in field work, GPS devices, and ESRI® ArcGIS® software (specifically ArcPad®).

The SFI Field Lead (Field Lead) and SFI Crew Lead (Crew Lead) who are directing field data collection should be knowledgeable about all aspects of the program requirements to ensure credible and usable data are collected. You will be briefed by the Field Lead, Crew Lead, or SFI Coordinator (Coordinator) on data collection goals and objectives prior to arrival in the field.

Field staff should be comfortable with operating mapping-grade survey equipment and are required to:

- Have a strong understanding of basic survey principles, including the fundamentals of the Global Positioning System (GPS/GNSS).
- Be receptive to working in adverse field conditions (weather- and site-specific) and be able to troubleshoot field and equipment problems.
- Be able to independently assess local highway conditions, determine the required level of traffic control, and apply approved traffic control plans.

Other training requirements may be necessary depending on situations encountered at each site.

## 3 Planning and Coordination

Prior to beginning field work in a TMDL area, you should conduct planning and coordination activities for the area of interest (AOI). These activities ensure there is full communication between the Field Lead, WSDOT's TMDL Lead, Ecology's TMDL Lead, inventory crews, and WSDOT staff, and that field work will be performed in a safe and effective manner.

The Field Lead or Crew Lead is responsible for coordinating the following planning tasks for TMDL assessments.

### 3.1 Schedule and Plan

A schedule and plan for TMDL field work will be developed by the Field Lead to reflect priority areas or highway segments. This plan should be reviewed and approved by the Coordinator prior to implementation. If significant changes in assessment locations or schedules occur, the Field Lead and/or Crew Lead are responsible for updating the plan and notifying all parties of plan changes.

## **3.2 Pre-Assessment Meeting**

Prior to beginning field work within a TMDL area, WSDOT's TMDL Lead will provide supplementary information regarding the TMDL boundaries, TMDL parameter(s) of concern, and TMDL-specific concerns or sources. This meeting will also include a data needs discussion to determine which components of the programmatic approach must be implemented (i.e., discharge inventory, IDDE, identification of potential pollutant sources, and identification of maintenance issues), based on TMDL requirements and existing data.

## **3.3 Basemap**

A basemap will be compiled by the Field Lead or Coordinator to help define the highway segment(s) to be assessed. This will assist the field crew in site orientation and note taking during field work. The basemap should be produced in hard copy for field use and depict the highway segments to be assessed as well as any additional pertinent information. Examples of additional information include the presence of state and local roads, streams, wetlands, or other water bodies, and other highway features such as milepost markers and previous discharge point inventories that may have been conducted in the area.

## **3.4 Region Contacts**

Once priority highway segments and a timeline are established, the WSDOT region Maintenance Superintendents and region Environmental Services staff should be contacted to determine the WSDOT-specific maintenance area where assessment work will be performed. Communications should include a statement of plans for field work and identify special safety precautions or maintenance requirements that may be requested from the region points of contact. Open lines of communication should be established by the Field Lead or Coordinator. Region contacts should receive a status update on a regular basis while work is occurring in their areas of responsibility.

## **3.5 Pre-Assessment Site Review**

Prior to beginning field work within a TMDL area, the Field Lead or Coordinator will visit and become familiar with the highway segments to be formally assessed. When performing a pre-assessment site review, the following should be considered:

- Components of the programmatic approach that must be implemented in this TMDL area, possibly including:
  - discharge inventory
  - IDDE
  - identification of potential pollutant sources
  - identification of maintenance issues
- Pollutants of concern specified for the TMDL area
- Field data collection logistics such as:
  - parking and staging areas
  - applicable safety requirements
  - any specialty equipment or tools that may be needed

## 4 Safety

Field data collection activities are the primary focus of this section. When you conduct field data collection in TMDL areas, follow all WSDOT safety procedures and protocols as defined in the WSDOT [Safety Procedures and Guidelines Manual](#) and all other formal statewide or region-specific safety-related manuals, guidelines, memos, etc. Preplan all traffic control in adherence to the federal [Manual on Uniform Traffic Control Devices for Streets and Highways](#) and the WSDOT [Work Zone Traffic Control Guidelines](#).

You can find additional guidance for field safety procedures and protocols, as well as recommended traffic control plans, in the WSDOT *Stormwater Features Inventory: Standard Operating Procedures for Field Safety* (WSDOT, 2013).

Exposure to harmful substances could occur during identification of pollutant sources in TMDL areas. Take great personal care when investigating a potential source. The maximum allowable limits of many contaminants are below a level at which they can be visually recognized. While a discharge may seem benign, the concentration of contaminants may be deceptively high. *At no time should you expose yourself to solids, fluids, or fumes that may cause personal injury.*

This SOP only addresses procedures for identifying TMDL concerns that are not suspected to be hazardous. If you encounter any identified illicit discharges that are potentially hazardous, immediately contact the Environmental Services Office (ESO) [IDDE Contact](#): 360-709-8058. In the event of an immediate threat, contact 9-1-1 emergency services.

