Minnesota Stormwater Manual Updates, Phase 2

<Note to MPCA: we recommended that hyperlinks to the applicable MPCA Construction Stormwater General Permit be included where appropriate on the stormwater Wikipedia page, highlighted in yellow>

# Diversion and Working in the Dry

Working “in the dry” refers to the dewatering of areas where piers, abutments, bulkheads, retaining walls, or other structures must be built in areas with flowing or standing water (e.g., creeks, rivers, lakes, wetlands, etc.). Working in the dry typically involves the use of a diversion or cofferdam. Diversions are used to isolate a segment of stream via a pump-around, to facilitate work in the dry channel. A cofferdam is a temporary, watertight structure erected around a construction site to keep water from inundating the site during construction. Cofferdams can vary in design from simple earthen dikes to elaborate sheet piling structures. The construction area within the dam is pumped out or otherwise dewatered after the dam is built, and kept relatively dry until construction work is completed. See Diversion barrier controls (cofferdams/temporary dikes) for additional information.

Temporary diversion methods can be divided into two groups of practices based on primary function: those which divert the entire stream or those which divert only part of the stream. Typical diversion practices in the former category include diversion channels/ditches, diversion pipes/culverts, and pumping (“pump-arounds”). The latter category (partial stream diversion) typically includes methods such as cofferdams and diversion dikes/berms. These methods are not discussed extensively in this BMP chapter; please refer to Diversion barrier controls (cofferdams/temporary dikes) for a discussion on the use of cofferdams and diversion dikes/berms.

A river running through a body of water

Description generated with very high confidence

*In this example, a temporary diversion was installed using two corrugated plastic pipes to divert a stream and provide dry working conditions during the construction of a new bridge.* (Source: Northpoint Engineering)

## Purpose and function

Temporary stream diversion allows for “working in the dry” when construction projects are adjacent, below, or within surface waters. They collect and redirect the flow of a stream using a new channel, pipe, or similar practice to allow a relatively dry working space for construction activities that require these conditions. In addition to restricting flows from entering the construction zone, diversion methods prevent sediment and other construction-related contaminants from entering the stream during construction activities by routing upstream flows around the active construction zone.

## Applicability

Temporary diversion methods apply when relatively dry conditions are required for construction activities adjacent, below, or within surface waters and it is necessary to divert flow around the work zone to maintain “dry” conditions. Temporary diversion methods vary based on the size of the waterway being diverted, as discussed below.

### Site applicability

Stream diversions are typically used for constructing, removing, or performing maintenance of large structures or other projects located within the stream channel. Examples of these situations include the construction of dams, detention ponds, instream grade control, installation of pipelines and other utilities, stream bank restoration and protection, and maintenance of existing structures.

Installation of a plastic-lined ditch for a stream bypass during a channel bank restoration project. Temporary bypass ditches can allow for higher volumes, less daily operation and maintenance attention, and lower overall costs than pump-arounds in some cases. *(Tetra Tech)*

For large streams, temporary diversion methods typically consist of the use of structures such as berms or cofferdams to divert flow to one side of the stream (“partial diversion”) and allow dry conditions on the other side. For smaller streams, temporary diversions such as lined ditches, pipes, and pumping may be used to divert the entire waterway.

Selection of the appropriate diversion type is highly site specific. The best temporary diversion method for a site is that which meets the needs of the project while minimizing site disturbance. The table below summarizes several common temporary diversion practices, the conditions in which they typically apply, and limitations of use.

*Typical diversion (“working in the dry”) methods and their applicability*

|  |  |  |
| --- | --- | --- |
| Diversion Practice | Applicability | Limitations |
| Partial stream diversion | * Suitable when work area is on one side of the stream channel or stream bank. * Appropriate stream size and duration of use depends on materials. * Structures are placed in the stream to confine flow to one side while work progresses on the “dry” side. * Sand bags, stone, or similar diversions are appropriate for smaller streams and work areas, while coffer dams, portable dams, or other similar barriers are necessary for larger water bodies. | * Not easily moved or adjusted after installation. * Sand bag or stone in-channel diversions are typically not appropriate for larger streams. * May be subject to failure or erosion during storm events. * Results in a smaller area of stream access compared to other diversion methods. * See Diversion barrier controls (cofferdams/ temporary dikes) for more information |
| Diversion channels/ditches | * Most appropriate for short duration projects with low baseflows. * Requires sufficient area in the stream corridor to construct the diversion channel. * Requires a positive slope to allow flow through the channel. | * Not easily moved or adjusted after installation. * Insufficient flow capacity in pipe can cause diversion failure and severe erosion. |
| Piped diversions/ culverts (bypass pipe) | * Most appropriate for short duration projects with low baseflows. * Appropriate when the required flow diversion can be accomplished without pumping. | * Construction equipment cannot be driven over pipes. * Insufficient flow capacity in pipe can cause diversion failure and severe erosion. |
| Pumped diversions (“pump-arounds”) | * Most appropriate for short duration projects with low baseflows. * Typically used when there is limited space for a diversion. * Pump(s) must be sized to accommodate stream baseflow. | * Limited by pump capacity, and continuous pumping can be costly. * Pump failure can result in delays and additional costs. |

### Permit applicability

The MPCA Construction Stormwater General Permit (2018) does not include provisions that specifically reference “diversion”; however, there are several sections that are applicable to Diversion and Working in the Dry, including the following:

* Regarding connection of drainage channels to surface waters, Section 8.6 states: “Permittees must stabilize the normal wetted perimeter of the last 200 linear feet of temporary or permanent drainage ditches or swales that drain water from the site within 24 hours after connecting to a surface water or property edge. Permittees must complete stabilization of remaining portions of temporary or permanent ditches or swales within 14 calendar days after connecting to a surface water or property edge and construction in that portion of the ditch temporarily or permanently ceases.”
* Regarding dewatering of diversions, Section 10.2 states: “Permittees must discharge turbid or sediment-laden waters related to dewatering or basin draining (e.g., pumped discharges, trench/ditch cuts for drainage) to a temporary or permanent sediment basin on the project site unless infeasible. Permittees may dewater to surface waters if they visually check to ensure adequate treatment has been obtained and nuisance conditions (see Minn. R. 7050.0210, subp. 2) will not result from the discharge. If permittees cannot discharge the water to a sedimentation basin prior to entering a surface water, permittees must treat it with appropriate BMPs such that the discharge does not adversely affect the surface water or downstream properties.”
* Further, Section 10.4 adds: “Permittees must discharge all water from dewatering or basin-draining activities in a manner that does not cause erosion or scour in the immediate vicinity of discharge points or inundation of wetlands in the immediate vicinity of discharge points that causes significant adverse impact to the wetland.”
* Regarding impacts to receiving water quality, Section 15.2 states: “Permittees must design the project so all stormwater discharged from the project during and after construction activities does not cause a violation of state water quality standards, including nuisance conditions, erosion in receiving channels or on downslope properties, or a significant adverse impact to wetlands caused by inundation or decrease of flow.”

The U.S. Army Corps of Engineers (USACE) requires a permit for any work performed in navigable waters. Refer to 33 CFR Parts 321 and 322 for additional information and applicability (<https://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Federal-Regulation/>).

A Public Waters Work Permit may also be required from the MN DNR, depending on the project scope. For additional information see: <https://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/index.html>.

