DEFINITION

Horizontal directional drilling (HDD)\(^1\) is a trenchless method of installing underground utilities such as pipeline, conduit, or cable, using a surface-launched drilling rig. HDD is often used to avoid or minimize impacts to wetlands, waterways, roads, and other surface features.

PURPOSE

This technical standard identifies practices to protect water quality by minimizing potential impacts from inadvertent releases (IRs), also known as a frac-out or inadvertent return, of drilling fluid associated with HDD and limiting the impact to water resources if an IR does occur. This technical standard has been developed as provided in subchapter V of NR 151, Wis. Adm. Code.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to drill paths within projects using HDD as an installation method. Within this standard, drill path segment is used to reference a specific instance where HDD is used within a project. HDD project is used to refer to a larger project that may contain multiple drill path segments. Some drill path segments within a project may require more practices than others based on the presence or absence of resources and risk factors.

For HDD projects where only air is used, this standard does not apply.

This standard does not apply to installation of service laterals or convenience drills in urban areas that are 6 inches or less in product diameter and less than or equal to 200 feet long.

CRITERIA

General Criteria

Laws and Regulations. Comply with applicable federal, tribal, state, and local laws, rules, regulations, or permit requirements including but not limited to those relating to HDD, safety, and spills. This standard does not contain the text of federal, tribal, state, or local laws.

Other Technical Standards. Follow other site erosion and sediment control technical standards, such as dewatering, that are applicable to HDD projects.

Organization of Criteria. Actions and documentation are described below in order of design development stage. Initial Design Criteria actions are intended to be completed during the very early stages of project development. Plan Development Criteria actions should be completed prior to submitting for permits for large drill paths and prior to the pre-construction meeting for medium and small drill paths. The actions are numbered sequentially for ease of reference.

Attachment 1 contains criteria applicability matrices by drill path size. Please note that additional actions may be required where the length of the drill path moves it into the medium or large size category.

Attachment 2 contains figures depicting typical HDD installation elements.

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\(^1\) Words in the standard that are shown in italics are described in the Glossary section. The words are italicized the first time they are used in the text.
Dimensions. For purposes of this HDD technical standard, drill paths are classified as small, medium, or large in size as follows:

Small: Drill paths with product diameter of 8 inches or less, and drill path length measured in the horizontal plane or station distance of 850 feet or less.

Medium: Drill paths with product diameter less than 24 inches, and drill path length measured in the horizontal plane or station distance less than 1500 feet. Drill paths with a product diameter of 8 inches or less are considered medium if the length of the drill path exceeds 850 feet but is less than or equal to 1500 feet.

Large: Drill paths with product diameter of 24 inches or greater for any length, or drill path length measured in the horizontal plane or station distance of 1500 feet or greater for any product diameter. Drill paths with a product diameter less than 24 inches are considered large if the drill path length exceeds 1500 feet.

Minimum Cover. Maintain at least 3 feet between the top of finished product and the soil surface within a wetland or waters of the state. Maintain at least 6 feet under the bed and bank of navigable waters to the top of finished product.

Drilling Fluid. Use drilling fluid that does not cause an exceedance of the Preventive Action Limits contained in ch. NR 140, Wis. Adm. Code. Do not use petroleum-based additives in drilling fluid.

Initial Design Criteria

(1) Desktop Site Assessment. For all HDD projects, conduct the following desktop reviews for the entire site (including temporary access roads, bore pits, staging areas, and adjacent areas) as part of initial design to assess the site for potential water resources, constraints, and challenging slope or soil conditions

(a) Water Resources – Complete a desktop review using the WDNR’s Surface Water Data Viewer (SWDV) tool (see References section) to identify all navigable waters and wetlands in the project area. For medium and large drill paths, note any resources that may be classified as key wetland types, Areas of Special Natural Resources Interest (ASNRI) waters, or navigable waters:

1. Identify navigable waters. All waterways mapped in the WDNR 24K Hydrography Lakes and Open Water layer, 24K streams and Rivers layer, and any additional surface waters that are visible on aerial photos, should be identified and presumed navigable unless determined non-navigable by WDNR through a navigability determination. To identify navigable waters, go to the WDNR SWDV and turn on the Surface Water layer. Under the Surface Water layer, the 24K Hydrography Lakes and Open Waters and 24K Streams and Rivers sublayers should be reviewed. In addition, review available aerial photos to identify additional surface waters not identified in the SWDV layers.

2. For medium and large drill paths, also identify ASNRI waters:

Go to the WDNR SWDV and turn on the Priority Navigable Waterways layer. Review the ASNRI sublayer. Note that the Other Priority Navigable Waterways sublayer should be turned off for this review.
3. Wetlands – Complete a desktop review using the WDNR’s Surface Water Data Viewer (SWDV) tool to identify all wetlands in the project area.
   
a. Identify All Wetlands.
   
   All wetlands mapped in the Wisconsin Wetland Inventory as well as all areas mapped in the Wetland Indicators & Soils layer are conservatively assumed to be wetland unless a wetland field delineation has been conducted in accordance with the US Army Corps of Engineers Wetland Delineation Manual and appropriate regional supplement has determined otherwise.
   
i. To conservatively identify wetlands via desktop site assessment, go to the WDNR SWDV and turn on the Mapped Wetlands layer and review the Wisconsin Wetland Inventory sublayers. Next turn on the Wetland Indicators and Soils layer and review the Wetland Indicators sublayer. Finally, review available aerial photos to identify additional wetlands not identified in the SWDV layers. Additional guidance regarding wetland review is listed in the References section.
   
   ii. If a wetland delineation was already completed and concurred with by the WDNR, then utilize the wetland boundaries identified in the wetland delineation for this review in place of the conservative desktop site assessment described in i. above.
   
b. Identify Key Wetland Types.