## 5 Standard Data Collection Equipment

Office data collection activities will utilize the standard WSDOT computer set up, software, applications, and connection to WSDOT's servers. A variety of tools, supplies, and equipment will be required for nearly all field operations. Each piece of equipment is considered an asset of the state and should be cared for accordingly. Stolen or damaged equipment should be reported to the Field Lead or Coordinator as soon as possible. Additional details are specified in documents listed in [Section 1](#). Field data collection activities are the focus of [Sections 5.1](#) and [5.2](#).

### 5.1 Care of Field Equipment

You must take proper care of the equipment used in order for it to function as intended. If you leave equipment wet and dirty at the end of the day, metal components (such as the data port or battery contacts) can corrode, thus degrading performance or even ruining the device. Metal measuring equipment can rust or roughen beyond usability.

At the end of each day in the field, wipe down, dry off, or otherwise clean all equipment and set batteries to charge overnight. If you use the equipment in rainy weather, detach cables and leave the plug/data port covers open overnight to allow for drying. Don't leave any valuable survey equipment in the vehicle overnight. The Performance Management Program annual review for all WSDOT field personnel should include a component for proper care of field equipment.

## 5.2 Field Data Collection Equipment List

You may need additional equipment depending on field conditions encountered in the TMDL area or specific assessment requirements. Following is a list of standard items required for stormwater field work. Proper planning during the pre-assessment meeting and site review should be conducted to tailor this list for each TMDL area assessment.

- Algiz® 10x rugged tablet PC and/or Trimble® GeoExplorer® 6000 Series GeoXT™ handheld GPS/GNSS unit (hand-held computer, antenna, range pole, cables, stylus, spare battery, etc.)
- Laser range finder
- Digital camera
- Chargers for camera, laptop, and GPS/GNSS unit (if traveling overnight)
- Cell phone and/or two-way radios
- Rite-in-the-Rain® field survey books
- Mechanical pencils, erasers, straight edge, stencil, etc.
- Base maps/field maps
- Covered clipboard
- Magnetic compass
- Spotlight/powerful flashlight
- 4 lb. sledgehammer
- Shovel
- Manhole lid-opening tool(s)
- Machete or brush clippers
- Measuring tape, graduated in inches

## 6 Data Collection Procedures

Office data collection procedures must follow applicable sections of the *Stormwater Features Inventory Database: Standard Operating Procedures for Office Data Collection* (WSDOT, 2012) and *Stormwater Features Inventory Database: Feature and Attribute Definitions* (WSDOT, 2012). Procedures for field data collection may include any of the following activities, which are uniquely defined for each TMDL area in [Appendix 3](#) of WSDOT's permit.

### 6.1 Boundaries of Responsibility

The department is responsible for all stormwater leaving the WSDOT right of way, including infiltration of stormwater into the ground. This includes the boundaries of WSDOT's highways, maintenance facilities, ferry terminals, rest areas, and park and ride lots.

You can identify and determine the right of way boundary using legal survey maps or general field indicators. The method used will depend on the specific parameters of each mapping/assessment project. For TMDL area assessments where accuracy is of high importance, you should review right of way plan sheets through various WSDOT region or Headquarters data repositories. For further information on office research using region or Headquarters data repositories, see the document titled *Stormwater Features Inventory Database: Standard Operating Procedures for Office Data Collection* (WSDOT, 2012).

In most instances, you should assess the approximate right of way boundary using field indicators. Use field indicators with care and in the following order of precedence:

1. Right of way fence (hog and barbed wire is most common, but private fences should also be considered)
2. Toe of slope or slope catch (the line where the roadway embankment or cut meets the natural ground surface)
3. Vegetation line/maintenance clearing line

When present, you may also use physical survey markers such as property corner or right of way boundary stakes to confirm or question the assumed boundary. However, you should not use them exclusively, since they may be out of date or incorrect. When there is concern about using field indicators, or if they are deemed to be insufficient, record a detailed note with the data point record to document justification for the point location.

## 6.2 Discharge Inventory

Discharge inventory is the process of mapping stormwater system discharge points. Discharge points are characterized into the following categories:

- Surface waters
- Land surface
- Managed system
- Incoming
- Subsurface

Refer to WSDOT's *Stormwater Features Inventory: Standard Operating Procedures for Stormwater Discharge Point Inventory* (WSDOT, 2013) and *Operating the Trimble® GeoExplorer® 6000 Series GeoXT™ handheld, using ArcPad® 10.0 with service pack 1 and GPSCorrect™ 3.20 software* (WSDOT, 2012) for specific instruction on completing a discharge inventory.

## 6.3 Illicit Discharge Detection and Elimination (IDDE)

Illicit discharge detection and elimination is the process of identifying:

- Any constructed conveyance that is connected to WSDOT's stormwater conveyance system without a permit, or
- A discharge or spill into WSDOT's stormwater conveyance system, or that could reach WSDOT's stormwater conveyance system, that is not composed entirely of stormwater.

