

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

TECHNICAL STANDARD

HORIZONTAL DIRECTIONAL DRILLING

1072

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 reducing sediment discharge from work areas, reduce potential for runoff to carry construction materials into waters of the state, and clarifying expectations for spill prevention and response procedures that are relevant to HDD construction methods. This includes practices to reduce the risk of runoff carrying *drilling fluid* from *inadvertent releases (IRs)*, also known as a frac-out or inadvertent return, to *water resources* through prevention and response planning. This technical standard has been developed as provided in subchapter V of ch. NR 151, Wis. Adm. Code. This technical standard is not intended to provide comprehensive design guidance for all engineering and environmental considerations related to HDD.

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* 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, ground water quality protection, safety, spills, cultural resources, invasive species, threatened or endangered species, wetland impacts, waterway impacts, waste disposal, and wastewater disposal. This standard does not contain the text of federal, tribal, state, or local laws and regulations.

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

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.

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.

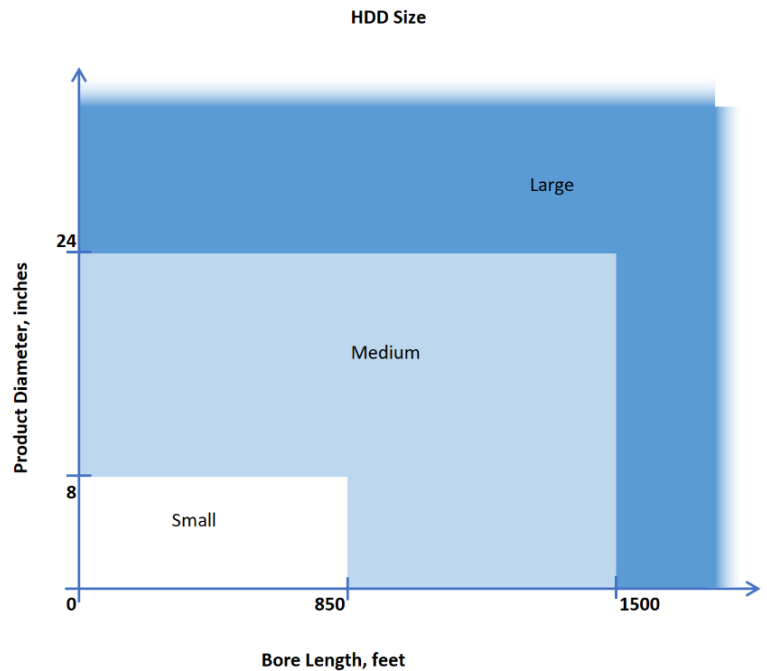
Attachment 1 contains criteria applicability matrices by drill path size. Please note that additional actions may be required where the length of the drill path moves it into the medium or large size category. Attachment 2 contains figures depicting typical HDD installation elements.

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 or equal to 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 greater than 1500 feet 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. Provide minimum cover listed in Table 1 unless there are site-specific design justifications for water resource crossings. Cover is measured from the top of the finished product to the bed or bank of a *navigable water or the soil surface* of wetlands and other waters of the state.

Product Diameter (in)	Depth of Cover (ft)*
≤ 6	4
≤ 15	6
≤ 24	10
>24	15

*Minimum cover is to reduce risk of IR. More cover may be needed to prevent future pipe exposure due to erosion or scour or in floodways or dredging in navigation channels.

Drilling Fluid. Use water from a known safe source free of bacterial and chemical contamination. The water used for drilling shall be stored in such a manner as to prevent contamination of the clean water. Document the source of water used to produce drilling fluids.

Unless prior WDNR approval is granted, use only products included in the Wisconsin Department of Natural Resource Approved Drilling and Filling Sealing Products List (including Heat Exchange Drillhole

Products), the NSF/ANSI/CAN 60: Drinking Water Treatment Chemicals – Health Effects program, or the Wisconsin Department of Natural Resources Approved HDD Drilling Fluid Products. Links to these lists are provided in the References section. Follow any use restrictions listed for those products or specified by WDNR during pre-approval. Non-petrochemical-based, non-hazardous additives that are not on the referenced lists may be submitted to the WDNR for prior approval per the process described on the Approved HDD Drilling Fluid Products list.