## Effectiveness

Properly designed and installed diversions are effective at keeping sediment out of the adjacent waterbody. Where temporary drainage ditches/channels are used to dewater or divert a waterbody, special attention is required to ensure that bare soil along the bypass ditch or channel is stabilized. Careful installation and removal of the diversion structure and restoration of the work area are required to ensure effectiveness.

*Expected performance benefits for diversion and working in the dry*

|  |  |
| --- | --- |
| **Water Quantity** | |
| Flow attenuation | Little or no design benefit |
| Runoff volume reduction | Little or no design benefit |
| **Water Quality** | |
| **Pollution prevention** | |
| Soil erosion | Primary design benefit |
| Sediment control | Little or no design benefit |
| Nutrient loading | Little or no design benefit |
| **Pollutant removal** | |
| Total suspended solids | Little or no design benefit |
| Total phosphorus | Little or no design benefit |
| Heavy metals | Little or no design benefit |
| Floatables | Little or no design benefit |
| Oil and grease | Little or no design benefit |

## Planning considerations

*Considerations for diversion method selection and approach*

The selection of appropriate methods for temporary diversion should be approached on a project and site-specific basis. Prior to designing a stream diversion, determine if the construction of a temporary diversion might cause a greater environmental impact than if the project were constructed without the diversion. For short-term projects constructed during dry periods, construction of the diversion may cause more site disturbance than all other earth disturbing activities of the project and could result in a large percentage of the overall project costs.

Planning for temporary diversion methods should include the following considerations:

* Verify that applicable permits have been obtained before the diversion is installed.
* Plan the timing of construction to minimize the time that a temporary diversion is needed.
* Stream size and anticipated flow rates during construction.
* Type of surface water (e.g., “special”, impaired, trout stream, etc.).
* Weather patterns and seasonal variations in stream flow.
* Impacts of failure including impacts to:
  + Public safety
  + The environment
  + Project schedule and budget
* Legal considerations including right-of-way and private property lines.

Whenever planning for working in the dry, project designers, construction engineers, project managers and/or contractors should contact their local DNR office for help in selecting the appropriate diversion method(s) for their construction activity and location. Additional considerations for special or impaired waters are discussed below.

*Considerations for special or impaired waters*

MPCA requires increased water quality protection measures on projects located within one mile of waters designated special and/or impaired waters. Check the interactive map called “Special Waters and Impaired Waters Search” located at <http://pca-gis02.pca.state.mn.us/csw/index.html> to determine if your project is located near a special or impaired water. NPDES/SPS permits from MPCA for construction sites near specially-protected and impaired waters require additional controls, conditions, or an individual permit, including:

* Sites that discharge near waters with qualities that warrant extra protection (special waters) must use additional best management practices and enhanced runoff controls.
* Sites that discharge near an “impaired water,” impaired for phosphorous, turbidity, dissolved oxygen, and biotic impairment, must meet special conditions during project design and/or when preparing a Stormwater Pollution Prevention Plan (SWPPP), or a Construction Stormwater permit application.

Failure to incorporate increased protection measures on special and/or impaired waters could be a violation of MPCA standards (Minnesota DNR Best Practices Manual, 2014).

## Design

Care should be taken during the design phase to ensure that construction and operation of the temporary diversion will avoid or minimize any damage to the waterway, aquatic and terrestrial habitat, and aquatic life. At all times during construction, operation, maintenance, and removal, sufficient water flow/volume must be diverted to sustain downstream aquatic life. The diversion structure should not constrict stream flow such that backups or washouts occur due to fluctuations in water depth or flow volume. Temporary berms or dams should be installed upstream and downstream of the work site to block stream flow from entering the construction site.

The timing and duration of construction activities are key factors for determining the appropriate design flow for stream diversion design. Improperly sized diversion methods can result in increased project costs, loss of water quality benefits, and increased erosion.

The design capacity of the temporary stream diversion should take into account the length of time the diversion will be in use. If high flows or flood hazards are anticipated during the operation of the diversion, capacity should be increased to prevent failure and erosion of the diversion practice.

*Piped diversions*

For piped diversions, the pipe should be sized to safely convey, at a minimum, the 2-year, 24-hour design storm, or anticipated high-flow conditions if applicable. The temporary pipe should be constructed from durable material, such as high density polyethylene (HDPE), that can withstand the anticipated site conditions. Provide energy dissipation at the downstream end of the diversion pipe.

*Pumped diversions*

For pumped diversions, size the pump based on the anticipated flow. At a minimum, the pump should be able to pump a 2-year, 24-hour event. A second pump of the same size is recommended to provide redundancy in the event of pump failure, or in case of increased pumping requirements.

When operating a pumped diversion, pump water from upstream of the construction area to the existing downstream channel. The intake must be screened to prevent fish and other aquatic species from becoming entrained. Stabilize the pump outlet location to prevent erosion.

*Channel diversions*

Temporary stream diversion channels should have trapezoidal cross-sections with side slopes no steeper than 2:1 (horizontal to vertical). Size the channel based on the anticipated flow. Excavated material can be stored along the banks of the temporary ditch for short-term applications; longer term use or use where soil berms may create drainage or environmental hazards may require stockpiling away from the site. As noted in “Effectiveness”, if a diversion ditch or channel is used, bare soil along the channel should be stabilized using a material appropriate for the expected velocity to prevent erosion of the channel and sedimentation of the stream. This is critical when ditched diversions are installed in highly erodible soils, such as silts. Inspect soils along the upslope areas to determine stability, and seed, mulch, or otherwise stabilize areas that may erode into the temporary ditch. The table below provides guidelines for stream diversion channel lining material based on expected velocity, drainage area, and design storm. Note that the use of other materials may be also be appropriate but should be evaluated on a site by site basis.

*Recommendations for temporary stream diversion channel lining* (Source: adapted from Illinois Urban Manual, 2011)

|  |  |  |  |
| --- | --- | --- | --- |
| Lining Material | Acceptable Velocity Range | Upstream Drainage Area | Design Storm Capacity |
| Erosion control blanket1 | Up to 1.5 ft/sec | Up to 1 sq. mi. | 2-year, 24-hour |
| Turf reinforcement mat (non-vegetated)2 | Up to 8.0 ft/sec | Up to 1 sq. mi. | 2-year, 24-hour |
| Geotextile (Type 1) | Up to 11 ft/sec | Up to 1 sq. mi. | 2-year, 24-hour |
| Riprap with geotextile | | | |
| Average 4” (3” – 6”) | Up to 4 ft/sec | Up to 5 sq. mi. | 10-year, 24-hour |
| Average 8” (4” – 12”) | Up to 6 ft/sec |
| Average 14” (5” – 18”) | Up to 13 ft/sec |
| Plastic sheeting3 | > 13 ft/sec | Up to 2 sq. mi. | 2-year, 24-hour |

1 Only for use with intermittent, low flows. Vegetation should be established when using as a channel lining.

2 TRM with temporary seeding may be used when sufficient time is available for the diversion channel to vegetate. The acceptable velocity for vegetated TRMs should not exceed 16 ft/sec.

3 Do not use where woody and other heavy debris moves with flow. Use thicker sheeting for longer runs, or when used for more than six months.