Refer to the *Standard Operating Procedure for Field Identification and Reporting Potential Illicit Discharges and Connections* (WSDOT, 2013) for specific instruction on inventorying the stormwater system for IDDEs.

## 6.4 Identification of Potential Maintenance Concerns

Identification of potential maintenance concerns is the process of identifying issues with a stormwater conveyance feature that can be remedied through maintenance activity. Common examples include significant erosion within WSDOT's right of way or significant sediment deposition in catch basins or other stormwater conveyance features. Maintenance-related issues can compromise the design of a conveyance system and facilitate discharge of undesirable pollutants.

In the case where a potential maintenance concern is seen to be creating or allowing a non-stormwater discharge, document the discharge and flag the point as a "maintenance concern." The TMDL Lead should submit potential maintenance concerns identified during the field assessment process to the maintenance group. Maintenance, environmental, and/or hydraulics staff should evaluate each location to determine if remediation is necessary. Remediation should be performed as soon as possible. Refer to Chapter 5-5 of WSDOT's *Highway Runoff Manual* (WSDOT, 2011) and Chapter 4 of WSDOT's *Maintenance Manual* (WSDOT, 2010) for guidance on maintenance issue identification.

## 6.5 Source Identification

Source identification is the process of identifying potential pollutant sources that originate in or are conveyed through WSDOT's stormwater conveyance system prior to discharge to a TMDL-listed water body. This involves identifying areas where *sensory indicators* of pollutants are present (potential IDDEs). Sensory indicators might include strong odors and auditory or visual indications of the presence of a pollutant of concern. Along with *sensory indicators*, locations that could cause an impact to WSDOT's MS4 but have no discernible evidence of a direct connection at the time of the visit, such as a livestock field that sheetflows toward WSDOT right of way, are documented as part of the TMDL assessment process. Potential pollutant sources and field identifiers are listed in [Appendix A](#).

Before identifying potential pollutant sources in the field, you should consider the following:

- Are the field identifiers for this pollutant present in the area being assessed?
- If present, can the pollutants be reasonably conveyed to the WSDOT stormwater system?
- If so, does this WSDOT stormwater system discharge to the water body of concern (or a tributary to it) as defined by the TMDL?
- How is the pollutant being conveyed to WSDOT's property?
- How should the location be documented (potential IDDE or potential source)?

Refer to [Appendix B](#) for specific procedures to identify and document potential pollutant sources in TMDL areas.

## 7 TMDL Staff Responsibilities

Once initial office and field data collection is complete and the data has been processed and quality-checked by the Stormwater Features Inventory group, information is then provided to the TMDL group for further development and reporting.

### 7.1 Field Review Site Visit

The purpose of the field review site visit is to familiarize WSDOT's TMDL Lead and TMDL support staff with the watershed, potential pollutant source locations, maintenance issues, and/or IDDEs identified by field crews. Additionally, this field review is meant to confirm results of initial office and field data collection efforts. Field reviews include documenting whether the problem still exists, and determining how to describe the issue and how to resolve it. The TMDL staff will use this site visit to locate sites, confirm findings, and begin to develop remediation plans. The SFI Field Lead and/or IDDE Lead may accompany the TMDL staff on these visits as need and workload permits. Prior to the field review, TMDL staff:

- Map and evaluate all potential pollutant source locations, maintenance issues, and/or IDDEs to determine which sites must be reviewed.
- Develop a plan to safely and efficiently assess the potential TMDL concerns.

### 7.2 Post-Field Review Meeting

After the field review site visit, the IDDE Lead (and the TMDL Lead, if necessary) and TMDL support staff meet to discuss appropriate resolution actions. Examples of possible actions include, but are not limited to:

- Report any newly identified IDDEs and seek resolution through that process.
- Notify and provide collected information to the local jurisdiction for resolution, if outside of WSDOT's right of way and control.
- Notify and provide collected information to Ecology for resolution, if outside of WSDOT's right of way and control and a local jurisdiction is unable or unwilling to address the issue.
- Specific remediation action, such as installing a pet waste station at a WSDOT-owned or -operated pet walking area.

### 7.3 Data Compilation

TMDL support staff compile TMDL area assessment information into a *Summary of Inventory Findings Report* for submittal to Ecology.

The *Summary of Inventory Findings Report* must include the following:

- Summary of TMDL area assessment activities and dates of work performed.
- Methods of data collection and assessment used with reference to this SOP.
- GIS-based map of discharge points (incoming, land surface, surface water, underground, managed system), potential TMDL source locations, and potential IDDEs.

- Summary of potential pollutant source locations and IDDEs, including milepost locations, photos, general description of the issue, and follow-up actions taken or to be taken.
- Summary of any maintenance issues identified and plan for remediation.

## 7.4 Follow-Up

Approximately six months after the *Summary of Inventory Findings Report* is submitted to Ecology, WSDOT's TMDL Lead and TMDL support staff will meet with the IDDE Lead to determine the status of reported IDDEs. TMDL program staff will provide an addendum report to Ecology with an update on all previously reported TMDL concerns and any planned remediation activities.