Initial Design Criteria

- (1) **Desktop Site Assessment.** Conduct the following desktop reviews for the *HDD site* as part of initial design to identify water resources, potential constraints, and challenging slope or soil conditions. The desktop site assessment is intended to identify conditions that may elevate IR risk, reduce the need for field modifications, and confirm the extent of the HDD site for the purposes of erosion and sediment control.
 - (a) **Water Resources** – Complete a desktop review using the following data sets which may be accessed via 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 for all drill paths. All waterways mapped in the WDNR 24K Hydrography Lakes and Open Water layer, 24K Hydrography Streams and Rivers layer, and any additional surface waters that are visible on aerial photos (leaf off is preferred), should be identified and presumed navigable unless determined non-navigable by WDNR through a navigability determination. If using the WDNR SWDV turn on the Surface Water layer. Under the Surface Water layer, the 24K Hydrography Lakes and Open Waters and 24K Hydrography 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 small drill paths that are part of a larger project that has more than 1 acre of land disturbing construction activity, identify Outstanding Resource Waters (ORW) and Exceptional Resource Waters (ERW). If using the WDNR SWDV, turn on the Clean Water Act Standards & Uses Waterways layer, and review the OERW Waters sublayer and the Tribal OERW sublayer.
 3. For medium and large drill paths, identify ASNRI waters, noting any waters that are also designated as ORWs or ERWs:

If using the WDNR SWDV, turn on the Priority Navigable Waterways layer, and review the ASNRI sublayer. Note that the Other Priority Navigable Waterways sublayer should be turned off for this review.
 4. For all drill paths, note any indicators of past dredging or scour in waterways visible on topographic maps and aerial photos. Indicators of past dredging include recently scraped soil and abrupt changes in vegetation growth. Indicators of scour and streambed instability include steep eroded banks, perched culverts, and exposed foundations.
 5. For small drill paths that are part of a larger project that has more than 1 acre of land disturbing construction activity, medium drill paths, and large drill paths, complete a desktop review using the following data sets 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 the area is either covered by existing impervious

surface or is documented as upland consistent with existing regulatory coordination processes.

- i. If using the WDNR SWDV, turn on the Mapped Wetlands layer and review the Wisconsin Wetland Inventory sublayers. Next turn on the Wetland Indicators & 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 section i. above.

b. Identify Key Wetland Types.

For medium and large drill paths for which 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. These are areas that may contain southern sphagnum bogs, boreal rich fens or calcareous fens.
 - iv. Areas that are actively farmed in row crop. Key wetland types are assumed to not be present in row crop areas.
6. Note drainage features such as storm sewers, storm sewer inlets, culverts and swales along the drill path that provide connectivity to water resources and are visible on aerial photos.

- (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. Include notes from review in project design documentation. Confirm conditions in the field as needed due to unclear desktop information.

During constructability review:

1. Verify access and space allocation for all elements of the HDD site, including space required for erosion and sediment control practices. Review drill path to confirm that proposed work can be completed within existing or proposed easements, fee ownership, or public right of way while minimizing impacts to *other protected resources*. Note land use adjacent to the drill path and known use restrictions.
2. Identify existing and proposed facilities within the project vicinity.
3. Verify required vertical and horizontal separation from existing and proposed facilities with existing facility owners to ensure construction crews can maintain

appropriate distances during installation, as separation requirements may be more restrictive than equipment or installation tolerances.

4. Review topography, visible geology, steep slopes, and signs of slope instability such as slumping.
5. Note any barriers to visual and physical access to drill path segments for IR monitoring or response. Note areas where tree removal within a wooded wetland may be required for IR monitoring or response but not otherwise required for the project.

(c) **Subsurface Conditions** – For medium and large drill paths, use existing subsurface condition 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 within application materials for any applicable permits:

1. Cobbles and boulders;
2. High gravel content;
3. Peat and/or muck soils;
4. Karst features and/or highly fractured bedrock;
5. Known or suspected artesian aquifers;
6. Shallow groundwater; and
7. Shallow bedrock.

(2) **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, bedrock, and depth to groundwater information. Lab-test samples if needed for additional classification, such as soil gradations and gravel percentages. Offset the geotechnical boring locations from the proposed drill path in order to avoid a potential conduit for IRs. 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. Increase the number of borings as needed to characterize the subsurface conditions for the purposes of design.

- (a) For medium drill path segments, conduct at least one geotechnical boring, or use existing geotechnical data or previous drilling experience for the site. Extend geotechnical bore depth to a depth that establishes the subsurface conditions that the pilot hole could potentially go through.
- (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 plus the pilot hole vertical tolerance.

