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1 General

1.1 OBJECTIVES

- .1 To minimize the disturbance of existing vegetation and soil within the extent of the construction site as indicated on the drawing.
- .2 Prevent the loss of soil from the site (including topsoil stockpiled for reuse) resulting from storm water runoff, wind erosion and construction activities.
- .3 Prevent sedimentation of storm water or receiving streams.
- .4 Prevent pollution of the air with dust and particulate matter.

1.2 DESCRIPTION OF WORK

- .1 Temporary Erosion and Sediment Control (ESC): includes the installation and maintenance of temporary structural control measures as required or specified to reduce or eliminate the erosion of soil and transport of sediment off-site.
- .2 Minimize the amount of disturbed soil and preserve existing vegetation by establishing construction boundaries, using stakes to indicate the limits of construction including construction area, laydown area, and stockpile area.
- .3 Clearly mark the trees to be preserved and protect them from ground disturbances around the base of the tree.
- .4 Dust Control: includes the management of operations and the application of water or dust palliatives in order to reduce or eliminate the spread of dust from the Project limits.
- .5 Coordination of Work of this Section with all other ESC Measures in place or planned under other Designated Contract Areas including laydown, work staging areas such as parking, office trailers, etc.
- .6 Follow strategy based on the best management practices for stabilization and structural measures outlined in Chapter 3 of EPA 832-R-92-005 "Storm Water Management for Construction Activities", Standard Construction Specifications published by Manitoba Infrastructure and Transportations Department, or City of Winnipeg Best Management Practices Handbook for Activities in and Around the City's Waterways and Watercourses, November 2005, whichever is more stringent.
- .7 Accept formal responsibility for monitoring, managing, replacing, and maintaining the ESC measures throughout the construction period and during warranty period.
- .8 Monitor and inspect ESC measures on a daily basis.

- .9 Coordinate ESC requirements of the overall project, with the site specific Erosion and Sedimentation Control requirements by other Contractors, which are specific to their Contracts.
- .10 During cessation of construction activity due to winter shutdown (if any), continue to provide erosion and sedimentation control measures.
- .11 Provide weekly reports to the Contract Administrator describing monitoring and maintenance activities during weekly meetings.
- .12 Review the existing ESC measures implemented and other preventative measures with all contractor employees and employees of sub-contractors on site. If additional measures are required, review with the Contract Administrator. Where there is a conflict with the requirements, the most stringent requirements will govern.

2 Products

2.1 TEMPORARY EROSION AND SEDIMENT STRUCTURAL CONTROLS

- .1 As indicated in the drawings or in the subsequent sections.
- .2 As required based on construction operations and staging of work.

3 Execution

3.1 REGULATORY REQUIREMENTS

- .1 Comply with all Federal, Provincial and Municipal legal and regulatory requirements and determine all applicable and relevant environmental legislation for this project, stipulated in the approvals, terms and conditions issued by Department of Fisheries and Oceans (DFO), and Province of Manitoba.

3.2 GENERAL REQUIREMENT

- .1 Incorporate the Manitoba Infrastructure and Transportations Department, USEPA standards as indicate above, or City of Winnipeg Handbook as indicated above; where they conflict, the more stringent requirements govern.
- .2 Minimize the amount of disturbed land that is susceptible to erosion. Ensure that areas outside the limits of construction are clearly defined and protected for all construction activities.
- .3 Provide immediate permanent or temporary pollution, sedimentation and erosion control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, designated site holding pond or other areas of water impoundment, or the delivery and deposition of sediment onto adjacent roads or properties. Use the designated site holding pond for collecting storm water, settling sediments, and/or dewatering and the like.

- .4 Install the appropriate erosion and sediment structural controls measures in accordance with approved sequence of construction. Schedule and perform clearing, grubbing and stripping operations so that grading operations and permanent erosion control features can follow immediately thereafter.
- .5 If sediment is deposited outside the Project limits, remove the sediment from the location(s) in which it is deposited within twenty-four (24) hours of the occurrence.
- .6 Any mud-tracking shall be avoided and clean haul routes to and from Site. Clean off mud from vehicles prior to leaving site.
- .7 Contractor shall provide a Site Management Plan that employs the Best Management Practices with proper house-keeping that would prevent pollution or releasing deleterious material to the adjacent water bodies or storm water infrastructure systems. The Site Management Plan shall address, at a minimum the following items:
 - .1 Site layout and boundaries indicating proposed Contract boundary.
 - .2 Site setup for construction staging.
 - .3 Temporary site utilities, potable water, and sewage requirements during the course of construction activities with proper and regular cleaning and off-site disposal procedure.
 - .4 Parking requirements.
 - .5 Fuelling and Maintenance Areas with spill prevention and emergency response clean up kit.
 - .6 Designated equipment storage area.
 - .7 Security and access requirements.
 - .8 All materials and waste handling requirements.
 - .9 Location for general recycling materials and storage, if used.
 - .10 Dust control measures and application.
 - .11 Water management during earthworks construction, outfall installation and pipe installation.
 - .12 On site management of top soil and subsoil stockpiles with sedimentation control measures.