# 8 Definitions

## 8.1 Code of Federal Regulations

*The following definitions are from 40 CFR 130.2.*

**Pollution:** The man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water.

**Load Allocation:** The portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources. Load allocations are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint source loads should be distinguished.

**Waste Load Allocation:** The portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality-based effluent limitation.

## 8.2 Highway Runoff Manual

*The following definition is from the 2011 WSDOT [Highway Runoff Manual](#), M 31-16 (as abridged for use by the Stormwater Features Inventory Group).*

**Best Management Practices (BMPs):** Best management practices or structural devices that are used singly or in combination to prevent or reduce the detrimental impacts of stormwater, such as pollution of water, degradation of channels, damage to structures, and flooding.

### 8.3 WSDOT Permit

*The following definitions are from the 2009 WSDOT NPDES Permit (as abridged for use by the Stormwater Features Inventory and TMDL Groups).*

**303(d) list:** The federal Clean Water Act requires states to prepare a list of water bodies that fail to meet water quality standards. If a water body segment does not meet water quality standards for a specific pollutant, it gets added to the Water Quality Assessment list as a Category 5 water body segment, known as the 303(d) list. The 303(d) list consists of water bodies for which Total Maximum Daily Loads (TMDLs) must be developed to address the water quality impairment.

**CWA:** The federal [Clean Water Act](#) (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended Pub. L. 95-217, Pub. L. 95-576, Pub. L. (6-483 and Pub. L. 97-117, 33 U.S.C. 1251 et seq. (1972))

**Discharge:** For the purpose of this permit, unless indicated otherwise, refers to discharges from municipal separate storm sewers. (See also [40 CFR 122.2.](#))

**Illicit connection:** Any constructed conveyance that is connected to a municipal separate storm sewer without a permit, excluding roof drains and other similar type connections. Examples include sanitary sewer connections, floor drains, channels, pipelines, conduits, inlets, or outlets that are connected directly to the municipal separate storm sewer system.

**Illicit discharge:** Any discharge to a municipal separate storm sewer that is not composed entirely of stormwater, except discharges pursuant to an NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from fire-fighting activities.

**Municipal separate storm sewer system (MS4):** All separate storm sewers that are defined as “large” or “medium” or “small” municipal separate storm sewer systems. (See also [40 CFR 122.26\(b\)\(8\)](#), which is included below.)

**National Pollutant Discharge Elimination System (NPDES):** The national program for issuing, modifying, revoking, and reissuing, terminating, monitoring, and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the federal Clean Water Act, for the discharge of pollutants to surface waters of the state from point sources. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington Department of Ecology.

**Runoff:** Water that travels across the land surface, or laterally through the soil near the land surface, and discharges to water bodies either directly or through a collection and conveyance system. Runoff includes stormwater and water from other sources that travels across the land surface.

**Stormwater:** Runoff during and following precipitation and snowmelt events, including surface runoff, drainage, and interflow (NPDES Permit); also, "that portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility" ([WAC 173-201A-020](#)).

**Total Maximum Daily Load (TMDL):** A water cleanup plan. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation must include a margin of safety to ensure the water body can be used for the purposes the state has designated. The calculation must also account for reasonable variation in water quality. Water quality standards are set by states, territories, and tribes. They identify the uses for each water body; for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs.

**Water Quality Standards:** Surface Water Quality Standards, Chapter [173-201A WAC](#), Ground Water Quality Standards, Chapter [173-200 WAC](#), and Sediment Management Standards, Chapter [173-204 WAC](#).

**Waters of the state:** Includes those waters defined as "waters of the United States" in [40 CFR 122.2](#) within the geographic boundaries of Washington State and "waters of the state" as defined in [Chapter 90.48 RCW](#), which includes lakes, rivers, ponds, streams, inland waters, underground waters (see [RCW 90.44.035](#)), salt waters, and all other surface waters and water courses within the jurisdiction of the state of Washington.

## 9 References

[40 CFR 122.2](#)

[40 CFR 122.26\(b\)](#)

[40 CFR 130.2](#)

[33 U.S.C. 1251 et seq.](#)

[RCW 90.44.035](#)

[RCW 90.48](#)

[WAC 173-200](#)

[WAC 173-201A](#)

[WAC 173-204](#)

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## Appendix A: TMDL Pollutant Sources and Identifiers

The pollutants of concern applicable to WSDOT, as defined in [Appendix 3](#) of the permit, include:

- Fecal coliform
- Temperature
- Dissolved oxygen
- Total suspended solids, sediment, or turbidity
- Nutrients

### A-1 Fecal Coliform

Fecal coliform bacteria originates in the intestines of warm-blooded animals, including humans, dogs, and livestock. These typically harmless bacteria tend to exist along with disease-causing bacteria and viruses (i.e., pathogens), so they serve to indicate the potential for a human health risk. High measurements of the bacteria can also cause shellfish and recreational area closures.