   For medium and large drill paths for which a key wetland types have not been identified during a wetland delineation and/or field reviews by qualified staff, complete the following to conservatively identify key wetland types:
   
i. Wild rice areas, as mapped in the WDNR SWDV, Wild Rice Waters layer. Mapped wetlands located contiguous to the mapped wild rice areas are assumed to be key wetland types.
   
   ii. Wetlands within townships for which a National Heritage Inventory (NHI) review has identified an element occurrence of Great Lakes Ridge and Swale wetlands, interdunal wetlands, or coastal plain marshes. These typically occur in the following counties: Adams, Ashland, Brown, Douglas, Door, Jackson, Manitowoc, Marquette, Sheboygan, and Waushara.
   
   iii. Peat soils, as mapped in the NRCS soil survey, in project areas located outside of a road right-of-way.
   
   iv. Areas that are actively farmed in row crop. Key wetland types are assumed to not be present in row crop areas.
   
4. Note drainage features such as storm sewers, storm sewer inlets, culverts and swales along the drill path that provide connectivity to water resources.

(b) Constructability – Review available resources (such as existing maps, interviews, Digger’s Hotline planning locate, aerial imagery, county geographic information system (GIS) resources, etc.) to locate existing utilities, existing roads and right of way, topography, property boundaries, cultural resources, and other potential constraints.

During constructability review:

   1. Review work area compared to existing right of way to determine need for easements.
   
   2. Identify existing and proposed facilities within the project vicinity. Note if the facilities are active, abandoned, or proposed.
3. Identify other protected resources in the vicinity of the drill path that may limit workspace during drilling and IR response. Use the WDNR's NHI portal and the spatial data available from the Wisconsin Historical Society.

4. Verify access and space allocation for planned entry pit, exit pit, and staging areas.

5. Verify required vertical and horizontal separation from existing and proposed facilities to ensure construction crews can maintain appropriate distances during installation, as separation requirements may be more restrictive than equipment or installation tolerances.

6. Note any indicators of past dredging or scour. Indicators of scour and streambed instability include steep eroded banks, perched culverts, and exposed foundations. Indicators of past dredging include recently scraped soil and abrupt changes in vegetation growth.

7. Note any areas where access to drill path segments for IR response would require tree removal within a wooded wetland not otherwise required for the project.

8. Note locations where invasive species are known to occur in the work area.

(c) Soils – For medium and large drill paths, use existing soils information from previous site experience, historical borings, soil mapping services, and other sources (see References section) to determine soil and bedrock type and conditions. Note the presence of any of the following characteristics along the drill path route:

1. Cobbles;
2. High gravel content;
3. Peat and/or muck soils;
4. Karst features and/or fractured bedrock;
5. Shallow groundwater; and

(2) Initial Design Site Walk-Through. For medium or large drill paths, conduct a site walk-through at initial design. Additionally, for large drill paths, include the owner, design team, environmental representative, and the contractor, if known, for the initial design site walk-through. Use the information collected to identify potential problems with the design and to implement design revisions to prevent or minimize problems during installation.

During the walk-through, identify or field-verify at least the following along the drill path route, related workspaces, and vicinity:

- Adjacent property and any use restrictions;
- Drill set-up locations and bore pit suitability (at entry and exit);
- Features identified in the Desktop Site Assessment;
- Note the location and document any drainage features not identified during the Desktop Site Assessment;
- Populations of invasive species in the work areas;
- Existing utilities and infrastructure (such as roads, railroads, structures, etc.);
- Known future development areas and areas of concurrent construction;
- Topography, visible geology, steep slopes, and signs of slope instability such as slumping;
Barriers to visual and physical access to drill paths and possible alternate inspection access options; and

Workspace suitability, including locations for drill set-up, bore pits, equipment staging, and pull-back.

(3) Geotechnical Investigation. For medium or large drill path segments, collect geotechnical information at the proposed drill path location, or utilize previous site experience or historical geotechnical data. For on-site work, perform soil borings, soil pits and/or rock coring to identify in-situ, site-specific soil and bedrock information. Lab-test samples if needed for additional classification, such as soil gradations and gravel percentages. Existing soil boring information may be used if it extends at least as deep as the proposed drill path and is within a reasonable distance from the proposed drill path considering expected soil variability.

(a) For medium drill path segments, conduct at least one geotechnical boring, or use existing geotechnical data or previous drilling experience for the site.

(b) For large drill path segments conduct at least two geotechnical borings or use existing geotechnical data or previous drilling experience for the site. Extend geotechnical bore depth to at least the planned drill path depth.

Plan Development Criteria

(4) Wetland Review.

(a) For large drill path segments where Desktop Site Assessment screening indicates wetland may be present within or in close proximity to the drill path area: Complete a wetland field review to confirm the absence and presence of wetlands along the drill path and associated work areas. Identify wetland boundaries, quality, and site characteristics. Employ qualified personnel with experience identifying the boundaries and characteristics of wetland features to conduct wetland field reviews. Conduct all wetland field reviews in accordance with current WDNR and US Army Corps of Engineers guidelines regarding the type and amount of information that must be collected and communicated.

(b) If a wetland delineation or wetland field determination is completed for medium and large drill path segments, request that key wetland resources be confirmed during the field component of the review.

(c) Incorporate findings in HDD project design and plans to avoid or minimize impacts to wetlands. Depict wetlands on maps and plans used during HDD project planning, permitting, and construction.

(5) Planning Site Walk-Through. For medium and large drill paths that also cross under key wetland types or ASNRI waters, employ qualified personnel knowledgeable and experienced in HDD installations as well as qualified environmental personnel to conduct a site walk-through at the planning phase. Walk the HDD drill paths that coincide with key wetland types or ASNRI waters to identify potential obstacles and conditions that may increase the risk of an IR. Review the location of wetlands, waterways, lakes, ditches, culverts, existing utilities, storm inlets, drain tile indicators, steep terrain, cobble and exposed rock for consideration in project design. Field verify without snow cover prior to construction, whenever possible.