A picture containing map, text

Description generated with very high confidence

*Schematic drawing of a typical temporary diversion channel.* (Source: UDFCD, 2010)

## Construction recommendations and specifications

Whenever a temporary diversion is used, construction should be scheduled during drier times of the year (e.g., November to March), during periods of low or no stream flow, to the extent practicable. Construction in the waterway should progress as quickly as practical to reduce the risk of exceeding the temporary diversion capacity.

Prior to starting construction, install erosion and sediment control devices to prevent sediment from entering the diversion or the stream. This should include stabilization of the inlet and outlet of the temporary stream diversion using approved techniques such as riprap over geotextile. The temporary stream diversion should be properly stabilized prior to accepting flows. Install instream diversion dams/berms at the upstream and downstream ends of the work area.

When constructing a diversion channel or ditch, contain the stream with appropriate methods such as sandbags on the opposing bank while cutting the diversion channel into the natural stream channel. Excavate and stabilize the diversion channel as a continuous operation. Remove large debris (e.g., rocks, sticks, etc.) and smooth the channel surface so that the channel lining material rests flush with the channel.

A field of grass

Description generated with high confidence

*A stabilized diversion channel is used to route stream flow around the work site during the installation of a new culvert where a highway is being constructed.* (Source: NZ Transport Agency)

During construction, minimize disturbance and removal of adjacent (riparian) vegetation. Ensure that any construction vehicles and equipment are free of petroleum residues and sealed to prevent leakage of fuels and oils into the water body. The main body of the construction equipment may not enter the water body except if necessary to cross the stream to access the work site; only the bucket of an excavator/backhoe may operate in the water body.

When dewatering construction areas adjacent to stream diversions, dewatering discharge must not negatively impact water quality or cause erosion or temporary sedimentation in the stream or the temporary diversion. Do not discharge dewatering from the construction site directly to the stream. For appropriate methods, see Dewatering.

Detailed guidance on planning and executing projects within and adjacent to waterbodies can be found in the Minnesota DNR’s Best Practices Manual (Best Practices for Meeting DNR General Public Waters Work Permit GP 2004-0001), Chapter 3: Methods of In-Water Construction (<https://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/gp_2004_0001_manual.html>).

## Inspection and maintenance

Temporary diversions are critical for work in waterways and must therefore be inspected and maintained frequently to ensure they function as designed. The following general inspection and maintenance recommendations apply to all temporary diversion methods:

* Ensure that bypass pump(s) can handle incoming flows, especially after precipitation or periods of rapid snowmelt.
* Inspect flow barriers (dams, berms, etc.) at the start and end of each work day and if excess water is observed in work areas that are supposed to be dry. Inspect for leakage and repair.
* Inspect diversion structures at least weekly and after significant rain events to check for buildup of sediment and debris and remove as needed.
* Inspect diversion channels for signs of erosion, and repair or replace lining as necessary.
* Inspect pumped and piped diversions to ensure flow is adequately diverted. Inspect for leakage and repair as necessary.
* Inspect the diversion path for erosion and repair any damages with rock, gravel, or other appropriate methods.
* Inspect the diversion discharge point for erosion and repair as necessary.
* Inspect dewatering device(s) and ensure that discharge is not sediment laden.

*Temporary diversion removal*

The temporary stream diversion should be removed as soon as practicable and only after construction is complete and the work site and existing stream channel have been stabilized. Do not remove the downstream diversion until all sediment-laden water from the upstream diversion has been filtered through an approved sediment filtering device such as a dewatering basin or filter bag. If using a temporary diversion channel, remove the lining material and then fill and stabilize the channel using appropriate erosion control practices. Stabilize the points of tie-in to the existing stream channel using riprap or other appropriate methods. After removing the diversion, revegetate any area disturbed by the removal.

## Costs

Temporary diversion method selection and approach should occur on a project and site-specific basis. Therefore, costs for construction of temporary stream diversions may vary widely depending on the type of structure, the intended purpose, and the size and nature of the stream being diverted.

The following table summarizes some example estimated BMP costs based on MnDOT data summarizing average bid prices for awarded projects in 2017.

Unit costs related to diversion and working in the dry (Source: MnDOT 2017 Average Bid Prices)

|  |  |  |  |
| --- | --- | --- | --- |
| Bid Item | Item Description | Units | Average Price |
| 2105601/00045 | Temporary stream diversion system | lump sum | $27,523.34 |
| 2452601/00011 | Steel sheet piling (temporary) | lump sum | $31,747.97 |
| 2452618/00011 | Steel sheet piling (temporary) | square foot | $37.64 |

## Reference materials

Except where more stringent requirements are presented in this guidance, BMPs shall comply with MnDOT and other state requirements. Primary design references include:

* 2018 Minnesota NPDES/SDS Construction Stormwater General Permit

<https://www.pca.state.mn.us/water/construction-stormwater>

* 2018 MnDOT Standard Specifications for Construction

<http://www.dot.state.mn.us/pre-letting/spec/>

* Best Practices for Meeting DNR General Public Waters Work Permit GP 2004-0001, version 4 (October 2014) (Chapter 3)

<https://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/gp_2004_0001_manual.html>

* MnDOT Erosion Control Handbook II

<https://www.dot.state.mn.us/environment/erosion/pdf/2006mndotecfieldhandbook.pdf>

The following is a list of additional resources that are not specific to Minnesota:

* District of Columbia Erosion and Sediment Control Manual (Chapter 8) <https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/2017%20DC%20ESC%20Manual_FINAL.pdf>
* Illinois Urban Manual (2011) (Practice Standard 976: Temporary Stream Diversion)

<http://www.aiswcd.org/illinois-urban-manual/practice-standards/>

* UDFCD Urban Storm Drainage Criteria Manual (USDCM), Volume 3 Stormwater Quality (2010) (SM-8)

<https://udfcd.org/wp-content/uploads/2014/07/SM-08-Temporary-Diversion-Methods.pdf>

# Temporary Stream Crossing

A temporary steam crossing is a structure designed for short-term (typically less than one year) use that is installed across a watercourse to allow construction vehicles to safely cross without damaging the stream bed or channel. They may also be referred to as “temporary access” or “temporary access crossings.” The most common types of temporary stream crossings include bridges, culverts (or “pipe crossings”), and fords (or “drive-through crossings”).

A dirty river

Description generated with high confidence

*Example of a temporary ford, or “drive-through” stream crossing.* (Source: Greg Jennings)

## Purpose and function

The primary function of a temporary stream crossing is to prevent construction equipment from damaging the stream bed and banks, impeding stream flow, blocking fish migration, and tracking sediment and other pollutants into the stream.

## Applicability

Because of the potential disturbance created by construction of a temporary stream crossing, they should be used only when they are completely necessary for construction purposes. Refer to **Planning considerations** for additional discussion. In general, temporary stream crossings are applicable when heavy equipment must be moved from one side of a watercourse to the other, or where lighter-duty construction vehicles require frequent, short-term access for crossing a stream channel.

### Site applicability

Temporary stream crossings should be limited to locations with low erosion potential and should be constructed during dry periods to minimize stream disturbance and reduce costs. Select crossing sites away from trees, steep banks, channel bends, and deep pools. Stream channel conditions, including expected flow rates during the operation of the temporary crossing, should be thoroughly evaluated before choosing the appropriate type of stream crossing. For example, culverts and access fords may not be appropriate for large streams or during high flow conditions, as they may constrict flow and create potential safety hazards. Temporary bridges may be more suitable for these conditions and are also less likely to impede fish and aquatic life passage.