WSDOT has developed a programmatic approach as a standard set of actions to complete when evidence exists that WSDOT is a significant contributor and has been assigned a wasteload allocation (WLA) in a fecal coliform TMDL. Currently, nine TMDLs in the permit require implementation of the programmatic approach. A flow chart describing the approach is included in [Appendix 3](#) of the permit.

**Table A-1 Potential Sources and Identifiers in Fecal Coliform TMDL Areas.**

Pet feces and/or dog walking areas
Domestic waste dumping in ditch lines
Excessive/localized concentrations of indigenous/wildlife waste
Colony-nesting bird species under WSDOT/local bridges
Migratory bird or waterfowl gathering areas
Runoff from local farms: sheet or concentrated flow from fields with high concentrations of manure or manure stockpiles
Human feces: camps for the homeless; outhouses in or next to WSDOT right of way; failing septic systems; garbage dumping that may include baby diapers
Excessive sediment input, transport, or deposition in the conveyance system: catch basin sumps that are greater than 60% full; stormwater ponds or other BMPs with excessive sediment
Excessive algae growth in conveyance system

## A-2 Temperature

Salmon and trout need water temperatures of 9–12 degrees Celsius (48–64 degrees Fahrenheit) to survive and reproduce. Warm temperatures reduce the amount of dissolved oxygen in water and threaten native fish species. Water temperature can increase as a result of streamside vegetation removal; eroding streambanks; riprap and other non-native materials that serve as a heat sink; reduced groundwater inputs; increased sediment inputs that reduce stream depth; and polluted runoff.

**Table A-2 Potential Sources and Identifiers in Temperature TMDL Areas.**

Rock-, asphalt-, or concrete-lined ditches
Large areas with streambank armoring or slope armoring where stormwater would be conveyed (riprap or large rock)
Excessive algae growth in conveyance system
Stormwater ponds, or areas of ponded stormwater near the discharge point, likely to discharge during summer months
Lack of streamside shading (for streams that flow within or near WSDOT right of way)

## A-3 Dissolved Oxygen

Dissolved oxygen (D.O.) is the concentration of oxygen that is dissolved in water. Certain concentrations are necessary for aquatic plants and animals to survive. Low levels of D.O. are primarily caused by high water temperature and decomposing algae and plants in the water. Excess algae and plant growth is caused by phosphorus and nitrogen pollution.

Levels of D.O. often vary by season, and state standards vary based on how the stream is used by salmon. In general, the state standard ranges from 6.5–9.5 milligrams of D.O. per liter of water. Higher concentrations indicate healthier streams.

Excessive nutrients or high water temperatures can lead to low D.O. levels. Many D.O. TMDLs list nutrients as pollutants of concern.

**Table A-3 Potential Sources and Identifiers in Dissolved Oxygen or Nutrient TMDL Areas.**

Runoff from local farms: sheet or concentrated flow from fields with high concentrations of manure or manure stockpiles
Human feces: camps for the homeless; outhouses in or next to WSDOT right of way; failing septic systems; garbage dumping that may include baby diapers
Pet feces and/or dog walking areas
Fertilizers and/or compost
Organic material deposition/accumulation (leaves, grass clippings, seeds, flowers, etc.)
Excessive algae growth in conveyance system
Excessive sediment input, transport, or deposition in conveyance system: catch basin sumps that are greater than 60% full; stormwater ponds or other BMPs with excessive sediment

## A-4 Total Suspended Solids, Sediment, or Turbidity

Total suspended solids (TSS) are particles, both mineral (clay and sand) and organic (algae and small pieces of decomposed plants and animals), that are suspended in water. High concentrations can harm aquatic life by blocking sunlight and reducing plant photosynthesis, clogging fish gills, and increasing water temperature.

Turbidity is a measure of water clarity. Things like algae and suspended solids can increase turbidity, making the water cloudy. Particles suspended in the water absorb heat from sunlight, increasing water temperature and reducing dissolved oxygen. Heavy metals and other pollutants can attach to suspended materials. High turbidity blocks sunlight, which decreases plant and algae photosynthesis and affects the food chain for fish.

**Table A-4 Potential Sources and Identifiers in Total Suspended Solids, Sediment, or Turbidity TMDL Areas.**

Excessive sediment input, transport, or deposition in the conveyance system: catch basin sumps that are greater than 60% full; stormwater ponds or other BMPs with excessive sediment
Erosion
Excessive algae growth in conveyance system
Sediment track-out onto roadway

## A-5 Nutrients

High levels of nutrients cause excessive algae and plant growth. When these plants die and decompose, they consume large amounts of dissolved oxygen. Common sources of nutrients are fertilizers, vehicle exhaust, atmospheric deposition, and human and animal waste.