(6) Written Plans. For HDD projects with only small drill paths, develop an IR Plan as described below and a Spill Plan for projects with drill paths crossing key wetland types or ASNRI waters. For all other HDD projects, develop an HDD Plan, Spill Plan, and IR Plan as described below. These plans may be generic except where additional site-specific plan content is prescribed for certain drill paths. The plans may be separate documents or combined. Maintain plans on-site and provide to WDNR upon request.

(a) HDD Plan – For medium and large drill paths, develop and implement a plan that provides the information listed in Table 1. For large drill paths or medium drill paths with
key wetland types or ASNRI waters include site-specific details. Medium drill paths under key wetland types or ASNRI waters are not required to have profiles if minimum cover under key wetland types or ASNRI waters can be maintained.

<table>
<thead>
<tr>
<th>Plan Element</th>
<th>Minimum Contents</th>
<th>Site-Specific Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDD Execution</td>
<td>Summary of the typical major steps required to complete an HDD project</td>
<td>Required additional steps* Required or prohibited construction means and methods.*</td>
</tr>
<tr>
<td>Equipment List and</td>
<td>General description of equipment typical for the HDD project</td>
<td>Required equipment, including fluid reclamation equipment.*</td>
</tr>
<tr>
<td>Specifications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drilling Fluid</td>
<td>Summary of typical drilling fluid composition, safety data sheets (SDS) for</td>
<td>Drilling fluid composition, including bentonite content and anticipated additives.</td>
</tr>
<tr>
<td></td>
<td>planned composition, if known, options for recycling and/or disposal</td>
<td>Anticipated disposal locations other than licensed landfills.*</td>
</tr>
<tr>
<td>Permit Requirements</td>
<td>List of anticipated permits and authorizations</td>
<td>List of applicable permits, and authorizations and issuance dates (or anticipated issuance date if in progress).</td>
</tr>
<tr>
<td>Environmental Protection</td>
<td>Statement addressing environmental protections and best management practice</td>
<td>Detailed list of practices for resource protection, erosion and sediment control and spill and IR containment.</td>
</tr>
<tr>
<td>Practices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication and</td>
<td>Description of responsibilities, responsible parties, and communication</td>
<td>Location-specific contact information for agencies, the responsible party, and response teams, including names and contact information of appropriate personnel in flowchart (where specific contacts are not known, fill in prior to pre-construction meeting).*</td>
</tr>
<tr>
<td>Notifications</td>
<td>expectations, including timing of key notifications</td>
<td></td>
</tr>
<tr>
<td>Plan Element</td>
<td>Minimum Contents</td>
<td>Site-Specific Details</td>
</tr>
<tr>
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</tr>
<tr>
<td>Project Staging</td>
<td>Not a minimum content element</td>
<td>Figure depicting:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Location of drill rig and supporting equipment, materials, and pipe;</td>
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<tr>
<td></td>
<td></td>
<td>• Location of spill response kits and equipment;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Access route for entry and exit pits;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Workspaces, including, but not limited to, space to stage and weld pipe for pullback;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Environmental protections for workspaces, like erosion and sediment controls, timber mats, dewatering, etc.;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Water resources and locations with restrictions due to other protected resources. Label appropriate setbacks or protective areas;</td>
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<tr>
<td></td>
<td></td>
<td>• Known utilities;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Locational information (GPS, latitude/longitude, street address, township/section/range); and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Anticipated schedule.</td>
</tr>
<tr>
<td>Profile Detail</td>
<td>Not a minimum content element</td>
<td>Include existing:</td>
</tr>
<tr>
<td>Drawing</td>
<td></td>
<td>• Topography/ground surface and ground features from civil survey or LiDAR;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Key wetland types and <strong>ASNRI water</strong> boundaries;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Known geotechnical information such as soil profile, water table elevation, bedrock elevation;</td>
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<tr>
<td></td>
<td></td>
<td>• Proposed and existing utility size and elevation; and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Underground structures (seawalls, storage tanks, etc.).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Include proposed drill path:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Length;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Minimum depth and proposed separation distance from bottom of environmental features;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Specific station and elevation data;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Entry and exit angle; and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Points of curvature or points of tangent and radius of curvature.</td>
</tr>
<tr>
<td>Plan Element</td>
<td>Minimum Contents</td>
<td>Site-Specific Details</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Contingency</td>
<td>Statement on what must be done if HDD proves to be unsuitable and who needs to be involved in related decision making</td>
<td>List of potential actions should HDD encounter unforeseen obstacles or failures, and a description of hole abandonment methods.*</td>
</tr>
</tbody>
</table>
| Monitoring   | General monitoring expectations of owner, contractor, and environmental personnel | Site-specific monitoring expectations of owner, construction inspectors, contractor and environmental personnel, including, but not limited to:  
- How often the drill path will be inspected for IRs;  
- Who must be contacted immediately regarding any IRs;  
- Who will meet and determine appropriate controls and actions to implement; and  
- Who will decide when drilling operations recommence and how that decision will be made. |
| Site Restoration and Final Stabilization | Description of site restoration and final stabilization, including how soil will be replaced to promote vegetation (could include fertilization, decompaction, seeding specifications, etc.), and specifying that erosion and sediment controls need to remain in place until vegetation is established and final stabilization is achieved. | Site-specific details such as minimum topsoil depth, seed mixes, timing relative to completion of other construction, restoration agreed upon with landowner (i.e. landscaping). |

Note: Items marked with '*' may be inserted prior to the pre-construction meeting if not known in advance.