Although bridges are generally the most expensive to design and construct, they are often the preferred method for temporary stream crossings because they provide the least disturbance of the stream bed and constriction of stream flow. Culverts are less expensive than bridges, relatively easy to construct, and able to support heavy equipment loads. Fords are typically the least expensive to construct but are generally not appropriate for construction during rainy periods or on high-flow perennial streams. The table below provides additional information on the applicability of each temporary crossing and limitations of use.

*Typical temporary stream crossing methods and their applicability*

|  |  |  |
| --- | --- | --- |
| Stream Crossing Type | Applicability | Limitations |
| Temporary bridge | * Results in least disturbance to stream bed and banks compared to other stream crossing methods. * Typically no time of year restrictions for use. * Generally most appropriate for streams with high flow velocities or steep gradients. | * Use in large channels may require pier(s) or other supports, which increase disturbance to stream (see **Construction recommendations and specifications**). |
| Temporary culvert (pipe) | * Most common temporary stream crossing. * Most appropriate for short-term use. * Generally appropriate for perennial or intermittent streams. * Generally preferred over fords as disturbance to stream is limited to construction and removal. | * May not be appropriate for large streams or during high flow conditions. * Causes greatest obstruction to flow. * May damage channel cross-section; culvert crossings should be planned to limit the number of crossings needed. * Not appropriate for streams that are vertically degraded or incised. |
| Temporary ford (drive-through) | * Most appropriate for short-term use. * Generally appropriate for ephemeral or low flow perennial streams. * Used when bridge or culvert crossings are not feasible; typically very shallow streams where stream banks are less than 4 feet above the stream invert. * Suitable when vehicles need access to the stream bed for in-stream construction. | * Use should be limited to dry season. * Use should be limited to streams whose beds are armored. * May degrade water quality due to contact with construction vehicles and equipment. |

### Permit applicability

Temporary stream crossings require coordination with regulatory agencies, and may require local, state, or federal permits. A permit is required for placement of fill in a waterway under Section 404 of the Clean Water Act. The local U.S. Army Corps of Engineers (USACE) office should be contacted concerning the requirements for obtaining a 404 permit. In addition, a permit from the U.S. Fish and Wildlife Service (USFWS) may be needed if endangered species are known to be present in the work area.

Section 23.11 of the MPCA Construction Stormwater General Permit (2018) notes that when a water crossing is necessary in order to complete a construction project, disturbance of the required undisturbed buffer zone may be allowed if fully documented in the SWPPP. Specifically, Section 23.11 states: “Permittees must include an undisturbed buffer zone of not less than 100 linear feet from a special water (not including tributaries) and must maintain this buffer zone at all times, both during construction and as a permanent feature post construction, except where a water crossing or other encroachment is necessary to complete the project. Permittees must fully document the circumstance and reasons the buffer encroachment is necessary in the SWPPP and include restoration activities.”

A DNR Public Waters Work Permit may be required if the waterway is a public water, depending on the impact of the stream crossing. For additional information see: <https://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/index.html>. The following guidance is provided by the MN DNR:

To Construct A Bridge or Culvert, or to Fill or Excavate the Bed of a Public Watercourse Having a Total Drainage Area, at its Mouth, of Less Than 5 Square Miles (3,200 Acres) - A DNR Public Waters Work Permit is not required, provided:

* County zoning officials and local Soil and Water Conservation District are given at least 7 days prior notice to determine that the project will not result in downstream erosion or sedimentation;
* The project will not divert water to a different watershed;
* The project will not impound water by damming the watercourse; and
* The watercourse is not an officially designated trout stream.

Low Water Ford Crossings (on streams only) - A DNR Public Waters Work Permit is not required when:

* The crossing conforms to the shape of the natural stream channel;
* The original stream bank is no higher than 4 feet;
* The normal summer flow does not exceed 2 feet in depth.
* The normal summer flow is not restricted or reduced;
* No special site preparation necessary;
* The crossing is constructed only of gravel, natural rock, concrete, steel matting or other durable, inorganic material not more than 1 foot thick;
* The finished graded slope is no steeper than 5:1 (horizontal to vertical);
* The graded banks must be seeded or mulched to prevent erosion and sedimentation; and
* The site is not an officially designated trout stream, wild, scenic or recreational river or officially designated canoe and boating route.

Temporary Bridges (on streams only) - A DNR Public Waters Work Permit is not required when:

* The stream bank can support bridge without pilings, foundations, culverts, excavation, or other special site preparations;
* Nothing is placed in the bed of the stream;
* The bridge is capable of removal for maintenance and flood damage prevention;
* The bridge is firmly anchored at one end and can swing away during flooding;
* A minimum 3 feet of clearance between the lowest portion of the bridge and normal summer stream flow is maintained; and
* The bridge construction is consistent with floodplain, shoreland, and wild and scenic river ordinances.

## Effectiveness

As a standalone practice, temporary stream crossings are not intended to provide significant water quantity or water quality benefits. In fact, when they are not properly planned, constructed, maintained, and removed, temporary stream crossings can be a direct source of water pollution.

As noted above, temporary stream crossings provide a means for construction vehicles to cross streams without moving sediment into them, damaging the stream bed or channel, or creating flooding or safety hazards. To protect water quality, stream crossings should be located in areas where erosion potential is low, and a natural buffer should be preserved along the stream on both sides of the crossing. Additional recommended measures to protect water quality are discussed in **Planning considerations**.

If the appropriate considerations and protective measures are implemented, temporary stream crossings can serve as a stream protection measure by effectively reducing soil erosion and transport of sediment into streams.

*Expected performance benefits for temporary stream crossings*

|  |  |
| --- | --- |
| **Water Quantity** | |
| Flow attenuation | Little or no design benefit |
| Runoff volume reduction | Little or no design benefit |
| **Water Quality** | |
| **Pollution prevention** | |
| Soil erosion | Primary design benefit |
| Sediment control | Little or no design benefit |
| Nutrient loading | Little or no design benefit |
| **Pollutant removal** | |
| Total suspended solids | Little or no design benefit |
| Total phosphorus | Little or no design benefit |
| Heavy metals | Little or no design benefit |
| Floatables | Little or no design benefit |
| Oil and grease | Little or no design benefit |

## Planning considerations

With careful planning, the need for temporary stream crossings may be minimized or avoided altogether. If stream crossings cannot be avoided, the following should be considered when planning for the use of temporary stream crossings:

* Plan for stream crossings to be in service for the shortest practical amount of time and removed as soon as their function is completed.
* Place crossings strategically to reduce the number of crossings needed during construction.
* To the extent possible, minimize the number of trips back and forth across stream by completing construction activities on one side of the stream and then moving to the other side.
* Maintain a natural buffer zone along the stream.
* When planning for temporary stream crossings, consider that bridges pose the least potential for creating barriers to aquatic migration.