**Table A-5 Potential Sources and Identifiers in Nutrient TMDL Areas.**

Runoff from local farms: sheet or concentrated flow from fields with high concentrations of manure or manure stockpiles
Human feces: camps for the homeless; outhouses in or next to WSDOT right of way; failing septic systems; garbage dumping that may include baby diapers
Pet feces and/or dog walking areas
Fertilizers and/or compost
Organic material deposition/accumulation (leaves, grass clippings, seeds, flowers, etc.)
Excessive sediment input, transport, or deposition in the conveyance system: catch basin sumps that are greater than 60% full; stormwater ponds or other BMPs with excessive sediment

## **Appendix B: Source Identification Field Data Collection Procedures**

The following field data collection procedures for TMDL source identification are intended to ensure consistent quality of data, which may be collected by multiple field crews or staff in various regions of the state.

You can document the location of potential pollutant sources using a variety of methods and equipment, depending on the nature of the concern and how the pollutant is conveyed to the WSDOT stormwater system. These methods might include using a field GPS unit or assigning a milepost value using a vehicle odometer or distance measuring instrument.

### **B-1 Documenting Potential Pollutant Source Locations Using GPS Survey Equipment**

Use GPS field units to locate pollutant sources in situations where the pollutant of concern is being introduced to the WSDOT drainage network by a discrete conveyance (e.g., a ditch or pipe).

GPS data collectors vary in quality and accuracy and can include units that are recreational grade, mapping grade, and survey grade. You should be familiar with the relative accuracy of the unit being used for data collection and whether it's of the appropriate grade for recording the location of interest.

### **B-2 Documenting Potential Pollutant Source Locations Using Milepost Value**

You can generate the location of a pollutant source by using highway linear referencing and placing the point using computer software. It should be noted that a milepost value is only as accurate as physical roadway references allow (i.e., milepost signs are specified to be installed within 50 feet of the actual location, where possible). Use this method only when you do not have a GPS unit to document the concern.

You can estimate a milepost value within roughly 500 feet using a standard vehicle odometer that is graduated in tenths (or within 50 feet if graduated in hundredths). Take care to reset the odometer while the vehicle is stopped next to a highway milepost sign.

Alternatively, you can determine a much more accurate milepost value using a vehicle that is equipped with a properly calibrated (and operated) distance measuring instrument (DMI). DMI values are usually graduated in thousandths and therefore can provide a milepost value that is within 5 feet.

### **B-3 Determining Potential Pollutant Conveyance to WSDOT's Stormwater System**

Only potential pollutant sources identified by field staff as originating within or being conveyed to or through WSDOT's stormwater conveyance system prior to discharge to a TMDL-listed water body should be recorded as a potential IDDE/TMDL concern. Local conditions where this may occur include:

1. A constructed conveyance that concentrates pollutants and discharges directly to WSDOT right of way. This can include features such as pipes and ditches that discharge either through a direct physical connection to the stormwater system or indirect discharge to a land surface within a WSDOT area of responsibility.
2. A slope or gradient of the land surface that facilitates flow toward and terminates in or near WSDOT's right of way. A land surface that slopes away from WSDOT's right of way will not convey surface runoff to WSDOT's stormwater system; therefore, pollutant conveyance is not likely to occur.
3. Subsurface soil/water table conditions that, regardless of local slopes or constructed conveyances, could potentially contribute an underground pollutant plume to migrate through the soil substrate to WSDOT's stormwater system.

### **B-4 Determining Potential Pollutant Conveyance to a Surface Water Body**

TMDLs are generally delineated based on watershed boundaries. To be a recordable potential pollutant source, the suspect pollutant of concern must be effectively conveyed to a water body inside the TMDL boundary (either by surface or subsurface flow).

### **B-5 Documenting the Mode of Potential Pollutant Source Transfer**

There are three potential modes of pollutant transfer to the WSDOT stormwater system: a point source, a line source, or a subsurface plume. The methods you should use to document either mode of transfer are described below.

#### **B-5.1 Point Source**

A point source transfer of pollutants is a discharge of those pollutants transported in stormwater or other flow that has been concentrated by a discrete conveyance such as a pipe, ditch, or natural channel. This flow is discharged to WSDOT property or directly to the WSDOT stormwater system at a single location that can be defined by a single coordinate on a map.

A point source discharge of a potential pollutant is documented as an "incoming" discharge type at the location where the potential pollutant enters WSDOT's right of way (see the WSDOT 2013 *Standard Operating Procedure for Stormwater Discharge Point Inventory*). You should flag this point as a potential illicit discharge and enter it into the WSDOT IDDE [web application](#) (internal tracking database). If necessary, take accessory photographs to assist in an office-based assessment of the magnitude of the concern.

## **B-5.2 Line Source**

A line source transfer of pollutants is a mobilization and transfer of pollutants through surface runoff or sheet flow that is intercepted and concentrated by a feature in the WSDOT stormwater system, such as a ditch. An example of this type of pollutant source might include an animal pasture or agricultural field that is sloped toward the WSDOT highway but doesn't incorporate excavated drainage ditches or pipe networks that concentrate the runoff prior to its transfer.