Plan Development Criteria

(3) **Wetland Field 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, as required by applicable regulatory agencies, to confirm the absence and presence of wetlands along the drill path and associated work areas. Identify wetland boundaries, quality, and site characteristics. Conduct all wetland field reviews in accordance with regulatory agency 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 documents to avoid or minimize impacts to wetlands. Depict wetlands on maps and *project plans* used during HDD project planning, permitting, and construction.
- (4) **Written Plans.** For all HDD projects, develop an HDD Summary and IR Plan as described below. For HDD projects with only small drill paths, develop a Spill Plan specific to the areas known to cross ERWs or ORWs. For all other HDD projects, develop a Spill Plan as described below. These plans may be generic except where additional site-specific plan content is required. The plans may be separate documents or combined. Maintain plans or access to the plans at the site. Submit plans with permit application materials.
- (a) **HDD Summary** – For all projects, develop a project summary describing the project and planned actions to reduce the risk of IR. Include the following information:
 1. A paragraph summarizing the following:
 - a. Project location, including municipalities and counties crossed;
 - b. The type of product to be installed (i.e., conduit, pipe, cable, bundled cables) and purpose (i.e., electric, telecommunications, natural gas, etc.);
 - c. The product diameter(s);
 - d. Total number of drill paths planned for the project that are in each of the size categories. Service laterals less than 6” in diameter and less than 200 feet long may be omitted;
 - e. Minimum depth of cover under water resources. If less than that listed in Table 1, please identify the location(s) and explain why;
 - f. Anticipated unique challenges, such as night-time drilling, winter construction, etc.;
 - g. A list of anticipated project permits.
 2. List drill paths in tabular format. For small drill paths, only list segments that cross ERWs and ORWs. For medium and large drill paths, list all drill paths within the project. Include the following columns in the table:
 - a. Drill path unique identification number or code;
 - b. Location description, including one of the following: station of an entry or exit point, nearby road or intersection, Township/Range/Section, street address, and sheet numbers the drill path is depicted on;
 - c. Diameter in inches;
 - d. Length in feet;
 - e. Category of water resources crossed or adjacent to the HDD site (i.e., wetland, key wetland type, ERW, ORW, ASNRI water); and
 - f. IR Risk Factors present including, but not limited to: steep slopes, indicators of slope instability, high gravel content, peat and/or muck soils, cobbles, boulders, karst features, highly fractured bedrock, artesian aquifers, shallow groundwater, shallow bedrock, less than minimum cover. List all risk factors that apply.
 3. For all drill paths, summarize measures taken to address the IR risk factors identified in the previous section, including planned monitoring of HDD operations for IR. For medium and large drill paths, include at minimum:
 - a. A description of any elective actions, such as those listed under Considerations, completed to address IR risk factors on specific drill paths.
 - b. How drill paths will be inspected for IRs (i.e., on foot, using binoculars, drones, boats, etc.);
 - c. The number and expected qualifications of those conducting inspections;

- d. How often the drill path will be inspected for IRs;
 - e. Additional steps to be taken if a *substantial fluid reduction or gain* occurs during drilling.
4. For all drill paths, describe the potential actions that may be taken if HDD encounters unforeseen obstacles or failures. Identify potential alternate installation methods. Identify the organizations (i.e., general contractor, regulatory agencies, owner representatives, etc.) that will be consulted if an alternate method must be implemented. Identify permits or approvals that may need to be obtained or amended if the installation method or location changes.
5. If hydrofracture analysis has been completed for any drill paths within the project, summarize the results in graphical format. Identify the calculation method used, the primary inputs to the calculations, and factors of safety used. Completion of a hydrofracture analysis is not required for all drill paths but may be part of a plan to address IR risk factors.
6. For medium and large drill paths, attach a geotechnical report or summarize the site-specific conditions from existing information, identifying the source of the information. Include a map showing the location the information was obtained from in relationship to the site.
7. For medium and large drill paths, identify anticipated drilling fluid products. Provide the following information in table format: manufacturer, product name, function, and maximum % by weight. Note in the table which products are on the Wisconsin Approved Drilling and Sealing Product List, the NSF/ANSI/CAN 60: Drinking Water Treatment Chemicals – Health Effects list, or the Wisconsin Approved Horizontal Directional Drilling Products List.
8. For medium and large drill paths, identify any planned disposal location options for drill fluid and cuttings that will be available to the HDD contractor.
9. For medium and large drill paths, attach a plan depicting the HDD site. Include the following information:
 - a. Drill path location;
 - b. Limits of proposed disturbance;
 - c. Topography/ground surface and features (e.g., from civil survey or LiDAR);
 - d. Workspaces with adequate space for the drill rig and supporting equipment, materials, and pipe, space to stage and weld pipe for pullback;
 - e. Access route for entry and exit points;
 - f. Water resources and locations with restrictions due to other protected resources. Label key wetland types and ASNRI waters;
 - g. Environmental protections for the HDD site including erosion and sediment controls, timber mats, dewatering, setbacks, etc.;
 - h. The location and size of existing and proposed utilities near or crossing the drill path;
 - i. Underground structures (seawalls, storage tanks, etc.); and
 - j. Limits of proposed containment berms, if applicable.
10. For large drill paths, attach a profile with the following information:
 - a. Existing and proposed ground surface;
 - b. Specific station and elevation data;
 - c. Vertical tolerance for the drill path;
 - d. Anticipated cover under water resources;
 - e. Proposed vertical alignment, including entry and exit angle, points of curvature, points of tangent, and radius of curvature;
 - f. Subsurface information including soil profile, water table elevation, bedrock elevation;

- g. The location and size of existing and proposed utilities near or crossing the drill path; and
- h. Boundaries of key wetland types and ASNRI waters.