## Design

Temporary crossings require coordination with regulatory agencies including USACE for a permit. If in-channel disturbance is required to build the temporary crossing, temporary stream channel diversions should be used to minimize soil loss and erosion and removed upon completion of the crossing. The following general design criteria apply for all temporary stream crossings:

* Select stream crossing sites along relatively straight channel reaches and away from deep instream pools and trees if possible. For piped and ford crossings, look for places where bank slopes are low and long. For fords, broad and rocky riffle areas are preferred, if available.
* Design the temporary stream crossing to be as perpendicular to the stream flow as possible. Under certain site conditions, the crossing angle may by up to 15 degrees from perpendicular.
* Do not use earth/soil material for construction within the stream channel. Any material placed in flowing water must not cause siltation (e.g., clean rock and gravel).
* If the temporary crossing will be used for 2 weeks or less, design the crossing to convey the stream’s base flow.
* For temporary crossings to be used for longer durations, design the crossing with sufficient capacity to convey the 2-year, 24-hour flow without overtopping.
* Design the crossing such that the design flow velocity at the outlet is non-erosive for the receiving stream channel and install outlet protection.
* Design the temporary crossing to have a single traffic lane with a width between 12 feet and 20 feet.
* Temporary crossings should not significantly impede stream flow; therefore, do not design a crossing method that results in a significant water level difference between the upstream and downstream ends of the crossing.

Specific design considerations for each type of temporary stream crossing are provided below.

**Bridges**

The following design recommendations apply to bridges as temporary stream crossings:

* Temporary bridge crossings are typically constructed of wood, metal, or other approved materials; common materials include logs, sawn timber, prestressed concrete beams, or metal beams.

Temporary wooden bridge crossing for short-term use over low-flow channel. (Source: Tetra Tech)

* Bridge deck materials should be capable of holding the maximum anticipated weight.
* Bridge crossings should be designed to minimize disturbance to the stream banks.

**Culverts**

The following design recommendations apply for culverts as temporary stream crossings:

* Design culverts with a minimum capacity to convey a 1-year flow or the stream’s base flow for projects shorter than two weeks and for the 2-year flows for all other projects. Multiple culverts or elliptical culverts may be used to achieve these flow capacities while providing minimum cover requirements.
* All culverts must be capable of supporting their cross-section area under the maximum expected loads of the project.
* Culvert diameters should be as wide as will fit into the existing stream channel without major excavation; the minimum culvert diameter used for a culvert crossing should be 12 inches; 18 or more inches is preferred.
* For channel widths greater than 3 feet, more than one culvert may be installed such that the cross-sectional area of the pipes exceeds 60 percent of the cross-sectional area of the existing stream.
* The culvert slope should mirror the slope of the existing stream.
* Culvert length should not exceed 40 feet.
* Culverts should be designed to minimize the erosive power at their outlets so as to not damage the stream channel at the discharge point. Outlet protection can be installed to minimize this damage.

Temporary crossing constructed with a pair of large metal pipes for a bridge construction project on a perennial stream. (Source: Tetra Tech)

**Fords**

The following design recommendations apply for fords as temporary stream crossings:

* Approach roads should be no steeper than 5:1.
* Convey overland flow away from the temporary access ford approaches using diversions like shallow swale, ensuring that discharge from the swale is non-erosive. Outlet protection or level spreaders can be used as necessary.

## Construction recommendations and specifications

When temporary stream crossings cannot be avoided, complete construction activities in an expedient manner and stabilize the area immediately to limit the period of time during which the crossing is needed. Ensure that all necessary materials and equipment are on site before beginning work to minimize delays.

If construction of the temporary stream crossing requires dewatering of the site, construct a bypass channel (Diversion and working in the dry) before undertaking other work. Stabilize the bypass channel using riprap or other suitable materials based on the anticipated velocity of flow.

The following general construction specifications are applicable for all temporary stream crossings:

* During installation of the temporary stream crossing, limit instream excavation to the minimum extent required to allow installation and removal of the crossing.
* The centerline of the crossing should align with the centerline of the roadway approaches on both sides for at least 50 feet from each stream bank. A shorter distance may be approved on a site-specific basis if physical constraints preclude the 50 foot minimum.
* Any fill material associated with the roadway approach may not exceed a height of 2 feet above the existing floodplain elevation.
* Construct a swale across the roadway on both sides of the stream crossing to divert water and prevent roadway runoff from directly entering the stream. The swale should extend a maximum distance of 50 feet on either side (measured from the top of the stream banks).
* After constructing stream crossings, stabilize all areas disturbed during installation using riprap, vegetation, or other appropriate measures.

**Bridges**

The following construction recommendations and specifications apply to bridges as temporary stream crossings:

* If the channel with exceeds 8 feet (top of bank to top of bank), a bridge support such pier(s) or footing(s) may be necessary at the rate of one per each additional 8 feet width of channel.
* Construct the temporary bridge at or above the bank elevation and place abutments parallel to and atop stable banks.
* Select decking materials that are of sufficient strength to support the anticipated load.
* Ensure bridge crossing components are butted tightly and fastened securely to prevent soil tracked onto the bridge from falling into the stream.
* Securely anchor the bridge at one end using steel chain or cable. Anchors may include large trees, boulders, or driven steel anchors.

**Culverts**

The following construction recommendations and specifications apply to culverts as temporary stream crossings:

* Minimize disturbance (clearing, excavation, etc.) of the stream banks and stream bed.
* Install a layer of geotextile fabric on the stream bed and stream banks prior to placement of the pipe(s) and aggregate. The geotextile should extend 6 to 12 inches beyond the ends of the culvert.
* The culvert should be installed such that the invert is on the natural stream bed grade to minimize interference with fish passage. Lay culvert(s) directly on flattened channel bottom; do not excavate.
* Backfill the culvert(s) with riprap and/ or 3-inch to 5-inch (i.e., #2) washed stone (do not use soil) to meet minimum cover requirements and create the road crossing. Backfill should be at least 1 foot higher that the grade at either approach.
* Cover the culvert(s) with a minimum of 12 inches of aggregate or one-half the pipe diameter, whichever is greater. Place top fill so that the stream overflow will occur in the center of the crossing, to prevent bypasses and bank erosion during higher flows. Extend rock driveway up the banks for at least 15 feet on both sides to prevent erosion and reduce saturated soil conditions where equipment will be driven. Use geotextile liner under the rock.
* If using multiple culverts, lay them side-by-side to accommodate stream flow.

A screenshot of a map

Description generated with high confidence

*Schematic drawing of a temporary bridge crossing.* (Source: Maryland Department of the Environment, 2011)

A picture containing text, map

Description generated with very high confidence

*Schematic drawing of a temporary culvert crossing.* (Source: Maryland Department of the Environment, 2011)

**Fords**

The following construction recommendations and specifications apply to fords as temporary stream crossings:

* During construction, divert the stream using an approved temporary stream diversion.
* Install erosion and sediment control devices, including perimeter controls, before constructing fords and ensure they remain in place until any disturbed areas are stabilized.
* Approaches to the ford should be constructed out of stone pads, underlain by a geotextile fabric, and protected with a sufficient layer of aggregate (typically about 4 inches). Do NOT place rock in channel, only on approach ramps.
* Install a bedding layer consisting of coarse aggregate. Bedding material should be no deeper than 12 inches to minimize upstream ponding.
* When constructing the ford, minimize blockage of stream flow and allow free flow over the ford to the extent practicable.
* Stabilize stream banks disturbed during ford installation.



