

## Turbidity Monitoring for Highway Projects-Guidance

### Purpose of Turbidity Monitoring

State water quality standards and regulatory permits set a limit on how much turbidity in streams can increase as a result of in-water work and stormwater discharges. Turbidity monitoring is required and necessary to show that a project is, or is not, meeting the standards and permit conditions. It also has the practical purpose of showing whether or not turbidity controls and erosion and sediment control measures are working as well as intended. Monitoring, then, is both a requirement and a useful tool.

### Guidance:

In-water work turbidity monitoring shall follow the protocol found in the General Conditions for the Clean Water Act Section 401 Water Quality Certification for 2012 Clean Water Act Nationwide 404 Permit Program

<http://www.nwp.usace.army.mil/Media/Announcements/tabid/1887/Article/1140/401-water-quality-certification-for-2012-nationwide-permit-program.aspx> or as stipulated in the 401 Certification for an individual 404 permit.

Construction site stormwater discharge monitoring shall follow the protocol in the NPDES 1200-CA permit, Schedule B paragraphs 1, 2, 3, 5 and 7c.

<http://www.deq.state.or.us/wq/wqpermit/docs/general/npdes1200ca/permit.pdf>

### Turbidity Monitoring Protocol

The basic protocol for monitoring turbidity from stormwater discharges and for in-water work is the same, but there are differences in monitoring site location and the response to results.

#### General

##### Safety

All monitoring must be done in a safe manner. Changes in monitoring methods, locations or cancellation of monitoring due to safety issues must be recorded on the monitoring form along with the specific reason for the modifications.

##### Monitoring Sites

Monitoring requires two observation sites, an upstream, background site, and a downstream, compliance site. The CWA 401 Certification and the NPDES 1200-CA permit specify the distance upstream and downstream of the monitoring sites, but circumstances may dictate that these sites will need to be moved. Examples include:

- Monitoring cannot be performed safely at that location. Relocate to the nearest safe site as close to the original site as possible.
- Turbidity at the background site is affected by other project activities upstream. Relocate to the nearest safe location upstream of the other activities.
- Non-project related activities or discharges affect turbidity between the monitoring site and the permitted activity. Add a second monitoring site between the non-project activity and the permitted activity; non-project turbidity needs to be factored out of the monitoring result.

- Pre-activity monitoring shows an increase in turbidity with no obvious source. Maintain the monitoring sites and subtract the increase out of results of samples taken during the activity.

Monitoring Schedule

The interval between monitoring times depends on the type of activity (construction discharges or in-water work), and the results of the previous monitoring. The schedules are described in the following sections.

Turbidity Meter or Visual Monitoring

Both visual and turbidity meter monitoring are acceptable techniques unless an Individual 401 Certification specifies the use of a meter. Turbidity meter monitoring is usually preferable to visual monitoring for in-water work because, compared with visual monitoring, there is a greater tolerance for turbidity increases, and recorded meter results are more defensible. Visual monitoring is easier to perform, and may be appropriate when there is a great deal of confidence in the containment of the in-water work area, or the in-water work will be of a very short duration. Visual monitoring is usually preferred for stormwater discharge monitoring.

When using a turbidity meter the turbidity sample should be taken at about mid depth and within any visible plume.

For visual monitoring, the observer looks for either a plume or a visible difference in turbidity between the background site and the compliance site.

In-Water Work Monitoring

The standard protocol for monitoring turbidity during in-water work is based on the requirements in the 401 Certification for Nationwide 404 permits. Projects with Individual 404 permits may have different monitoring protocols in the 401 Certification, including different monitoring intervals and responses to increases in turbidity. Any differences between the standard monitoring protocol and those in the Individual 401 certification should be described on the monitoring form.

Monitoring Sites

Monitoring requires two observation sites, an upstream, background site, and a downstream, compliance site. They should be placed as follows, unless there is one of the conditions described above in the General section on Monitoring Sites.