(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 ERWs or ORWs and medium drill paths without key wetland types or ASNRI waters. For large drill paths or medium drill paths with key wetland types or ASNRI waters, also include the additional details. This information may be provided by drill path or groups of drill paths with similar site conditions and risk factors.

Table 2 Spill Plan Elements		
Plan Element	Minimum Contents	Additional Details
Potential Contaminants	List of most common pollutant sources present on HDD projects.	List materials and quantity expected on-site. *
Spill Containment	Include typical elements of a spill response kit.	Describe expected material storage areas, secondary containment, and locations of spill response kits and equipment (i.e., at fueling station or in liquid storage trailer). Describe additional protections planned where wetlands and waters of the state are within 250 feet of the site. For projects with multiple drill paths, identify the drill paths where the additional protections will be implemented. *
Spill Response Practices	Include typical practices used on HDD projects.	Location-specific contact information for agencies, the responsible party and response teams. If not known, include a position description (i.e., site superintendent or HDD foreman) and leave space to fill in contact information at the preconstruction meeting. Include WDNR contacts for spills coordinators, duty officers, and wardens.

Note: Items marked with '*' should be completed with the best available information based on previous projects and site-specific knowledge. Information can be modified as part of an amendment process for most permits.

(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 additional details. This information may be provided by drill path or groups of drill paths with similar site conditions and risk factors. 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 any site-specific approaches in the IR Plan.

Table 3 IR Plan Elements		
Plan Element	Minimum Contents	Additional Details
Response Training	Requirements for site personnel.	Identify site-specific resources as part of training or provide to pre-trained individuals.
On-site and On-call Equipment	List of materials and equipment types to be used during IR response and whether they are staged at the entry point, exit point, or on-call. Include at minimum: <ul style="list-style-type: none"> • Containment materials • Hydrovac (with capacity information). 	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 the types and capacities of on-site or on-call equipment. *
Access	Describe best management practices (BMPs) that will be utilized to minimize impacts associated with access.	Describe site-specific plans for access, and response actions for release into any areas that cannot be accessed by personnel. Identify alternate access options to avoid or minimize tree removal.
Response and Control	Describe required actions to commence as soon as a potential IR is identified.	Describe responses for site-specific environmental resources along the drill path.
Extended Response Actions	Describe actions required after immediate response is complete.	Describe responses for site-specific environmental resources along the drill path.
Resumption of Drilling	Describe what is required before drilling resumes after an IR.	Describe any site-specific considerations regarding resumption of drilling operations.
Post-IR Restoration	Describe methods to restore to original or better condition and the required timing of restoration.	Describe resource areas where specific restoration protocols are needed.
Communications and Notifications	List titles and organizations of those who must be communicated with in the event of project changes or an IR. Leave space for project-specific phone numbers to be added at the pre-construction meeting.	Location-specific contact information where needed for agencies and response teams. If the project is not bid prior to permit application, leave space for contractor contacts to be added at the pre-construction meeting.
Figures	Not required.	Figure showing HDD entry and exit points, the drill path, and all water resources.

Items marked with "*" should be completed with the best available information based on previous projects and site-specific knowledge. Information can be modified as part of an amendment process for most permits.

Construction Criteria

- (5) **HDD Pre-Construction Meeting.** For projects with medium and large drill paths, 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 combined with the HDD Site Observation.

For projects with medium and large drill paths, invite those involved with the HDD project, including but not limited to representatives of the following:

- Project owner (required for large drill paths);
- General contractor (required for large drill paths);
- Drill contractor (required);
- Designers/engineers (if available); and
- Owner's environmental staff or consultant (required for large drill paths).

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;
- Mapped floodways and 100-year flood boundaries;
- Timing restrictions;
- Seasonal considerations;
- Permit compliance;
- Erosion and sediment control practices;
- HDD Summary, Spill Plan, and IR Plan;
- Monitoring, recordkeeping and reporting;
- Chain of command; and
- Restoration and final stabilization.

- (6) **HDD Site Observation.** For all projects, the HDD operator and locator shall physically walk or observe the HDD site prior to starting the drill. If remote sensing equipment will be used to monitor for IRs in less accessible portions of the drill path, test this equipment as part of the observation. During the observation identify potential obstacles and note the location of site-specific risk factors, environmental conditions, and water resources within the HDD site. For projects with only small drill paths, discuss the IR Plan. If erosion and sediment control practices have been installed prior to the observation, confirm that practices are in operational condition. 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 as needed based on site conditions. Include additional personnel with the HDD operator and locator as follows:

- (a) For the observation of medium HDD drill paths, invite additional personnel, such as the project owner's representative and a design team representative.
- (b) For large drill paths, require attendance by a project owner's representative and a design team representative.
- (c) For medium and large HDD drill paths that cross ASNRI waters or key wetland types, require attendance by an environmental representative.