3.3 SUSPENSION OF WORK

- .1 The City of Winnipeg or Contract Administration may suspend work in cases where, in their opinion, the Contractor fails to comply with procedures. If the Contractor fails to maintain or implement proper ESC to protect the adjacent water bodies and storm water systems, the Contract Administrator may make other arrangements to have the work completed, and deduct the cost thereof from any money owing to the Contractor.

3.4 EMERGENCY PROCEDURE AND RESPONSE

- .1 Provide a description and tabulation of potential environmental emergency procedures and responses.
- .2 Provide a breakdown of these emergency procedures and responses that include at minimum:
 - .1 Operational Requirements
 - .2 Release Reporting.
 - .3 Comply with all Municipal, Provincial and Federal environmental emergency procedures and requirements in this regard.

3.5 SLURRY AND SILT CONTROL MEASURES

- .1 Construct, regularly inspect, maintain and repair as necessary, such facilities until such time that the risk of silt and/or deleterious materials entering the storm sewer drainage system for the construction phase has passed.
- .2 When using vegetation control, consult with the Contract Administrator on which species are to be used. Do not use non-native/invasive species.
- .3 Saw cutting slurry may contain substances such as sediment, hydrocarbons from asphalt cutting or high pH water from concrete cutting that may be harmful to the aquatic environment. All saw cutting slurry must be contained in a manner that will ensure that none of the materials enter the storm water system or the adjacent creek, in accordance with Government of Manitoba, Department of Fisheries and Oceans requirements (where they conflict, the most stringent requirements apply).
- .4 Use a sway with a built-in slurry containment system. Dispose of solid and liquid clean-up material as per provincial and federal regulation.

3.6 STABILITY MEASURES

- .1 Preservation of Natural Vegetation:
 - .1 Establish construction boundaries to limit site disturbance so that no vegetation damage is done beyond this boundary.
 - .2 Use stakes to indicate limits of construction, grading and disturbance. Clearly mark
 - .3 The trees to be preserved and protect them from ground disturbances around the base of the tree.
 - .4 Rehabilitate natural vegetation to pre-construction condition if damaged during construction activity.
- .2 Dust Control:

- .1 Use vegetative cover, mulch, spray-on non-toxic adhesives, clean water sprinkling, stone, or barriers when open dry areas of soils are anticipated on site.

3.7 SILT BARRIER FENCES

.1 Placement of Silt Barrier Fence:

- .1 Place silt barrier in a manner that will intercept run-off at or close to right angles to flow. In areas where problem is severe, erect two or more silt barriers parallel to each other, until required degree of control is achieved.
- .2 Position posts at maximum 2 metres o.c., in such a manner that the fence structure remains naturally taut and placed or driven a minimum of 300 mm into the ground.
- .3 Position posts so that they are downstream.
- .4 Where a 300 mm depth is impractical or impossible, adequately secure or brace posts to prevent overturning of fence due to sediment loading.
- .5 Bury excess geotextile at bottom of silt fence minimum of 150 mm in trench located upstream such that no flow can pass under fence.
- .6 Splice subsequent lengths of barrier only at support post locations. Splice by wrapping geotextile fabric completely around each of two abutting support posts, such that gap between abutting posts is completely covered by other sections of fabric.
- .7 Do not use where site slope is steeper than 3:1.
- .8 Silt barrier to have a >75% efficiency. Employ successive, parallel fences to achieve required degree of control.

3.8 OTHER STRUCTURAL MEASURES

- .1 Use one or more of the following structural measures, as required and/or where applicable.
- .2 Earth Dike:
 - .1 Construct a mound of stabilized soil to divert surface run-off volumes from the disturbed areas or into sedimentation basins or sedimentation traps.
- .3 Storm Drain Inlet Protection:
 - .1 Place a filtering measure around any inlet or drain to trap sediment and prevent it from entering the inlet structures.
 - .2 Structure may be composed of gravel and stone with a wire mesh filter, block and gravel, filter fabric or sod.
- .4 Temporary Earth Check Dams:
 - .1 Install earth check dams during stripping process to ensure protection from run-off into natural drainage areas surrounding the site.