(b) **Spill Plan** – Develop and implement a plan addressing spill prevention, containment and response appropriate for HDD projects. Provide a Spill Plan including the minimum contents in Table 2 for small drill paths that cross key wetland types or ASNRI waters. Provide a Spill Plan including the minimum contents in Table 2 for projects with medium and large drill paths. For large drill paths or medium drill paths with key wetland types or ASNRI waters, also include the site-specific details.
### Table 2
#### Spill Plan Elements

<table>
<thead>
<tr>
<th>Plan Element</th>
<th>Minimum Contents</th>
<th>Site-Specific Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Contaminants</td>
<td>List of most common pollutant sources present on HDD projects</td>
<td>List materials and quantity expected on-site.*</td>
</tr>
<tr>
<td>Spill Containment</td>
<td>Include typical elements of a spill response kit</td>
<td>Description of material storage areas, secondary containment, locations of spill response kits and equipment, and wetlands and waters of the state within 250 feet of the site.*</td>
</tr>
<tr>
<td>Spill Response Practices</td>
<td>Include typical practices used on HDD projects</td>
<td>Location-specific contact information for agencies, the responsible party and response teams (include prior to the start of construction).* Include WDNR contacts for spills coordinators, duty officers, and wardens.</td>
</tr>
</tbody>
</table>

Note: Items marked with ‘*’ may be inserted prior to the pre-construction meeting if not known in advance.

(c) **IR Plan** – Develop and implement an IR response plan. For all projects, include the minimum contents in Table 3 and for large drill paths and drill paths crossing key wetland types or ASNRI waters also include the site-specific details. Where access to drill path segments for IR response would require tree removal within a wooded wetland not otherwise required for the project or vehicle access through a key wetland type or ASNRI water, discuss IR response and control with regulatory authorities and include the site-specific requirements in the IR Plan.

### Table 3
#### IR Plan Elements

<table>
<thead>
<tr>
<th>Plan Element</th>
<th>Minimum Contents</th>
<th>Site-Specific Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response Training</td>
<td>Requirements for site personnel</td>
<td>Identify site-specific resources as part of training or provide to pre-trained individuals.</td>
</tr>
<tr>
<td>Prevention</td>
<td>Typical actions to minimize potential for IRs</td>
<td>Site-specific actions to minimize potential for IRs.*</td>
</tr>
<tr>
<td>On-site and On-call Equipment</td>
<td>List of equipment staged by entry and exit pits, and list of additional equipment available on-site or on call including:</td>
<td>Include matting (e.g. timber or composite mats) and low ground pressure equipment for response in key wetland types. Include a site-specific list of on-site or on-call equipment.*</td>
</tr>
<tr>
<td></td>
<td>• Containment materials</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Hydrovac (minimum pressure available for range of size, possible conditions)</td>
<td></td>
</tr>
<tr>
<td>Access</td>
<td>Describe BMPs that will be utilized to minimize impacts associated with access</td>
<td>Describe site-specific plans for access, and response actions for release into any areas that cannot be accessed by personnel.</td>
</tr>
</tbody>
</table>
Table 3
IR Plan Elements

<table>
<thead>
<tr>
<th>Plan Element</th>
<th>Minimum Contents</th>
<th>Site-Specific Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response and Control</td>
<td>Describe required actions to commence as soon as a potential IR is identified</td>
<td>Describe responses for site-specific environmental resources along the drill path.</td>
</tr>
<tr>
<td>Extended Response Actions</td>
<td>Describe actions required after immediate response is complete</td>
<td>Describe responses for site-specific environmental resources along the drill path.</td>
</tr>
<tr>
<td>Resumption of Drilling</td>
<td>Describe what is required before drilling resumes after an IR</td>
<td>Describe any site-specific considerations regarding resumption of drilling operations.</td>
</tr>
<tr>
<td>Post-IR Restoration</td>
<td>Describe methods to restore to original or better condition and the required timing of restoration</td>
<td>Describe resource areas where specific restoration protocols are needed.</td>
</tr>
<tr>
<td>Communications and Notifications</td>
<td>List titles and positions that must be communicated with in the event of an IR. Leave space for project-specific phone numbers to be added at the pre-construction meeting.</td>
<td>Location-specific contact information where needed for agencies and response teams.</td>
</tr>
<tr>
<td>Figures</td>
<td>Not required</td>
<td>Figure showing HDD entry and exit points.</td>
</tr>
</tbody>
</table>

Note: Items marked with ** may be inserted prior to the pre-construction meeting if not known in advance.

Construction Criteria

(7) HDD Pre-Construction Meeting. For all projects, conduct a pre-construction meeting to go over site-specific constraints associated with the drill paths and potential convenience drills. This meeting is not required to be held at the job site or in person (may be a virtual/online meeting) and may be part of the overall project kick-off meeting. Invite those involved with the HDD project, including:

- Project owner’s representative;
- General contractor;
- Drill contractor;
- Inspectors;
- Designers/engineers; and
- Environmental representative.

During the meeting, address the following as they relate to the HDD project:

- Location and required protections for key wetland types and ASNRI waters;
- Workspace boundaries and restricted areas;
- 100-year flood boundaries;
Timing restrictions;
Seasonal considerations;
Permit compliance;
Erosion and sediment control practices;
HDD Plan, Spill Plan, and IR Plan;
Monitoring, recordkeeping and reporting;
Chain of command; and
Restoration and final stabilization.

(8) HDD Path Walk-Through. For all HDD projects, the contractor foreman shall physically walk or observe the length of each drill path and each workspace prior to initiating the HDD. During the walk-through identify any obstacles and observe the areas of concern and the site characteristics discussed at the pre-construction meeting. Identify situations where a boat and/or drone is necessary to monitor for and respond to IRs. Modify the IR Plan to include additional equipment and supplies needed for monitoring and response.

(9) Monitoring and Inspections. For all HDD projects, during HDD installation, conduct monitoring and inspections of drill path to determine if the HDD is proceeding in accordance with its design and specifications, to identify IRs or other issues, and to confirm that appropriate equipment is on site to respond to IRs.

Monitor drilling fluid pressure and returns continuously for potential IRs. Inspect the drill path immediately upon noted loss of drilling fluid. If no IR is found but there is sustained fluid losses, the drill path and surrounding area should be monitored continually until either losses are reduced or installation is complete.

Maintain documentation that monitoring and inspections are completed as specified in this section and provide to WDNR upon request.