- (7) **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 the returns continuously during drilling operations. Inspect the drill path immediately upon noted loss of drilling fluid. If no IR is found but there are sustained fluid losses, the drill path and surrounding area should be monitored continually until either losses are reduced or installation is complete. For medium and large drill paths, supplement monitoring returns with visual inspections at least every 4 hours.

Document any substantial fluid loss or gain. A *substantial fluid loss or gain* is one that is estimated to exceed the lesser of 50% of the *drill path volume* or 500 gallons. If fluid loss is recovered within a few hours due to adjustments to drilling operations, only the unrecoverable amount is considered when assessing if a substantial fluid reduction has occurred.

Maintain documentation that monitoring and inspections are completed as specified in this section and provide to WDNR upon request. For small drill paths and medium drill paths where the entire drill path is visible to the HDD contractor during drilling, documentation may be limited to describing the frequency of observations and the names of the staff observing the drill path in lieu of documenting individual inspections. For medium drill paths where the entire drill path is not visible to the HDD contractor during drilling, inspection documentation should include at minimum the date, time, name of inspector, and whether an IR was observed. For large drill paths, include the name of the inspector, the date, the time, the stage of installation (pilot hole, reaming, or pullback), and any observations that were made along with the location of the observation.

Additionally, for large drill paths and medium drill paths that cross key wetland types or ASNRI waters require the owner's construction or environmental representative to inspect the drill path at least once per day or more often after an IR occurs.

- (8) **Reporting.** For all HDD projects, report IRs, spills, and project modifications as required by applicable permits and federal, tribal, state, and local regulations. At a minimum notify WDNR Spills Hotline (1-800-943-0003) within 24 hours if drilling fluid enters an ERW or ORW or a substantial loss or gain has occurred. 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;
- Estimated amount of fluid lost or gained;
- Estimated amount of fluid recovered during IR response;
- 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, entry/exit point placement, or containment pit placement to avoid impacts to threatened or endangered species, trout streams, and cultural resources;
- Written HDD Summary, Spill Plan, and IR Plan;
- Potential convenience drill locations;
- Proper erosion and sediment control devices to protect workspace boundaries (refer to other WDNR Technical Standards);
- Requirements for documenting installed location.

If formal project plans are not completed, provide the applicable information above to the contractor in an alternate format.

OPERATIONS AND MAINTENANCE

Keep the HDD Summary, Spill Plan, and IR Plan on-site or accessible from the site during construction.

Replenish materials used for spill and IR response before proceeding with HDD installation.

If used, provide drill fluid containment pits with sufficient capacity to avoid overflowing during rain events.

Dispose of drilling fluid and cuttings in compliance with state and local requirements.

Convenience Drills. Prior to initiating a convenience drill, evaluate environmental risks and update or create an IR Plan for the convenience drills. For convenience drills with product diameters greater than 24 inches, follow the criteria for large drill paths.

CONSIDERATIONS

The following are not required under this technical standard but are recommendations and reminders of commonly overlooked measures that may be required under other rules, laws, and regulations:

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 HDD design engineer or geotechnical consultant AND 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 where possible.

For small and medium drill path segments, consider implementing required actions for larger drill path segments voluntarily where conditions warrant. For example, consider developing a detailed plan and profile where subsurface conditions are highly variable.

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.

Geotechnical investigation work may require coverage under wetland or waterway permits.

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 points, containment 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. Coordination between federal, state, and/or tribal historic preservation specialists may be necessary for some projects.

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 subsurface conditions 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 containment pits as far as practicable from wetland boundaries.

Obtain geotechnical borings every 500 feet along the drill path or as necessary to characterize subsurface conditions.

Document why some water resources are crossed by HDD and some are crossed with other installation methods.

Plan Development.

Document drill path field conditions using photos and notes prior to snow cover if construction is likely to begin after snow cover is in place.

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.

Conduct a bathymetric survey where needed to determine the depth of surface water features.

Timing of operations and/or placement of entry or exit points may be affected by protection of threatened or endangered species. Identify the purpose for these adjustments and modifications within the HDD Summary.

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

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 Annular Pressure Curve (APC) may be generated as part of a hydrofracture analysis to help inform project design limitations which, in turn, helps to 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;
- Minimum factor of safety for calculations of annular pressure:
 - Use at least 2.0 under water resources;
 - Use at least 1.5 in all other locations;
 - Mitigation measures to prevent IR where safety factors cannot be met, such as conductor casings or wash-over casings.
- 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.

Increase cover and have an environmental monitor inspecting during installation under a high-quality water resource during fish spawning season.

Scan the drill path for locating system interference during the pre-construction walk-through.

In the event of an IR, notify landowners in the vicinity of the IR prior to resuming operations.

Inspect the drill path more frequently during pilot hole, reaming, or after an IR has occurred. Supplement contractor-responsible inspections with utility owner inspections.

Keep bore logs of soil types encountered for use in planning future HDD installations in the area. Prepare as-built plans for each drill path.