- .2 Build temporary earth check dams to suit field conditions. Verify site conditions prior to placement.
- .3 Review locations with Contract Administrator prior to placement of material.
- .4 Remove temporary earth check dams, except as determined by the Contract Administrator, when permanent seeding has been established and is exhibiting rigorous growth.
- .5 Surface Roughening:
 - .1 Create horizontal grooves, depressions, or steps that run parallel to the contour of the land.
 - .2 Use surface roughening on all slopes, as soon as possible after the vegetation has been removed.
 - .3 Methods of surface roughening are stair-step grading, grooving (using disks, spring harrows, or teeth on a front-end loader), and tracking (driving a crawler tractor up and down a slope, leaving the cleat imprints parallel to the slope contour).

3.9 MONITORING AND MAINTENANCE REQUIREMENTS

- .1 Coordinate with all maintenance, monitoring, and reporting procedures.
- .2 Conduct daily monitoring and bi-weekly maintenance reports and submission to the Contract Administrator.
- .3 Maintain integrity of silt fences, and all other erosion and sedimentation control measures as long as necessary to contain sediment run-off. Inspect all temporary silt fences and all other erosion and sedimentation control measures immediately after each storm, rainfall, snow melt and the like, with twenty-four (24) hours of such event, weather permitting and at least daily during prolonged rainfall or storm. Immediately correct any deficiencies.
- .4 Maintain and monitor silt fences, erosion and sedimentation control measures during holidays, and other times when construction is not in progress, at least on a weekly basis or more often as required by the Contract Administrator.
- .5 In addition, make daily review of location of silt fences and other sedimentation control measures in areas where construction activities have changed natural contours and drainage run-off to ensure that silt fences and other sedimentation and control measures are properly located for effectiveness. Where deficiencies exist, install additional silt fences and other sedimentation and control measures. Should silt fences or other sedimentation and control measures become damaged or otherwise ineffective while barrier is still necessary, repair or replace within twenty-four (24) hours.
- .6 Remove sediment deposits when deposit reaches approximately one-third ($\frac{1}{3}$) of height of silt fence or install second silt fence up slope.

- .7 Do not remove silt fences or other sedimentation and control measures until permanent erosion protection is established or the Contract Administrator directs that it be removed.
- .8 Remove and dispose of sediment in a location where such sediment will not erode into construction areas, offsite properties or watercourses.
- .9 Should the silt barrier fabric cease to function due to clogging, damage, or deterioration, replace with a new fabric, when and as required.
- .10 Monitor erosion control blanket to ensure that all anchoring is stable and staples securely installed. Replace damaged erosion control blankets if erosion control measures and performance is compromised. Reseed as required prior to replacement. Repair installation and anchoring as required.
- .11 Reapply tackifier when erosion and disturbance has occurred on stockpiles, berms and embankments, as required and where applicable.
- .12 Reseed and repair seeded areas that have become bare or damaged by construction activity.
- .13 During the construction dewatering process, when sedimentation builds up beyond 30 mm in depth, in the storm water management pond or swales, remove the sedimentation and place in a designated area on site. Do not remove sedimentation from site.

3.10 CLEAN-UP AND REMOVAL

- .1 Upon completion of the Work, when erosion and sedimentation controls are no longer required, as determined by the Contract Administrator, remove all such temporary erosion and sedimentation controls and clean-up and restore areas.
- .2 Site restoration shall be conducted in areas shown on the drawings. These include the construction laydown, and work staging area within the construction boundary.

END OF SECTION

1 General

1.1 GENERAL DESCRIPTION

- .1 Horizontal directional drilling (HDD) is the installation of a pipeline by drilling a pilot bore from the entry pit to a predetermined exit location. The drilling head is then replaced with a reamer and the borehole is enlarged to a predetermined size. Once completed the product pipeline is pulled into place.
- .2 This Specification outlines the minimum requirements for the installation of HDD crossings for pipeline systems. The Contractor shall ensure that the HDD requirements set out in this Specification are complied with by the Contractor to the extent they are applicable in the circumstance. Except as otherwise expressly provided herein; the Contractor is responsible for implementing this Specification. The Contractor shall be solely responsible for ensuring that the Work is performed in strict compliance with all Environmental, Health, and Safety Laws.