Additionally, for large drill paths and medium drill paths that cross key wetland types or ASNRI waters, use environmental inspectors to conduct the monitoring and inspections described above and require the owner’s construction or environmental representative to inspect the drill path at least every four hours.

(10) Reporting. For all HDD projects, report IRs, spills, and project modifications as required by applicable permits and federal, tribal, state, and local regulations. If a spill or IR enters a separate storm sewer inlet or drainage conveyance system, promptly notify the system owner that the discharge occurred, and include the estimated quantity of material discharged. If using an electronic, online project-tracking system, consider granting access to WDNR or make available tracking data as needed.

If requested by WDNR staff, provide regular status reports to WDNR including:

- HDD status;
- Monitoring and inspection summary;
- Issues (including spills and IRs) and associated responses;
- Project-specific concerns and how they were addressed.

PLANS AND SPECIFICATIONS

If applicable, include the following information in the project plans and specifications:

- Available soils information;
• Location and type of water resources;
• Requirements for timing or bore pit placement to avoid impacts to threatened or endangered species, trout streams, and cultural resources;
• Written HDD, Spill, and IR Plans;
• Potential convenience drill locations;
• Proper erosion and sediment control devices to protect workspace boundaries (refer to other WDNR Technical Standards).

OPERATIONS AND MAINTENANCE

Keep the HDD Plan, Spill Plan, and IR Plan on-site and accessible to all operators.
Replenish materials used for spill and IR response before proceeding with HDD installation.
Notify regulatory authorities prior to disposing of drilling fluid and cuttings at a site other than a licensed landfill or a site identified within permit application materials.

Convenience Drills. Prior to initiating a convenience drill, evaluate environmental risks and update or create an IR Plan for the convenience drills.

CONSIDERATIONS

The following are not required but are recommendations:

General Considerations.

Additional cover over the HDD drill path may be warranted in locations with highly variable soils or topography, larger product diameter, or under waterways where evidence of erosion, head cutting, or path morphology is observed. The minimum depth of cover requirement should be considered by all parties early in the design phase of each HDD project. The HDD project design may need to be modified to meet the minimum depth of cover requirements including changing the angle of entry/exit or extending the length.
When evaluating the cover under a wetland, consult with environmental staff with expertise in wetlands to determine if additional cover is needed based on soil or wetland type.
If product will carry hazardous substances, Federal minimum cover requirements may apply.
Avoid entry and exit elevation differences in excess of 50 feet. Avoid entry and low point elevation differences in excess of 50 feet.
For small and medium drill path segments, consider implementing required actions for larger drill path segments voluntarily where conditions warrant. For example, consider conducting a planning site walk-through where conditions at the drill path segment warrants a detailed plan and profile or where the Desktop Site Assessment provided limited or inconclusive information (such as poor-quality aerial photos, heavy tree canopy obstruction in aerial photos, outdated information, insufficient elevation data, etc.).

Initial Design.

The US Army Corps of Engineers may regulate some wetlands that receive a Wisconsin artificial wetland exemption.
Tribal/inter-tribal guidelines for wetland delineation may be applicable for some projects.
HDD has the potential to impact cultural resources, therefore review of publicly available spatial data from the Wisconsin Historical Society is recommended for all projects, regardless of size, and any potential impacts must be resolved prior to issuance of WDNR permits. Consult with a Cultural Resources Management contractor to assist in avoiding conflicts with historic sites at the design phase. Placement of
entry or exit pits, utility location holes, HDD boring routes, access routes, or other construction activity may be affected by protection of cultural resources or human burial sites.

Collect existing site-specific geotechnical information for small drill paths if the information from the Desktop Site Assessment indicates there is a combination of site-specific factors that together would create a high risk of an IR that would have significant environmental consequences. These factors include presence of shallow bedrock, bedrock fractures, poor soils, highly variable soils, ASNRI waters, and key wetland types.

Consider conducting a Desktop Site Assessment for soils for small drill paths outside areas of previous development.

Obtain additional geotechnical information for HDD installation under ASNRI waters if installation may be conducted during fish spawning periods.

Locate bore pits as far as practicable from wetland boundaries.

**Plan Development.**

Consider combining Wetland Review and Planning Site Walk-Through where the HDD drill path is adjacent to both key wetland types and ASNRI waters.

Note any access constraints and append a map of alternate access routes where warranted.

For large drill paths, conduct field survey work to provide the most accurate information relating to right of way and existing utilities.

Timing of operations and/or placement of entry or exit pits may be affected by protection of threatened or endangered species. Identify this in the HDD Plan.

If a cultural resource monitor is required during HDD operations, include in HDD Plan.

Where karst features underlay the drill path perform geophysical surveying techniques to determine soil boundaries, soil moisture, soil type, bedrock depth and voids. Ground penetrating radar is the most common type of geophysical survey and is effective at finding karst and soil/rock boundaries.

For large drill paths or drill paths within loose soils or fractured bedrock that are suspected to have a high probability of drilling fluid circulation challenges and IRs, consider conducting a hydrofracture analysis. Hydrofracture happens when drilling fluid pressure exceeds the strength and confining stress of surrounding soils. An Annual Pressure Curve (APC) may be generated as part of a hydrofracture analysis to help inform project design limitations which in turn help minimize impacts to environmental resources.

Review the following when performing a hydrofracture analysis or creating an APC:

- Topography;
- Proposed drill path length and depth;
- Subsurface soil conditions, including soil strata information and water table elevation;
- Minimum required drilling fluid pressure;
- Factor of safety for calculations (minimum of 1.5, except for locations with ASNRI waters or key wetland types use 2.0); and
- Site-specific subsurface soil conditions and testing (to obtain calculation variables including friction angle, shear modulus, etc.).

**Implementation.**

Discuss all other protected resources during the pre-construction meeting, including construction timing restrictions, threatened and endangered species, invasive species management, and cultural resource monitoring requirements.