Revise the HDD Summary, 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.

Implement additional steps to minimize IRs for convenience drills, including practices described under criteria appropriate to the size and length of the drill path.

For HDD installation in winter when snow cover is present and the ground is frozen, include the following additional measures for HDD installation: remove snow along the drill path where possible; evaluate alternate entry point and exit point locations; inspect the drill path and areas in the vicinity of the drill path 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 the drill path after snow melt for evidence of IRs.

Use drones and thermal imaging to assist with locating IRs in standing water or snow cover.

Document field changes on HDD plans, along with any unmapped utilities encountered, for future use in utility locates.

Implement measures to avoid the spread of invasive species due to construction activities.

Stop work and contact the State Historical Preservation Officer at the Wisconsin Historical Society if excavated material appears to contain cultural resources or human remains.

During construction, use relief wells during construction where needed to control downhole fluid losses.

Use the tracking capabilities of installation equipment to create a record of the installed product location, both vertically and horizontally.

The WDNR may require chemical analysis of the water used to produce drilling fluids.

The WDNR may take actions, within the context of regulatory programs established by statutes or rules, if those actions are necessary to protect public health and welfare or to prevent a significant damaging effect on groundwater or surface water quality for present or future consumptive or non-consumptive

uses, whether or not an enforcement standard and preventive action limit for a substance have been adopted under ch. NR 140, Wis. Adm. Code.

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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: A containment pit used to monitor drilling fluid. Often these are located near the entry and exit points for a drill path.

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.

Containment pit: An excavated area used to manage drill fluid. Containment pits are typically located near the entry or exit points.

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 point and ending at the exit point.

Drill path volume: The diameter of the borehole times the length of the drill path at the time of the loss or gain.

Entry point: The location where a drill path begins.

Exit point: The location where a drill path ends.

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.

HDD site: All areas needed to complete an HDD drill path. The HDD site includes space needed for equipment and operations at the entry point, exit point, containment pits, laydown area, pull-back area, and equipment staging areas. The HDD site also includes the drill path, associated areas of vegetation removal, and area needed to access all other parts of the site from public roads.

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. The following resources may be used to identify other protected resources: [WDNR's NHI](#) portal and the spatial data available from the [Wisconsin Historical Society](#).

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. For bundled cables, the product diameter is the nominal outside diameter of the bundle.

Project plans: Engineered drawings, sketches, marked-up aerial photos, or other depiction of the proposed work for the purposes of communicating the location and scope of a construction project.

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

Soil surface: The surface profile of the existing ground above water level.

Substantial fluid reduction or gain: A change in the drill fluid volume that is estimated to exceed the lesser of 50% of the *drill path volume* or 500 gallons.

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).

Attachment 1A
Summary of Required Actions for Small Drill Paths

Project Stage	Description	Applicability
Initial Design	Desktop Site Assessment for Water Resources, Constructability, and Subsurface Conditions	Complete for all drill path segments. If small drill path is part of a project with at least 1 acre of land disturbing construction activity, identify ORWs and ERWs. The following reviews are optional: <ul style="list-style-type: none"> • Identification of key wetland types and ASNRI waters; and • Review of existing soils information.
	Geotechnical Investigation	Optional. Consider where poor or highly variable soils are present.
Plan Development	Wetland Field Review	Optional. Consider where key wetland types may be present.
	HDD Summary	Provide items 1-4 and item 5 if applicable.
	Spill Plan	Provide minimum contents for drill paths that cross ERWs and ORWs. Optional for all other drill paths.
	IR Plan	Provide minimum contents for all drill path segments. Provide additional details for drill paths crossing ERWs, ORWs, or where tree clearing in wooded wetland is likely to be needed for IR response.
	Geophysical Investigation	Optional. Consider where karst features are likely.
	Hydrofracture Analysis	Optional. Consider where fractured bedrock and/or karst features or loose soils may be present.
Construction	HDD Pre-construction Meeting	Optional. Consider combining with path observation.
	HDD Site Observation	Complete for all drill paths.
	Monitoring and Inspections	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.
	Reporting	Required for all drill path segments.

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.

Attachment 1B
Summary of Required Actions for Medium Drill Paths

Project Stage	Description	Applicability
Initial Design	Desktop Site Assessment for Water Resources, Constructability, and Subsurface Conditions	Complete for all drill path segments.
	Geotechnical Investigation	Complete for medium drill path segments. Existing geotechnical data or previous drilling experience may be used in lieu of a geotechnical boring.
Plan Development	Wetland Field Review	Optional for medium drill paths. Consider where key wetland types may be present.
	HDD Summary	Complete items 1-9.
	Spill Plan	Provide minimum contents for all drill path segments. Provide additional details for drill paths crossing key wetland types and ASNRI waters.
	IR Plan	Provide minimum contents for all drill path segments. Provide additional details for drill paths crossing key wetland types, ASNRI waters, or where tree clearing in wooded wetland likely to be needed for IR response.
	Geophysical Investigation	Optional. Consider where karst features are likely.
	Hydrofracture Analysis	Optional. Consider where fractured bedrock and/or karst features or loose soils may be present.
Construction	HDD Pre-construction Meeting	Complete for all HDD projects.
	HDD Site Observation	Complete for all drill paths.
	Monitoring and Inspections	Complete for all drill paths. Inspect drill paths at least every 4 hours during drilling to supplement continuous monitoring of drilling fluid pressure and returns. Where key wetland types or ASNRI waters are present, include an owner's construction or environmental representative at least once per day or more often after an IR.
	Reporting	Required for all drill path segments.