2 Construction

2.1 PRE-COMMENCEMENT

- .1 All subsurface utilities within 25 m of the proposed drill path must be identified and location marked on the surface. Owners of subsurface utilities within 25 m of the proposed bore path must be notified of the impending work through the one-call program or directly if not a member of the service.
- .2 The Contractor shall prepare all construction sites including removal of vegetation and topsoil to a base level grade, containment berms, excavation of entry/exit pits, temporary and permanent slurry containment pits, and installation of conductor barrels.
- .3 Drill sites shall be constructed to prevent fluids from leaving the site.
- .4 All utility crossings shall be exposed using hydro-excavation, hand excavation, or another approved method to confirm depth. Contractor must acquire appropriate permits to cross, expose, and backfill existing utilities.
- .5 The proposed drill path shall be surveyed and documented, including its horizontal and vertical alignments and the location of buried utilities and subsurface structures along the path.
- .6 Exit and entry areas should be delineated using traffic cones, barricades, construction taping, flagging, fencing/hoarding or by some combination of these. If necessary, warning signs should be placed to indicate open excavation.

- .7 All documents and plans as required in Clause 3.12 of this Section shall be submitted and approved by the Contract Administrator prior to commencement of any work associated with the HDD unless otherwise authorized by the Contract Administrator.
- .8 Exit area should be suitable size to accommodate activities related to reamer and product pipe connection.

2.2 PIPELINE SECTION

- .1 The Contractor shall provide all equipment, labour and materials to prepare the pipe sections and support all pullback activities:
 - .1 Complete all first call and ground disturbance activities to positively locate all foreign facilities and develop a plan to cross safely;
 - .2 Ensure all equipment is in good working order throughout the entire project so as not to affect the completion date;
 - .3 Shall schedule work to minimize interruption to existing services and local traffic;
 - .4 Shall obtain all necessary permits or authorizations to conduct construction activities and to disturb ground near or across all existing buried utilities, pipelines, services, and conduits;
 - .5 Pipe layout shall be prepared in the space required to layout the section in one piece. All City of Winnipeg bylaws and requirements shall be met;
 - .6 Depending on level of pedestrian and vehicular traffic, work area may have to be delineated (discretion of the Contract Administrator);
 - .7 Preparation of the layout section including loading, hauling, stringing, fusion, hydrostatic pre-testing prior to pull back and placement on rollers according to the pipeline specifications;
 - .8 All tests shall be completed with water - testing with air is strictly prohibited. Only potable water shall be used if the pipe is to transport potable water after its installation;

2.3 CLEAN-UP

- .1 Upon the successful completion of the HDD and subsequent tie-ins, all equipment and materials will be removed from the site and the area will be cleaned up. At a minimum, the Contractor shall:
 - .1 Fill in abandoned drill holes to completely seal and stabilize the borehole so as not to affect the new installation;
 - .2 Reclaim all drilling fluid/cuttings pits;
 - .3 Remove all equipment, materials and waste from the sites;
 - .4 Clean-up and restore access, entry/exit work areas, HDD right of way, layout area, and water body access (except for seeding/fertilizing) to original condition;

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- .2 All areas affected by Contractor use shall be restored, and free of contaminants, to the original state prior to construction.

3 Directional Drilling Installation Specifications

3.1 WORK CONTENT

- .1 The work shall include the complete installation of one 750 mm diameter DR9 HDPE pipeline by the directional drill method accordance to the Contract Documents.

3.2 CONSTRAINTS

- .1 All Horizontally Directionally Drilled (HDD) Crossings shall be performed in accordance with the following codes, regulations and requirements as applicable:
 - .1 Provincial Environmental Regulatory Bodies
 - .2 Fisheries and Oceans Canada (DFO)
 - .3 Navigable Waters Protection Act
 - .4 Crossing / Proximity agreements of foreign pipelines
 - .5 Access routes to the right-of-way (ROW), work sites, staging areas, or to associated areas
 - .6 Landowner / Shareholder agreements
- .2 The Contractor shall review the Contract Documents and drawings to ensure workspace, right-of-ways., drill design, layout areas, and all other items pertaining to the HDD are acceptable for their equipment and set-up procedures.
- .3 The Contractor shall base bid and work plan on geotechnical information provided.
- .4 The Contractor shall be responsible for the directional drilling methodology and equipment. The Contractor shall confirm that the drill rigs and mud mixing systems will be of sufficient capacity to successfully complete the installation considering the installation length, product type and diameter, and formation and ground water conditions that can be reasonably foreseen.
- .5 If there is a conflict between Acts, Regulations, Laws, Codes and Standards, the most stringent requirement shall be met by the Contractor at the sole cost to the Contractor.