Document a line source discharge of a potential pollutant by recording a GPS coordinate:

- At the point where the potential for concentration of surface runoff from the pollutant source is greatest. For example, the point where a natural swale draining a pasture crosses into the WSDOT right of way.
- Near the highway shoulder, midpoint of the "line." For example, where a field or pasture has no primary zone of surface flow concentration.

If necessary, take accessory photographs to assist in an office-based assessment of the magnitude of the concern.

## **B-5.3 Subsurface Plume**

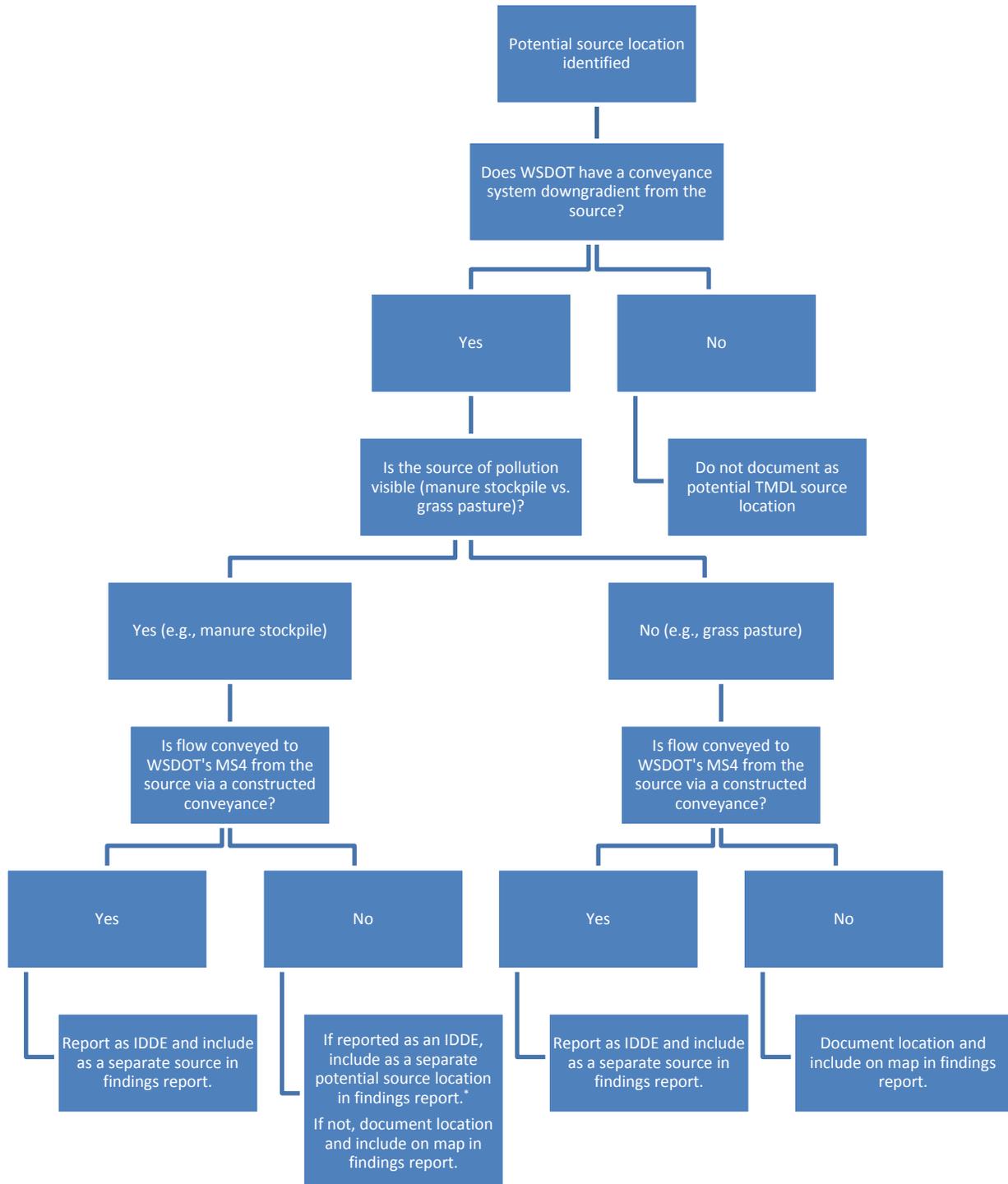
Transfer of pollutants through a subsurface plume involves migration of those pollutants through the ground, which then percolates up in the WSDOT conveyance or right of way. This may be the most difficult mode of transfer to detect using only sensory indicators.

Document a subsurface plume-type discharge of potential pollutants by recording a GPS coordinate at the most upstream location at which the pollutant appears in the WSDOT drainage network. Take care to clearly document the source and potential flow path of the pollutant. If necessary, take accessory photographs to assist in an office-based assessment of the magnitude of the concern.

## **B-6 Identifying and Reporting a Potential Pollutant Source**

WSDOT follows the decision criteria, presented in [Figure B-1](#), for identification and reporting of potential pollutant sources.