*Example low-water ford crossing (MN DNR)*

MnDOT Specification 1717.1 Part B discusses the precautions that are required in order to prevent pollution of ground and surface waters when contractors must use stream crossings. Part B states: “The Contractor shall avoid the crossing of streams and rivers unless approved by the regulatory authority. The Contractor shall minimize water pollution from haul roads, work platforms, temporary earth fills, and other temporary staging areas used for construction. The Contractor shall restore all temporary crossings to pre-existing conditions or as shown in plan.”

## Inspection and maintenance

In general, bridge crossings require less maintenance than culvert crossings, and ford crossings typically require the most intensive maintenance. The following general inspection and maintenance recommendations apply to all temporary stream crossings:

* At least weekly and after runoff-producing rainfall:
  + Verify that the structure, stream bed, and stream banks are not damaged and that sediment is not entering the stream.
  + Remove and dispose of accumulated sediment and debris.
  + Replace aggregate that has washed away from culvert ends.
  + Inspect temporary stream crossings after runoff-producing rains to check for blockage in channel, erosion of abutments, channel scour, riprap displacement, or piping in the soil.
  + Inspect temporary crossing structure(s) for weakening, such as cracks and undermining of foundations and abutments.
  + Make all repairs immediately to prevent further damage to the installation.

During construction of fords, the stream diversion method should be inspected daily for leakage and any repairs made immediately. Inspect perimeter control barriers periodically and repair as necessary.

*Removal of temporary stream crossings*

After a temporary stream crossing is no longer needed, it should be removed in the following general sequence:

1. Inspect the site to confirm the practice is no longer needed.
2. Remove temporary crossing as soon as it is no longer needed (within 14 calendar days).
3. Remove sediment buildup in the area of the temporary crossing.
4. Remove the temporary crossing.
5. Restore the stream channel to its original cross-section.
6. Stabilize and revegetate any areas disturbed by removal of the temporary crossing.

Removal of fords requires an approved temporary stream diversion method and dewatering of the construction area prior to removal of the ford. Stabilize any disturbed areas prior to removal of the stream diversion.

## Costs

Costs for construction of temporary stream crossings are highly project-specific and may vary widely depending on the type of structure, the intended purpose, and the nature of the water course to be crossed.

## Reference materials

Except where more stringent requirements are presented in this guidance, BMPs shall comply with MnDOT and other state requirements. Primary design references include:

* 2018 Minnesota NPDES/SDS Construction Stormwater General Permit

<https://www.pca.state.mn.us/water/construction-stormwater>

* 2018 MnDOT Standard Specifications for Construction

<http://www.dot.state.mn.us/pre-letting/spec/>

* Minnesota Department of Natural Resources: Temporary Bridges and Low-Water Ford Crossings (2008)

<https://files.dnr.state.mn.us/publications/waters/shoreline_alterations_stream_crossings.pdf>

* MnDOT Erosion Control Handbook II

<https://www.dot.state.mn.us/environment/erosion/pdf/2006mndotecfieldhandbook.pdf>

The following is a list of additional resources that are not specific to Minnesota:

* Contractor’s Handbook for Erosion, Sediment, and Stormwater Management on Capital Project Construction Sites (Lexington-Fayette Urban County Government) (2018)

<https://www.lexingtonky.gov/sites/default/files/2018-12/LFUCG%20Contractor%27s%20Handbook%20Final%20v29Nov2018.pdf>

* District of Columbia Erosion and Sediment Control Manual (Chapter 8.2) <https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/2017%20DC%20ESC%20Manual_FINAL.pdf>
* 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control (Chapter H-4)

<https://mde.maryland.gov/programs/water/stormwatermanagementprogram/pages/esc_standards.aspx>

* New York State Standards and Specifications for Erosion and Sediment Control (2016)

<https://www.dec.ny.gov/docs/water_pdf/2016nysstanec.pdf>

* Tennessee Erosion & Sediment Control Handbook (Fourth Edition, 2012) (Chapter 7.43)

<https://tnepsc.org/TDEC_EandS_Handbook_2012_Edition4/TDEC%20EandS%20Handbook%204th%20Edition.pdf>

# BMP Removal (after final stabilization)

Alert Box: temporary perimeter controls constructed from materials that do not readily decompose, such as silt fences, filter socks, straw bale barriers, sandbag barriers, metal stakes and reinforcement fencing, and other relatively low cost BMPs are often forgotten on site after construction is complete. These temporary BMPs must be removed prior to site closeout and permit termination.

In general, when a temporary BMP is no longer needed on a construction site, most often after final stabilization has occurred, it must be removed by the contractor. However, some BMPs, such as temporary sediment basins, may be converted to permanent BMPs after construction is complete.

While many construction stormwater BMPs must be removed from the site after final stabilization, it is generally acceptable for BMPs made of natural materials (such as fiber logs/rolls, natural fiber erosion control mats, etc.) to be left on the site to decompose. Erosion prevention practices constructed from degradable materials represent the most common class of stormwater construction BMPs that are left in place after construction is complete and the site is stabilized (see <https://stormwater.pca.state.mn.us/index.php?title=Erosion_prevention_practices>). Perimeter control BMPs constructed from degradable materials may also be left on site in some cases. However, temporary perimeter controls constructed from materials that do not readily decompose, such as silt fences, filter socks, straw bale barriers, sandbag barriers, metal stakes and reinforcement fencing, and other relatively low cost BMPs must be removed.

## Applicability

In general, whether a construction stormwater BMP is removed after the completion of construction and stabilization of the work site primarily depends on (1) the conditions of the contract and applicable permit(s), (2) the intended function and lifespan of the BMP, and (3) the nature of the materials used to construct the BMP.

MPCA’s 2018 Stormwater Construction Inspection Guide states that “all temporary synthetic and structural erosion prevention and sediment control BMPs (such as silt fence) must be removed on the portions of the site for which the Permittee is responsible”, and that BMPs “designed to decompose on site (such as some compost logs) may be left in place.”

### Site applicability

Whether they are to be removed or left in place, all BMPs should still be cleaned of excess sediment and other accumulated debris at the completion of construction and final stabilization when they are no longer needed. However, depending on the expected rate of decomposition and intended use of the site, a contractor or site owner may wish to remove and dispose of some BMPs or BMP components in lieu of leaving them in place to decompose. The guidance in this BMP chapter pertains primarily to sites where the standard regulatory procedures for determining whether a temporary construction stormwater BMP should be removed, left in place, or converted to a permanent stormwater management feature apply.

The table below provides general recommendations for categories and types of temporary BMPs regarding whether they are typically removed or left in place on a construction site after final stabilization.