3.3 CONTRACTOR SHALL SUPPLY

- .1 The Contractor shall supply:
 - .1 HDD materials, equipment, pipe, and personnel required to complete the work. Specifically the Contractor shall supply the following (at a minimum);
 - .2 HDD equipment including a drilling rig with a minimum of 300,000 lbs. of push-pull force with suitable rotary torque to open boreholes to diameters specified within the Contract Drawings. This will also include all cold weather equipment as required and a complete water pumping and drilling fluid recycling system for the entry and/or exit sides (if required on exit);
 - .3 Equipment and personnel to supply transport, handle, weld, install, auger, and install/remove casing on entry and/or exit sides as required;
 - .4 All drill pipe, crossover subs, monels, heavy wall drill pipe, bits, hole openers, pipe pulling swivel, pipe pull head, and any other down-hole tools shall be supplied with current inspection certificates. All bits and cutters for reamers shall be new and in good condition prior to inserting in the borehole;
 - .5 Surface tracking systems and down-hole steering systems suitable for the type of crossing and the required accuracy for the bore path monitoring. The Contractor shall acquire all land use approvals or agreements for the installation of the coils necessary for tracking prior to commencement of the Work. Surface coils shall encompass 100% of the bore path, unless approved by Contract Administrator;
 - .6 A down-hole annular pressure monitoring tool;
 - .7 An approved anchoring system for the drill rig such that the installation can proceed in a safe and effective manner throughout the Work without failure;
 - .8 Fluid recycling equipment capable of isolating operating systems by redundancy, without down-time, for the purposes of cleaning or repairing;
 - .9 Flagging of the proposed pipeline between the proposed entry and exit location for reference;
 - .10 Barricades, warning signs, sack breakers and all materials for fluid containment on the worksite.
 - .11 A fence barrier around the entire worksite to prevent access by unauthorized personnel.
 - .12 Excavators and other lifting/excavation equipment with operators to support the HDD process on entry and exit throughout the work;
 - .13 Sanitary facilities at appropriate locations;
 - .14 Fully equipped first aid facilities and personnel satisfying all applicable legislation (as required);

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- .15 An Electronic Drilling Recorder (EDR) and access inside the drill cab and to all instruments and their readings at all times. Contractor shall provide conversion factors to convert instrument read-outs of all EDR, Annual Pressure (AP), rotary motors, pressure, travel, and torque units to the manufacturer's specifications;
 - .16 Onsite Radios and frequency of Contractor radios prior to the commencement of drilling operations;
 - .17 Frac-out containment equipment as described in the Environmental Response Plan (ERP);
 - .18 Noise attenuating equipment or materials in conformity (to a minimum) with all municipal by-laws and any additional special provisions of the Contract Documents. Contractor shall retain responsibility for moderating noise at the site and shall schedule the noisiest operations during the day;
 - .19 Pollution control measures in conformance with the applicable sections of the Provincial and Municipal Regulations with respect to air and water pollution control requirements and any necessary dust control measures;
 - .20 Adequate lighting systems to perform the Work.
- .2 The Contract Administrator, in its sole discursion, reserves the right to prohibit the use of any piece of equipment deemed to be unsuitable for the use in the performance of the Work.
 - .3 The Contract Administrator may request evidence of maintenance, inspection and testing programs relating to all equipment utilized on the crossing. Such evidence shall be provided at no additional expense to The City.
 - .4 The Contract Administrator shall have free and unrestricted access to all Work and equipment. This shall include all forms of record keeping, inspection, and evidence.

3.4 CASING INSTALLATION

- .1 The Contractor shall install casing to stabilize near surface formations from collapse and drilling fluid loss. The Contractor (at a minimum) shall;
 - .1 Independently assess the requirement for casing. If casing is required, casing shall be sized and by the Contractor as required to isolate any unsuitable formations near surface with Contract Administrators approval;
 - .2 Transport, handle, install driving shoe, weld (with an approved welding procedure), install into competent material, and remove casing pipe upon completion of the work;
 - .3 Install casing (with an approved procedure provided by the Contractor) and seal into competent material. Once the casing is augured out, a leak down test shall be completed to ensure the casing can contain the hydrostatic pressure of the drilling fluid prior to the start of the pilot hole;

- .4 Supply and install centralizer pipe throughout the project and replace/rotate as required to ensure wear on the casing is minimal;
- .5 All casing pipe shall be removed after pipe pullback or prior to demobilization (at a minimum).