Figure B-1 Source Location Identification and Reporting.



\*May be an IDDE depending on the severity of pollutant and characteristics of flow.

## **B-7 Field Photograph Procedures**

Photograph all potential pollutant source locations. Assign each photo an identification number and record it in the corresponding feature's attributes. In the final deliverable, these can be digitally linked.

**Take care during photo composition.** The field photograph is the most commonly overlooked or rushed phase of field data collection. A carefully composed photograph can contain an enormous amount of information. Your photo should be able to independently communicate the stormwater scenario and justify the collection of the potential source location.

Reference objects included in the photo, indicating scale and location, are invaluable. These objects can allow for office-based assessment of the conditions, as well as help a third party to locate the point in the field at a later time. In each photo, include critical elements such as perspective on flow paths, pipe ends, drainage structures, and potential pollutant sources.

There are many locations completely covered by vegetation or otherwise obscured. In these instances, a reference photograph with a crew member at the point of interest helps to show where the potential source is, relative to the highway shoulder, but not the exact nature and condition of the potential source. In these cases, accompany the "vicinity" photo with a "detail" photo.

Set digital camera photo resolution according to the scope of the field activity and purpose of the final dataset. In general, for TMDL area assessments, **set photo resolution at 1 megapixel or below.**

This accommodates limited data transfer rates and server storage capacity, while also improving the ultimate user interface for the end user.

Field crews are responsible for assigning the unique picture ID for each photo prior to data submittal. This photo number is then recorded as an attribute in the digital data. Most commonly, the final picture ID is equivalent to the unique photo ID number as assigned by the camera.

## **B-8 Records Management & Data Processing**

Data can be roughly divided into three categories: digital data recorded using a GPS data collector, field book notes recorded manually, and field photographs taken during data collection.

Once you record this data, transfer it to the appropriate Data Stewards and/or WSDOT servers for processing and storage. In addition to the transferred dataset, maintain a back-up copy (hard copy or digital copy, where applicable) of all raw edited dataset versions. Maintain this redundant back-up for a period of time that is sufficient to ensure all information has been properly transferred and loaded to the final destination. It may be deleted by the appropriate personnel upon verification of transfer.

### B-8.1 Digital Data

A geodatabase specific to TMDL field data collection is currently under development. Store all potential pollutant source locations recorded as “point source” incoming discharges in the internal [WSDOT SFI server](#) location on the W:Drive (W:\Public\DOT\StormwaterFieldCrew\Incoming) for later upload to the WSDOT Stormwater Features Inventory Database (SFID).

The SFID technical data administration is conducted by the ESO Environmental Information Program and the Data Management Services Office. These groups are responsible for maintaining the SFID, managing the geospatial data structure, and processing and storing the geospatial data.

On a weekly basis, after coordination with the Stormwater Features Inventory field staff, the Environmental Information Program Data Steward will check out a versioned dataset from the SFID for editing on mobile field units. This dataset is stored on the above-referenced internal [WSDOT SFI data](#) transfer location from which field crews can transfer it to mobile GPS units. Upon completion of field activity, the field staff transfers the edited dataset back onto the internal [WSDOT SFI data](#) transfer location. The GIS technical Data Steward then sequesters it for postprocessing and merging into the SFID. Until such time that a TMDL-specific geodatabase can be completed, field staff will manually record the latitude and longitude value of the potential pollutant source location in their field notebook. The coordinate values will then be digitized by TMDL program staff in the office during the quality control/quality assurance process.

### B-8.2 Field Notebooks

Photocopy and scan field notebooks to PDF at the end of each day. This provides a hard copy back-up that can be filed by the Crew Lead and a digital copy that can be accessed by office personnel. After a quality assurance review, the digital version will be permanently stored on the internal WSDOT SFI server space and will be accessible to all end users upon request.

Use careful attention to detail when photocopying and scanning field notebook pages. The contrast settings, field notebook orientation in the copy machine, and page size selection all have an impact on the record quality. The final product must be clear and legible. The borders should not be cropped (e.g., by an “auto formatting” algorithm in the copy machine or by poor document placement).

Once a field notebook has been filled, file the original copy in a field notebook “library,” kept by the SFI Lead, for future reference. If a hard copy of field notes is necessary for field reviews, use the photocopy. *Never remove the original copy from the office for a field review.*

### **B-8.3 Field Photographs**

Transfer photographs taken of potential source locations to a computer drive at the end of each day. Label the folder they are transferred to using the date and state route number where they were collected. Upon a quality assurance review by Stormwater Features Inventory staff, transfer these photos to the internal WSDOT SFI server space for permanent storage.

### **B-8.4 Quality Control/Quality Assurance**

After potential pollutant sources have been identified by field crews and field inventory within the TMDL is complete, the data is reviewed in the office by Stormwater Features Inventory staff for quality control and data processing. Then, TMDL program staff map the latitude and longitude coordinates collected for each potential concern in GIS and the layer is used to prioritize additional field review locations.