The background monitoring site should be 100 feet upstream of the permitted activity. The downstream, compliance site's location is determined by the wetted stream width, as shown in the table below.

WETTED STREAM WIDTH	COMPLIANCE DISTANCE
Up to 30 feet	50 feet
>30 feet to 100 feet	100 feet
>100 feet to 200 feet	200 feet
>200 feet	300 feet

LAKE, POND, RESERVOIR	Lesser of 100 feet or Maximum surface dimension
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Monitoring Techniques

Turbidity meter monitoring is usually preferable to visual monitoring for in-water work because, compared with visual monitoring, there is a greater tolerance for turbidity increases, and recorded meter results are more defensible. Visual monitoring is easier to perform, and may be appropriate when there is a great deal of confidence in the containment of the in-water work area, or the in-water work will be of a very short duration. Visual monitoring is an advantage if the background turbidity is high, above 50 NTU, and there is no visible plume. (Increases of less than 10% are usually not visible, and meet state water quality standards.)

Monitoring Schedule

Initial baseline monitoring should be done immediately before in-water work begins. The baseline samples will show if there is an ambient increase in turbidity unrelated to project activities in the monitored stream segment. Any increase detected in the baseline monitoring should be subtracted from subsequent values at the downstream site. The first mandated monitoring takes place 4 hours after the start of the in-water work. Subsequent monitoring intervals and responses by the project are based on the results of the monitoring, as shown in the following tables. Compliance monitoring is to be done when there is active in-water work, not during temporary pauses.

<b>MONITORING WITH A TURBIDITY METER</b>		
ALLOWABLE EXCEEDANCE TURBIDITY LEVEL	ACTION REQUIRED AT 1 <sup>ST</sup> MONITORING INTERNAL	ACTION REQUIRED AT 2 <sup>ND</sup> MONITORING INTERNAL
0 to 5 NTU above background	Continue to monitor every 4 hours	Continue to monitor every 4 hours
5-29 NTU above background	Modify controls and continue to monitor every 4 hours	Stop work after 8 hours at 5-29 NTU above background*
30-49 NTU above background	Modify controls and continue to monitor every 2 hours	Stop work after 2 hours at 30-49 NTU above background
50 NTU or greater	Stop Work	Stop Work
<i>*Work stops after two consecutive readings within this turbidity range.</i>		

<b>Visual Monitoring</b>		
No plume observed	Continue to monitor every 4 hours	Continue to monitor every 4 hours
Plume observed within compliance distance	Modify controls & continue to monitor every 4 hours	Stop work after 8 hours with an observed plume within Compliance Distance
Plume observed beyond compliance distance	Stop Work	Stop Work
<i>* Monitoring visually may require stopping work as soon as the visual plume exceeds the waterbody specific compliance distance. However, using a turbidity meter can allow work to</i>		

*continue based on more precise determination of the severity of the turbidity increase over time.*

### Documentation and Reporting

A Turbidity Monitoring form for in-water work is available at (<ftp://ftp.odot.state.or.us/techserv/construction/Construction%20Forms/2755.pdf>). It includes fields for all elements required by the Nationwide 401 Certification. The “Comments” field on the Monitoring Report is for a description of the causes of any observed elevated turbidity and for a description of all actions taken to reduce or eliminate the turbidity.

The Monitoring Report should be used for monitoring, documenting and reporting of turbidity at all ODOT project sites covered by CWA Section 401 Water Quality certification for the Nationwide 404 permit. It should also be used for project with individual 401 Certifications for Individual 404 permits, with notes indicating any required differences in monitoring protocol.

The Monitoring Reports for a project must be made available to DEQ, US-ACE upon request. Paper and electronic copies are both acceptable.

### Construction Stormwater Discharge Monitoring

The protocol for monitoring turbidity from the discharge of stormwater from construction sites comes from the NPDES 1200-CA permit. Projects that are covered by the NPDES 1200-C permit (perhaps some local agency projects) have a slightly different sampling protocol, as may projects on Indian Reservations, which require permits from EPA instead of DEQ.