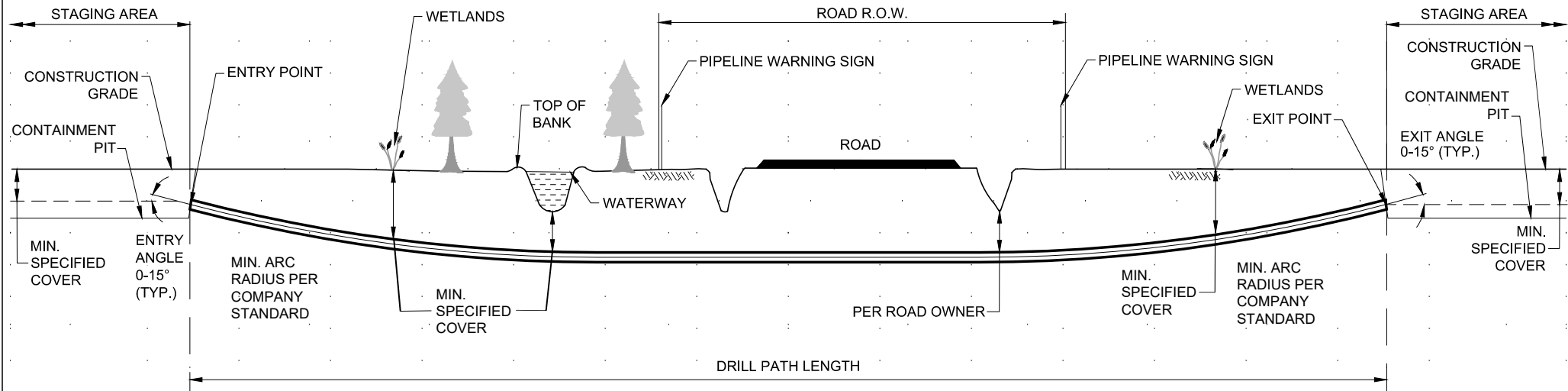
Note: Medium drill paths have a product diameter less than 24 inches, and drill path length measured in the horizontal plane or station distance less than 1500 feet. Drill paths with a product diameter of 8 inches or less may be considered medium if the length of the drill path exceeds 850 feet but is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

Attachment 1C
Summary of Required Actions for Large Drill Paths

Project Stage	Description	Applicability
Initial Design	Desktop Site Assessment for Water Resources, Constructability, and Subsurface Conditions	Complete for all drill path segments.
	Geotechnical Investigation	Complete for all drill path segments.
Plan Development	Wetland Field Review	Complete where wetlands may be present. Confirm location of key wetland types.
	HDD Summary	Complete Items 1-10.
	Spill Plan	Complete a plan with additional details for all drill path segments.
	IR Plan	Complete a plan with additional details for all drill path segments
	Geophysical Investigation	Optional for all drill path segments. Consider action where karst features underlay the drill path.
	Hydrofracture Analysis	Optional for all drill path segments. Consider action where fractured bedrock and/or karst features or loose soils may be present.
Construction	HDD Pre-construction Meeting	Complete for all HDD projects.
	HDD Site Observation	Complete for all drill paths.
	Monitoring and Inspections	Complete for all drill paths. Inspect drill paths at least every 4 hours during drilling to supplement continuous monitoring of drilling fluid pressure and returns. Where key wetland types or ASNRI waters are present, include an owner's construction or environmental representative at least once per day or more often after an IR.
	Reporting	Complete for all drill path segments.

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 2A TYPICAL DRILL PATH ELEMENTS



NOTE: REFER TO WISCONSIN DNR TECHNICAL STANDARD 1072 HORIZONTAL DIRECTIONAL DRILLING FOR DETAILED CRITERIA AND CONSIDERATIONS FOR HDD PROJECTS.