In the event of an IR, consider notification of landowners in the vicinity of the IR prior to resuming operations.
Consider more frequent inspections of drill path during pilot hole, reaming, or after an IR has occurred. Consider supplementing contractor-responsible inspections with utility owner inspections.
Consider keeping logs of drilling pressures, soil types encountered for use in planning future HDD installations in the area.
Consider revising HDD Plan, Spill Plan and IR Plan if project conditions change, convenience drills are added, or there are more HDD drill paths planned along a longer profile with similar expected conditions.
Document unexpected conditions for future maintenance and future HDD projects in the area.
Consider implementing additional steps to minimize IRs for convenience drills, including practices described under criteria appropriate to the size and length of the drill path.
Consider avoiding HDD installation in winter or consider additional measures for HDD installation in winter due to frozen ground and snow cover: remove snow along drill path where possible; evaluate alternate entry pit and exit pit locations; inspect drill path and vicinity for discolored snow that may indicate an IR, particularly where water is likely to pool or leave the site; exercise additional caution with IR containment and cleanup; and inspect drill path after snow melt for evidence of IR.
Consider using drones and thermal imaging to assist with locating IRs in standing water or snow cover. Consider locating entry pits, exit pits, and staging areas outside of the 100-year floodplain.
Consider management of invasive species in right-of-way areas and measures to avoid spread of invasive species across work areas.
Consider using relief wells during construction where needed to control downhole fluid losses.

REFERENCES


NSF International, NSF/ANSI/CAN 60: Drinking Water Treatment Chemicals -- Health Effects program, Certified Drinking Water Treatment Chemicals list. [https://info.nsf.org/Certified/PwsChemicals/](https://info.nsf.org/Certified/PwsChemicals/)


University of Wisconsin-Madison, Wisconsin State Cartographer’s Office, Elevation/LiDAR Data. [https://www.sco.wisc.edu/data/elevationlidar/](https://www.sco.wisc.edu/data/elevationlidar/)


United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)
Wisconsin Soil Surveys, various dates.
https://www.nrcs.usda.gov/wps/portal/nrcs/surveylist/soils/survey/state/?stateId=WI

Wisconsin Department of Natural Resources, Natural Heritage Inventory (NHI) Portal.
https://dnr.wisconsin.gov/topic/nhi/calypso/portal.html

Wisconsin Department of Natural Resources, Spills Webpage. https://dnr.wisconsin.gov/topic/Spills

Wisconsin Department of Natural Resources, Surface Water Data Viewer.
https://dnrmaps.wi.gov/H5/?Viewer=SWDV

Wisconsin Department of Natural Resources, Wetland Screening and Delineation Procedures, Guidance Number 3500-2016-62, October 21, 2019.

Wisconsin Historical Society, Wisconsin Historic Preservation Database (WHPD).
https://www.wisconsinhistory.org/Records/Article/CS4091

Wisconsin Historical Society, Wisconsin Burial Sites Catalog.
https://www.wisconsinhistory.org/Records/Article/CS3130

GLOSSARY

Areas of Special Natural Resources Interest (ASNRI) waters: Waterbodies designated as state natural areas, trout streams, outstanding or exceptional resource waters, wild rice waters, waters in special area management plan or special wetland inventory study, coastal wetlands of Wisconsin, wild or scenic rivers, and sensitive areas of water bodies.

Bore pit: An entry pit, exit pit, or a pit used to monitor drilling fluid.

Convenience drills: Convenience drills are HDD implementation during the course of a project when alternative installation methods are not suitable or would be more detrimental to the environment. Convenience drills can be any of the sizes listed in this standard.

Drilling fluid: A mixture of bentonite, water and/or additives/polymers.

Drill path or drill path segment: A length of HDD installation starting at the entry pit and ending at the exit pit.

Entry pit: An excavation from which a drill path begins.

Exit pit: An excavation at the end of a drill path.

Final stabilization: All land-disturbing construction activities at the construction site have been completed and a uniform perennial vegetative cover has been established with a density of at least 70% of the cover for the unpaved areas and the areas not covered by permanent structures or by equivalent permanent stabilization measures.

Highly variable soils: Soils where the soil textural classification and layer thickness are likely to change several times within the length of the drill path.

Horizontal directional drilling (HDD): A trenchless method of installing underground utilities such as pipeline, conduit or cable, using a surface-launched drilling rig. HDD is often used to avoid or minimize impacts to surface features such as waterways, wetlands, roads and other surface features.

HDD project: A project containing one or more drill paths.

Inadvertent release (IR): An unintended return or release of drilling fluid during horizontal directional drilling. Also known as a frac-out or inadvertent return.
Key wetland type: Any wetland classified as Great Lakes ridge and swale complexes, interdunal wetlands, coastal plain marshes, emergent marshes containing wild rice, southern sphagnum bogs, boreal rich fens or calcareous fens.

Navigable waters: Any body of water which is navigable under the laws of this state (s. 30.01(4m), Wis. Stats.). Includes all lakes, streams, sloughs, bayous, and marsh outlets that meet the navigability criteria identified in s. 30.10(1) and (2), Wis. Stats., and s. NR 310.03(5), Wis. Adm. Code.

Navigable waterway: Any body of water with a defined bed and bank that is navigable under Wisconsin law. In Wisconsin a body of water is navigable if it is capable of floating on a regularly recurring basis the lightest boat or skiff used for recreation or any other purpose (s. NR 310.03(5), Wis. Adm. Code).

Other protected resources: Threatened or endangered species protected under s. 29.604, Wis. Stats. and historic property listed under ss. 44.45, Wis. Stats., burial sites protected under s. 157.70, Wis. Stats., and mapped floodways.

Product: The pipe, conduit, cable, or bundled cables being installed via HDD. The product is also known as a utility.

Product diameter: The nominal diameter of the pipe, conduit, casing, cable or bundled cables installed during an HDD operation.

Service lateral: A distribution line from a distribution facility or main to an individual customer or building.