### Monitoring Sites

Baseline and downstream monitoring sites should be placed 30 feet upstream and downstream of the stormwater discharge outfall. If there is more than one outfall from the construction site, each discharge point should be monitored.

### Monitoring Techniques

Visual monitoring is the preferred technique in most circumstances. Observed level of turbidity (including a visible plume), color of any turbidity, any sheen and any floating debris should be recorded, along with a comparison between the background and downstream sites.

A turbidity meter may be preferred on a highly visible or sensitive project where numerical data would be useful to clearly document compliance with permit conditions.

### Monitoring Schedule

Active construction sites are to be monitored at least once every seven days, and within 24 hours following 0.5 inches of rainfall in a 24 hour period. If possible, the post rain monitoring should be done while stormwater is actually being discharged. Observations during a rain storm are useful to determine if modifications to erosion and sediment control have been successful.

Inactive sites are inspected once every two weeks. There is no requirement to monitor stormwater discharges during or immediately following rain.

### Response to Observations

Elevated turbidity in the receiving water caused by stormwater discharge is a sign that the erosion and sediment control is not working to expectations. Improvements should be made immediately, and all modifications, improvements and repairs to erosion and sediment controls are to be recorded on the monitoring forms. There is no requirement to increase the monitoring or construction site inspection frequency, but an interim inspection may be useful anyway.

### Documentation and Reporting

The ODOT Erosion Control Monitoring form includes a section for recording turbidity monitoring location, observations and actions, and date. For active construction sites, keep a written copy of all of the project's monitoring reports on site or with the Construction Project Manager. Monitoring reports for inactive sites are to be kept with the Construction Project Manager. Once a project is completed, the monitoring records must be retained for a year. The Erosion Control Monitoring forms must be made available upon request to DEQ or DEQ's representative upon request. (Some municipalities have been delegated authority from DEQ, and therefore have the right to view the inspection reports.)

### Frequently Asked Questions:

- Q: Do I have to use a turbidity meter at every project where turbidity monitoring is required?  
A: **No, you are not required to use a turbidity meter for turbidity monitoring unless otherwise specified or required by a permit condition.**
- Q: Do I have to use the ODOT turbidity monitoring form for documenting my turbidity readings?  
A: **Yes, you are required to use the ODOT turbidity monitoring form to document visual observations and measurements.**
- Q: Can I continue visual observations and document observations in the new form?  
A: **Yes, the form can be used for either visual or turbidity meter monitoring. Make sure to record your observations and your resultant BMP modifications in the new form.**
- Q: When am I required to monitor for turbidity with a turbidity meter?  
A: **You are required to use a turbidity meter when required by a permit or as determined by the Project Manager or Project Engineer.**
- Q: Does ODOT have turbidity meters?  
A: **Each Region should purchase turbidity meters depending on Region needs. Tech Center Managers, Project Managers and Project Engineers should decide on the number of turbidity meters required for each Region. If you need guidance/assistance purchasing turbidity meters, please contact your Regional Environmental Coordinators or Geo-Environmental staff (Raghu Namburi).**
- Q: Can we assign turbidity monitoring responsibility to the contractor and put this requirement in the contract?

**A: Yes. Turbidity monitoring can be included in the contractor's contract. When required it is important to stipulate in the contract that turbidity monitoring with a turbidity meter must be done by a trained person and that the meter must be calibrated as per the manufacturer's instructions.**

Q: Is there a training class that covers the use and calibration of turbidity monitoring equipment?

**A: ODOT does not have any training classes for turbidity monitoring at this time. However, a class may be offered in the future if a survey of regional staff indicates significant interest.**

Q: Do we have Standard Specification language to be included in the contract documents?

**A: We have new Boiler Plate Specification language to be included in contract documents on projects with in-stream work permits.**

Q: Who should I contact if I have more questions about this issue?

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