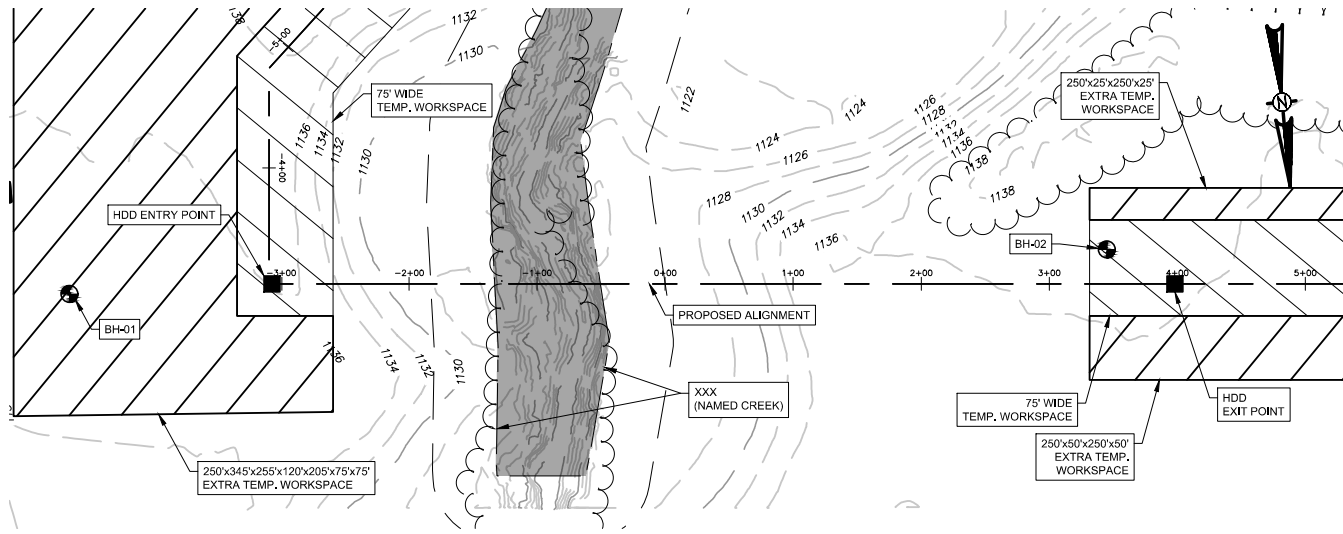


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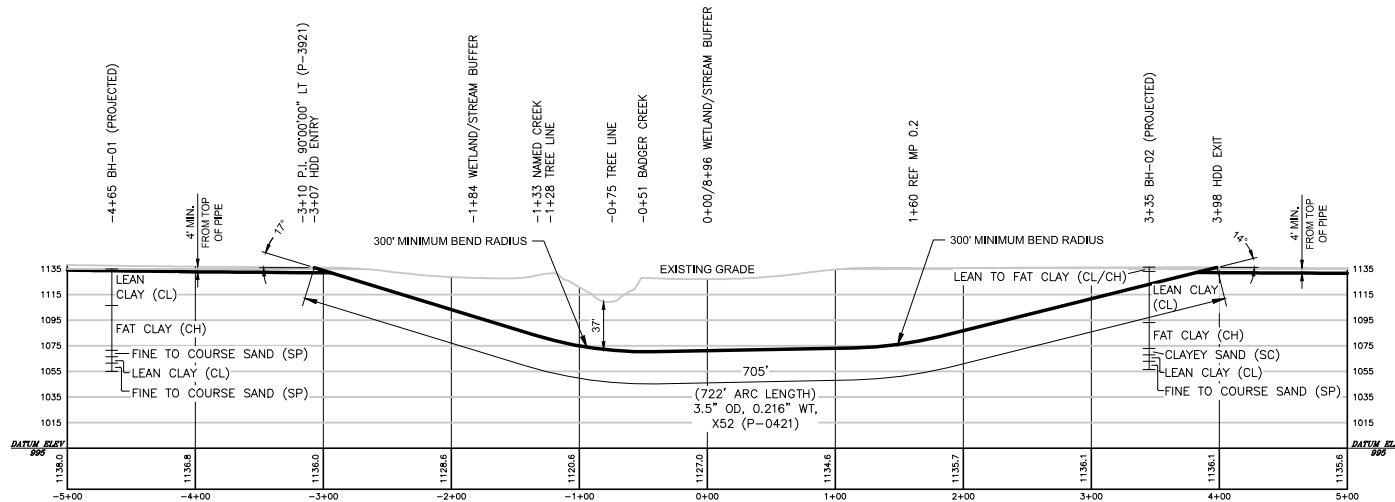
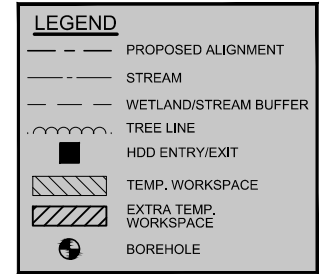
09/2022
REVISION DATE

NOT TO SCALE

ATTACHMENT 2B EXAMPLE DRILL PATH PLAN AND PROFILE



PLAN
SCALE: 1"=150'



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



1072
TECHNICAL STANDARD No.

09/2022
REVISION DATE

SCALE 1"=150'