*Typical recommendations for BMP removal for common construction stormwater BMPs*

|  |  |  |
| --- | --- | --- |
| **BMP Category/Type** | **Standard Procedure** | **Applicability and Special Considerations** |
| Erosion prevention practices (stabilization practices) | | |
| Temporary / permanent seeding | Left in place. | Mulch or other natural temporary cover to protect seeded areas should also be left in place. |
| Mulches | Left in place. | Mulch, hydraulic mulch, and any anchoring materials must be degradable. |
| Tackifiers/soil stabilizers | Left in place. | If using tackifiers and stabilizers (e.g., polyacrylamide or PAM), ensure they are nontoxic to aquatic life (i.e., not cationic). |
| Erosion control blankets (ECBs) | Left in place. | Installed ECBs with emergent vegetation are left in place. May be removed and reused when used as temporary cover without seed on short-duration projects. |
| Turf reinforcement mats (TRMs) | Left in place. | Left in place to provide permanent armoring and vegetation support. |
| Erosion prevention practices (other) | | |
| Riprap | Left in place. | Typically serves a permanent function for armoring, stabilizing, and protecting soil against erosion. |
| Sediment control practices | | |
| Vehicle tracking BMPs | Removed. | Removed after final site stabilization or after no longer needed (e.g., vehicles no longer entering or existing site). |
| Perimeter controls | Varies; most are removed. | May be left in place if constructed from degradable materials (e.g., fiber rolls/logs). Silt fencing must be removed after upslope areas are stabilized.  BMPs with degradable fill (e.g., sediment control logs filled with compost) may have outer casing removed and contents left in place. |
| Check dams | Varies. | May be left in place if constructed from degradable materials (e.g., fiber rolls/logs). Check post-construction stormwater management plan for applicability. Rock check dams can be spread along ditch bottom after channel is vegetated.  Non-degradable manufactured products must be removed after stabilization. |
| Diversion barrier controls | Varies; most are removed. | In general, all are removed after stabilization. In special cases, such as where removal may damage structures or foundation soils, cofferdams may be left in place. |
| Inlet protection | Removed. | Must be removed after stabilization. |
| Outlet energy dissipation | Varies. | Devices designed for temporary, short-term (e.g., less than one year) use must be removed after stabilization.  Whether they are left in place as permanent BMPs depends on function and desired aesthetics. Check post-construction stormwater management plan for applicability. |
| Sediment traps/basins | Varies. | Temporary sediment traps are removed after stabilization.  Temporary sediment basins may be converted to permanent stormwater management basins after stabilization. |
| Stabilized earth/soil berm | Varies. | Typically removed after stabilization. In some cases, may be left in place if permanently stabilized with vegetation. Check post-construction stormwater management plan for applicability. |
| Surface water protection practices | | |
| Buffer zones | Left in place. | Always preserved on site; see Buffer zones. |
| Construction stormwater treatment practices | | |
| Dewatering (including chemical treatment and sediment filtration) | Removed. | Dewatering practices are operated during construction activity and may be removed after construction ceases and site is stabilized. |
| Practices to minimize sediment discharge | | |
| Diversion and working in the dry | Removed. | Removed after construction is complete and stream channel and site are stabilized. |
| Temporary stream crossing | Removed. | Removed after construction is complete and stream channel and site are stabilized. |
| Stabilized construction exit | Removed. | Removed after construction is complete and construction equipment/materials have been removed. Grade and stabilize area after removal. |

### Permit applicability

Final stabilization and removal of applicable temporary BMPs must be completing prior to closing out the project permit. At project completion, a Notice of Termination (NOT) will need to be submitted to terminate coverage under the MPCA Construction Stormwater General Permit. The NOT must be submitted within 30 days of completing final stabilization at the project site. The following must be completed (MnDOT, 2006):

* All soils must be stabilized to a uniform cover to achieve 70% cover over all exposed areas of the project site.
* Temporary synthetic and structural erosion prevention and sediment control BMPs must be removed.
* All sediment from conveyances and from temporary sediment basins designed to be used a permanent sediment basin will need to be restored to the original design volume and the sediment stabilized.

Section 13 of the MPCA Construction Stormwater General Permit (2018) describes conditions for permit termination (submission of the NOT), which includes BMP removal. Regarding the removal of temporary BMPs, Section 13.5 states: “Permittees must remove all temporary synthetic erosion prevention and sediment control BMPs prior to submitting the NOT. Permittees may leave BMPs designed to decompose on-site in place.”

See **Costs** for information on payment for temporary sediment control devices by MnDOT, including the schedule of payment following BMP removal.

## Planning considerations

It is important to consider the cost and time required for BMP removal and disposal when planning the overall project cost and schedule.

The MnDOT Standard Specifications for Construction (2018 Edition) Section 2753.3 Part A.1 delegates responsibility of erosion and sediment control BMP removal to the Erosion Control Supervisor, stating: “The following list describes the duties of the Erosion Control Supervisor:

* (2) Ensures proper installation, functionality, and maintenance, clean-up, and removal of all erosion and sediment control Best Management Practices (BMPs) and in accordance with manufacturer’s recommendations.”

## Removal or modification procedures

The removal of temporary erosion and sediment control BMPs is not considered a standalone construction stormwater practice; therefore, there are no specific design recommendations for BMP removal, only recommended procedures. In all cases, the removal of devices intended for temporary use shall be performed in accordance with the terms of the contract or as directed by the Engineer.

The following information provides general recommendations on sequencing for several common erosion prevention and sediment control BMPs that are removed from construction sites after final stabilization, when they are no longer needed.

Vehicle tracking BMPs (including temporary concrete washout facilities):

* Remove and dispose of trapped sediment.
* Remove and dispose of materials used to build facility outside of the construction area.
* Backfill any holes or disturbances left after removal.
* Permanently stabilize soil areas disturbed by removal.

Perimeter controls (silt fence):

* Remove and dispose of accumulated sediment.
* Dispose of fencing and posts that are not able to be reused.
* Fill and compact post holes and trenches.
* Grade the area to blend with adjacent ground.

Perimeter controls (straw bale, silt socks, filter berms, and other filtration barriers):

* Remove and dispose of non-degradable materials (including any stakes).
* Remove and dispose of accumulated sediment.
* Re-grade and stabilize as necessary.

Check dams (ditch checks, ditch dikes, etc.):

* Remove and dispose of accumulated sediment.
* Where appropriate, spread rock check dams along channel bottom after channel is vegetated.
* Remove manufactured dikes and check dams after site is stabilized.
* Restore the channel to its original cross-section.
* Stabilize and revegetate any areas disturbed by removal.

Diversion barrier controls (e.g., cofferdams, temporary dikes, etc.):

* Prior to cofferdam removal, stabilize the work area.
* Dewater the cofferdam and discharge sediment-laden water through an approved sediment filtering device.
* Remove the downstream cofferdam first, then remove the upstream cofferdam.
* Remove all parts of the cofferdam with minimal disturbance to the stream channel, stream banks, and any adjacent permanent structures.
* If using floating silt curtains in conjunction with diversion barriers, remove upon the completion of work, being careful not to allow resuspension of sediment, trash, or oil into the water.
* In special cases, such as where removal may damage foundation soils or structures, cofferdams may be left in place; this generally only applies to sheet piling where sheet piles extending below the permanent structure are cut off and left in place.

Storm drain inlet protection:

* After surrounding drainage area has been stabilized, remove inlet protection and clean area around inlet including removal of accumulated sediment.
* Re-grade area around inlet as needed.
* Clear inside of inlet of sediment and debris prior to final inspection.

Outlet energy dissipation:

* After surrounding drainage area has been stabilized, remove accumulated sediment from the device and dispose.
* Remove the structure if it is not needed to prevent scour erosion after construction.
* Re-grade and stabilize as necessary.

Temporary sediment traps and basins:

* After all sediment-producing areas have been stabilized, remove accumulated sediment from the structure and dispose.
* Remove the structure and all unstable sediment.
* Grade the area to blend in with adjacent areas and stabilize as necessary.

Stabilized earth/soil berm:

* Determine if berm is necessary for post-construction site drainage.
* Once site reaches final stabilization, remove the berm if necessary, and any accumulated sediment.
* Fill, compact, and vegetate areas of ground disturbance to blend with adjacent ground.