Water resources: Includes navigable waters, navigable waterways, and wetlands that are defined in this standard.

Waters of the state: Includes those portions of Lake Michigan and Lake Superior within the boundaries of this state, and all lakes, bays, rivers, streams, springs, ponds, wells, impounding reservoirs, marshes, watercourses, drainage systems and other surface water or groundwater, natural or artificial, public or private, within this state or its jurisdiction. (s. 281.01(18), Wis. Stats.).

Wetland: An area where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions (s. NR 103.02(5), Wis. Adm. Code).
Summary of Required Actions for Small Drill Paths and Convenience Drills with Product Diameter <24"

<table>
<thead>
<tr>
<th>Project Stage</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Design</td>
<td>Desktop Site Assessment for Water Resources, Constructability, and Soils</td>
<td>Complete for all drill path segments. The following reviews are optional:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Identification of key wetland types and ASNRI waters; and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Review of existing soils information.</td>
</tr>
<tr>
<td></td>
<td>Initial Design Site Walk-through</td>
<td>Optional. Consider action for drill paths crossing key wetland types or ASNRI waters.</td>
</tr>
<tr>
<td></td>
<td>Geotechnical Investigation</td>
<td>Optional. Consider where poor or highly variable soils are present.</td>
</tr>
<tr>
<td>Plan Development</td>
<td>Wetland Review</td>
<td>Optional. Consider where key wetland types may be present.</td>
</tr>
<tr>
<td></td>
<td>Planning Site Walk-through</td>
<td>Optional. Consider where crossing ASNRI waters.</td>
</tr>
<tr>
<td></td>
<td>HDD Plan</td>
<td>Optional. Consider where drill paths cross key wetland types or ASNRI waters.</td>
</tr>
<tr>
<td></td>
<td>Spill Plan</td>
<td>Provide minimum contents for drill paths that cross key wetland types or ASNRI waters. Optional for all other drill paths.</td>
</tr>
<tr>
<td></td>
<td>IR Plan</td>
<td>Provide minimum contents for all drill path segments. Provide site-specific details for drill paths crossing key wetland types, ASNRI waters, or where tree clearing in wooded wetland likely to be needed for IR response.</td>
</tr>
<tr>
<td></td>
<td>Geophysical Investigation</td>
<td>Consider where karst features underlay the drill path</td>
</tr>
<tr>
<td></td>
<td>Hydrofracture Analysis</td>
<td>Consider where fractured bedrock and/or karst features or loose soils may be present.</td>
</tr>
<tr>
<td>Construction</td>
<td>HDD Pre-construction Meeting</td>
<td>Complete for all HDD projects.</td>
</tr>
<tr>
<td></td>
<td>HDD Path Walk-through</td>
<td>Complete for all drill paths.</td>
</tr>
<tr>
<td></td>
<td>Monitoring and Inspections</td>
<td>Required for all drill paths. Consider drill path inspection at least every 4 hours during drilling near key wetland types or ASNRI waters to supplement continuous monitoring of drilling fluid and returns.</td>
</tr>
<tr>
<td></td>
<td>Reporting</td>
<td>Required for all drill path segments.</td>
</tr>
</tbody>
</table>

Note: Small drill paths have a product diameter of 8 inches or less, and drill path length measured in the horizontal plane or station distance of 850 feet or less. Convenience drills are when HDD is selected during the course of a project when alternative installation methods are not suitable or would be more detrimental to the environment.
### Summary of Required Actions for Medium Drill Paths

<table>
<thead>
<tr>
<th>Project Stage</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Design</td>
<td>Desktop Site Assessment for Water Resources, Constructability, and Soils</td>
<td>Complete for all drill path segments.</td>
</tr>
<tr>
<td></td>
<td>Initial Design Site Walk-through</td>
<td>Complete for medium drill path segments.</td>
</tr>
<tr>
<td></td>
<td>Geotechnical Investigation</td>
<td>Complete for medium drill path segments. Existing geotechnical data or previous drilling experience may be used in lieu of a geotechnical boring.</td>
</tr>
<tr>
<td></td>
<td>Wetland Review</td>
<td>Optional for medium drill paths. Consider where key wetland types may be present.</td>
</tr>
<tr>
<td></td>
<td>Planning Site Walk-through</td>
<td>Complete for drill path segments that cross under key wetland types or ASNRI waters. Optional for other drill path segments.</td>
</tr>
<tr>
<td></td>
<td>HDD Plan</td>
<td>Complete prior to pre-construction meeting with minimum contents for all drill path segments and provide site-specific details for drill paths crossing key wetland types or ASNRI waters. Profiles are optional where minimum cover is provided. Staging details are optional.</td>
</tr>
<tr>
<td></td>
<td>Spill Plan</td>
<td>Provide minimum contents for all drill path segments. Provide site-specific details for drill paths crossing key wetland types and ASNRI waters.</td>
</tr>
<tr>
<td></td>
<td>IR Plan</td>
<td>Provide minimum contents for all drill path segments. Provide site-specific details for drill paths crossing key wetland types, ASNRI waters, or where tree clearing in wooded wetland likely to be needed for IR response.</td>
</tr>
<tr>
<td></td>
<td>Geophysical Investigation</td>
<td>Consider where karst features underlay the drill path.</td>
</tr>
<tr>
<td></td>
<td>Hydrofracture Analysis</td>
<td>Consider where fractured bedrock and/or karst features or loose soils may be present.</td>
</tr>
<tr>
<td>Construction</td>
<td>HDD Pre-construction Meeting</td>
<td>Complete for all HDD projects.</td>
</tr>
<tr>
<td></td>
<td>HDD Path Walk-through</td>
<td>Complete for all drill paths.</td>
</tr>
<tr>
<td></td>
<td>Monitoring and Inspections</td>
<td>Complete for all drill paths. Inspect drill paths under key wetland types or ASNRI waters using environmental inspectors at least every 4 hours during drilling to supplement continuous monitoring of drilling fluid pressure and returns.</td>
</tr>
<tr>
<td></td>
<td>Reporting</td>
<td>Required for all drill path segments.</td>
</tr>
</tbody>
</table>

Note: Medium drill paths have a product diameter less than 24 inches, and drill path length measured in the horizontal plane or station distance less than 1500 feet. Drill paths with a product diameter of 8 inches or less may be considered medium if the length of the drill path exceeds 850 feet but is less than or equal to 1500 feet.
## Summary of Required Actions for Large Drill Paths

<table>
<thead>
<tr>
<th>Project Stage</th>
<th>Description</th>
<th>Applicability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Design</td>
<td>Desktop Site Assessment for Water Resources, Constructability, and Soils</td>
<td>Complete for all drill path segments.</td>
</tr>
<tr>
<td></td>
<td>Initial Design Site Walk-through</td>
<td>Complete for all drill path segments.</td>
</tr>
<tr>
<td></td>
<td>Geotechnical Investigation</td>
<td>Complete for all drill path segments.</td>
</tr>
<tr>
<td>Plan Development</td>
<td>Wetland Review</td>
<td>Complete where wetlands may be present. Confirm location of key wetland types.</td>
</tr>
<tr>
<td></td>
<td>Planning Site Walk-through</td>
<td>Complete for drill path segments that cross under key wetland types or ASNRI waters. Optional for other drill path segments.</td>
</tr>
<tr>
<td></td>
<td>HDD Plan</td>
<td>Complete with site-specific information, anticipated staging plan and profile drawings.</td>
</tr>
<tr>
<td></td>
<td>Spill Plan</td>
<td>Complete a site-specific plan for all drill path segments.</td>
</tr>
<tr>
<td></td>
<td>IR Plan</td>
<td>Complete a site-specific plan for all drill path segments.</td>
</tr>
<tr>
<td></td>
<td>Geophysical Investigation</td>
<td>Optional for all drill path segments. Consider action where karst features underlay the drill path.</td>
</tr>
<tr>
<td></td>
<td>Hydrofracture Analysis</td>
<td>Optional for all drill path segments. Consider action where fractured bedrock and/or karst features or loose soils may be present.</td>
</tr>
<tr>
<td>Construction</td>
<td>HDD Pre-construction Meeting</td>
<td>Complete for all HDD projects.</td>
</tr>
<tr>
<td></td>
<td>HDD Path Walk-through</td>
<td>Complete for all drill paths.</td>
</tr>
<tr>
<td></td>
<td>Monitoring and Inspections</td>
<td>Complete for all drill paths. Inspect drill paths using environmental inspectors at least every 4 hours during drilling to supplement continuous monitoring of drilling fluid pressure and returns.</td>
</tr>
<tr>
<td></td>
<td>Reporting</td>
<td>Complete for all drill path segments.</td>
</tr>
</tbody>
</table>

Note: Large drill paths have a product diameter 24 inches or greater for any length, or the drill path length measured in the horizontal plane or station distance is 1500 feet or greater. Drill paths with a product diameter less than 24 inches may be considered large if the drill path length exceeds 1500 feet.
ATTACHMENT 2B EXAMPLE DRILL PATH PLAN AND PROFILE

LEGEND
- PROPOSED ALIGNMENT
- STREAM
- WETLAND/STREAM BUFFER
- TREE LINE
- HDD ENTRY/EXIT
- TEMP. WORKSPACE
- EXTRA TEMP. WORKSPACE
- EXISTING GRADE

PLAN
SCALE: 1"=150'

PROFILE
SCALE (VERT): 1"=150'
SCALE (HORIZ): 1"=150'

ATTACHMENT 2B EXAMPLE DRILL PATH PLAN AND PROFILE

LEGEND
- PROPOSED ALIGNMENT
- STREAM
- WETLAND/STREAM BUFFER
- TREE LINE
- HDD ENTRY/EXIT
- TEMP. WORKSPACE
- EXTRA TEMP. WORKSPACE
- EXISTING GRADE

PLAN
SCALE: 1"=150'

PROFILE
SCALE (VERT): 1"=150'
SCALE (HORIZ): 1"=150'
ATTACHMENT 2C EXAMPLE STAGING AREA PLAN FOR LARGE DRILL PATH

EROSION CONTROL DEVICES TO BE PLACED AT BOUNDARIES OF WORKSPACES ACCORDING TO THE WNR TECHN PLANS & PROCEDURE

PROPOSED ALIGNMENT

BOUNDARY OF WORKSPACE

ENTRY PIT & CONTAINMENT BERM 15'x15'

EXIT PIT & CONTAINMENT BERM 15'x15'

EQUIPMENT/BULK STORAGE 60'x30'

SURVEY TRAILER 25'x10'

MUD RIG SOLID HANDLING SPOIL STORAGE MUD/WATER STORAGE TYP. 25'x10'

PIPE TRAILER 40'x10'

SURVEY TRAILER 25'x10'

PIPE TRAILER 40'x10'

DRILL RIG 40'x10'

POWDER 10'x10'

MUD RIG SOLID HANDLING SPOIL STORAGE MUD/WATER STORAGE TYP. 25'x10'

EQUIPMENT/BULK STORAGE 60'x30'

SURVEY TRAILER 25'x10'

MUD RIG SOLID HANDLING SPOIL STORAGE MUD/WATER STORAGE TYP. 25'x10'

POWDER 10'x10'

BOUNDARY OF WORKSPACE

ADDITIONAL WORKSPACE FOR PIPE ASSEMBLY AND STAGING

EROSION CONTROL DEVICES TO BE PLACED AT BOUNDARIES OF WORKSPACES ACCORDING TO THE WNR TECHN PLANS & PROCEDURE

LEGEND

PROPOSED ALIGNMENT

EDGE OF WORKSPACE

TREE LINE

SCALE 1"=100'

1072
TECHNICAL STANDARD No.

09/2021

REVISION DATE

SCALE 1"=100'