Dewatering (chemical treatment and sediment filtration):

* Remove and dispose of accumulated sediment.
* Properly dispose of treatment chemicals (polymers, flocculants, or other sedimentation treatment chemicals).
* Properly dispose of screening equipment, geotextiles, dewatering bags, fiber filters, and other equipment.
* Remove and dispose of materials used to construct dewatering system
* Backfill any holes or disturbances left after removal.
* Permanently stabilize soil areas disturbed by removal.

Temporary stream diversion:

* Do not remove the downstream diversion until all sediment-laden water from the upstream diversion has been filtered through an approved sediment filtering device.
* If using a temporary diversion channel, remove the lining material and then fill and stabilize the channel.
* Stabilize the points of tie-in to the existing stream channel using riprap or other appropriate methods.
* After removing the diversion, revegetate any area disturbed by the removal.

Temporary stream crossing:

* Remove temporary stream crossings promptly when no longer needed.
* Remove sediment buildup in the area of the temporary crossing.
* Remove the temporary crossing.
* Restore the stream channel to its original cross-section.
* Stabilize and revegetate any areas disturbed by removal of the temporary crossing.
* Use turf reinforcement matting along banks where flows may cause erosion.

Temporary sediment basins and fiber rolls or logs can be left on site, but should be modified.

Temporary sediment basins (conversion to permanent stormwater management basins):

* The contributing drainage areas must be permanently stabilized.
* Clean out sediment from the basin and conveyances.
* Inspect to ensure that side slopes and the volume, containment berm, outlet, and inlets comply with stormwater basin design requirements.

Fiber rolls or logs:

* May be left in place if they are degradable. A common application where fiber rolls/logs are left on site is when they are used as permanent slope breaks (often in conjunction with erosion control blankets).
* If they are removed, dispose of accumulated sediment and fill in any trenches, holes, or depressions to blend in with adjacent ground. Degradable contents, such as compost, may be left in place and spread over the ground to decay.

## Inspection and maintenance (final closeout)

Final inspection and closeout of a construction site requires cleanup of all materials related to construction activities, final stabilization to prevent erosion from disturbed areas, and removal of temporary erosion prevention and sediment control BMPs.

*Final cleanup*

Section 1407 (Final Cleanup) of the MnDOT Standard Specifications for Construction (2018 Edition) states: “Before requesting final inspection in accordance with 1516.2, “Project Acceptance,” the Contractor shall remove the following from the Project Site and other locations outside of the Project Site used in performing the Work:

(1) Surplus and discarded materials,

(2) Equipment,

(3) Rubbish,

(4) Temporary structures, and

(5) Other items not on the Project Site before execution of the Contract.

The Contractor shall also leave the Project Site, including borrow pits, in a condition acceptable to the Engineer. The cost of final cleanup is included in the Contract Unit Prices of the Contract Items.”

*Final stabilization*

As discussed above in **Applicability**, MPCA’s 2018 Stormwater Construction Inspection Guide provides guidelines on conducting final inspection of the site for meeting final stabilization requirements. Regarding BMP removal, the guidance states:

* “Inspect any stabilized areas to ensure that excessive erosion is not occurring. Estimate whether the site has been stabilized with uniform perennial vegetative cover with a density of 70% over the entire pervious area. Temporary BMPs in areas with final stabilization must be removed and sediment must be cleaned out of all conveyances and temporary sediment basins that will be used as permanent water quality management basins. Areas where temporary BMPs have been removed must be stabilized and seeded.”
* Prior to submission of the NOT [Notice of Termination], all temporary synthetic and structural erosion prevention and sediment control BMPs (such as silt fence) must be removed on the portions of the site for which the Permittee is responsible. Best Management Practices designed to decompose on site (such as some compost logs) may be left in place.

Once vegetation has been established and applicable temporary erosion and sediment control BMPs have been removed, the Notice of Termination will need to be submitted to formally close out the project.

*Construction Stormwater Permit Notice of Termination and Site Closeout Checklist*

|  |  |
| --- | --- |
| **Final inspection and site closeout elements**  *(see below)* | * Site is stabilized with vegetation |
| * Drainage system is stable and functional |
| * Temporary BMPs have been removed |
| * Final housekeeping tasks are completed |
| *Site stabilization closeout* | * No large patches or areas of bare soil or dead vegetation on site |
| * At least 70 percent uniform vegetated cover is established in all areas |
| * Slopes are stable, with no significant rills/ruts |
| * Sodded areas are established and green, with no dead areas or slipping |
| * No large bulges or loose areas visible in netting, blankets, or mats |
| *Drainage system closeout* | * Stormwater pipes, ditches, etc. checked for conformance with design plans |
| * Manholes, pipes, catch basins, headwalls, and concrete flumes checked for alignment, integrity, etc. |
| * No significant sediment accumulations in pipes, ditches, and catch basins |
| * Ditches/swales/channels are well-vegetated, rip-rapped, paved, or otherwise stabilized, with no large areas of bare soil or active erosion |
| *Temporary BMP removal* | * Silt fencing, posts, and accumulated sediment |
| * Non-degradable sediment barriers |
| * Inlet protection devices (rock, rock bags, filter fabric, proprietary products) |
| * Ditch checks (rock, rock bags, dams, etc.) |
| * Temporary rock or other berms |
| * Temporary sediment traps, accumulated sediment |
| * Temporary sediment basins, accumulated sediment |
| * Waste and other containers |
| * Concrete washouts and any concrete waste |
| * Stabilized construction exits |
| *Good housekeeping closeout* | * Litter and trash pickup / cleanup over entire site |
| * Removal of debris and waste piles |
| * Removal of fuel tanks and other fueling/maintenance items/equipment |
| * Removal of signs, barriers, flagging, etc. |
| * Removal of construction phase supplies, materials, and stockpiles |
| * Stabilization of material storage, staging, and other areas (vegetation, etc.) |

## Costs

Costs for removal of larger BMPs are typically included in bid pricing. Section 2573.5 (Basis of Payment) of the MnDOT Standard Specifications for Construction (2018 Edition) states:

“The contract pay items for stormwater management will include the material, equipment, installation, maintenance, and removal as required by the contract to complete the work. For items of work not included in the schedule of Contract Pay Items, the Department will pay Unit Prices for the relevant items of work.

The Department will provide partial payment of temporary sediment control devices properly installed at no greater than 50 percent of the contract unit price for each relevant pay item unless otherwise required by the contract. The Department will pay the remaining partial payment after proper maintenance and removal of the device.” These terms provide an incentive for the contractor to ensure that BMPs are properly removed after the completion of construction.

## Reference materials

Except where more stringent requirements are presented in this guidance, BMPs shall comply with MnDOT and other state requirements. Primary design references include:

* 2018 Minnesota NPDES/SDS Construction Stormwater General Permit

<https://www.pca.state.mn.us/water/construction-stormwater>

* 2018 MnDOT Standard Specifications for Construction

<http://www.dot.state.mn.us/pre-letting/spec/>

* MnDOT Erosion Control Handbook II

<https://www.dot.state.mn.us/environment/erosion/pdf/2006mndotecfieldhandbook.pdf>

* MPCA Stormwater Construction Inspection Guide (2018)

<https://www.pca.state.mn.us/sites/default/files/wq-strm2-10.pdf>