3.5 PILOT HOLE

- .1 Unless specifically waived by the Contract Administrator, the Contractor will install the pilot hole along the design drill path shown on the Issue for Tender and Construction drawings. The Contractor may suggest an alternate drill path plan at the time of Tender subject to the Contract Administrator for approval.
- .2 The Contractor shall:
 - .1 Clearly identify the expected drill path for quick reference in the event of a potential fracture;
 - .2 Be responsible for the protection of all existing utilities and structures in the area of work which will include (at a minimum) determining location, protection, avoidance and plan and execute the crossing safely;
 - .3 Supply all steering/intersect tools to complete the Work with appropriate accuracy for an as built. Contractor shall present a steering plan along with proposed equipment for Contract Administrator Acceptance;
 - .4 Indicate the X, Y, and Z positions every ten meters (minimum).
 - .5 Inform the Contract Administrator of any deviation from design path and present a plan for mitigation or re-drill for Contract Administrator acceptance. In all cases, the Contractor shall be responsible for the drilling of the pilot hole;
 - .1 The Contractor shall be responsible for correcting any deficiencies in the pilot hole installation at own cost.
 - .6 Provide the Contract Administrator a copy of the steering report upon request.

3.6 REAMING

- .1 The Contractor will complete all reaming passes to open the borehole to a final diameter that will allow for the safe installation of the product pipeline. The minimum final diameter for the 750 mm DR9 HDPE pipe is 1050 mm. The Contractor shall:
 - .1 Determine the number of passes required to open the borehole to the size required for the existing geotechnical conditions;
 - .2 Select and supply reamers with new cutters as required for the geotechnical conditions;
 - .3 Supply adequate devices on exit side to safely make and break drill pipe as required and ensure that the torque being applied is completed to manufacturer's specifications;

.4 Supply adequate equipment on exit side to recycle drilling fluid and pump down the drill string to support the drilling operations, if required;

.5 Shall complete all reaming operations according to their approved procedure, execution plan, specifications, and the Issue for Tender and Construction drawings;

.6 Any tools or other metal object lost or lodged down hole shall be reported to the Contract Administrator. Metal objects shall be fully recovered prior to pipe pullback operation unless specifically approved otherwise by Contract Administrator. Failure to recover metal objects lost or lodged down hole within a reasonable time period constitutes just cause for rejection of the drill borehole.

3.7 CLEANING PASS

.1 The Contractor shall complete a cleaning pass to prepare the borehole for product pipe installation. The Contractor shall:

.1 Complete a minimum of one cleaning pass as per the approved Contractor procedure prior to pullback. A second pass may be required to ensure the pipe section is installed safely without coating damage. In all cases, the Contractor shall ensure the borehole is clean and free of obstructions prior to pullback;

.2 Monitor and record pull force and rotary torque every joint during the cleaning pass and provide this information to the Contract Administrator prior to pipe pull;

3.8 PRODUCT PIPE INSTALLATION

.1 The Contractor shall control the pipe installation process to ensure a safe and quality installation. At a minimum the Contractor shall:

.1 Begin the installation of the product pipe in daylight hours;

.2 Monitor the pullback of the pipe section and record the pull forces vs. time and joint. A conversion chart will be provided where necessary;

.3 Have sufficient equipment and storage on-site to manage excess fluid displaced by the pullback section;

.4 Provide the Contract Administrator with sufficient notice for start of the pullback to ensure support operations from The City are in place (road closure, etc.). The Contractor shall be fully responsible for managing the pullback operations to ensure the pipeline is installed properly and safely;

.5 Support equipment during pipeline pull-back operation to safely install the pipe section without over-stressing the product pipe. Contractor shall be responsible for coordinating and managing all aspects of the pull-back section;

.6 Anchor installed section if required on the upper section to sufficiently restrict the pipelines movement in the hole. The Contractor shall submit a plan of this anchor for approval by the Contract Administrator;

.7 Traffic control measures for any public or private venues that may require restricted access or closure pursuant to the Contract Drawings. Traffic control devices and personnel must conform to City of Winnipeg bylaws and be approved for use by the City prior to execution;

.8 Pull as much as practicable into the entry pit to inspect the pipe. If pipe is damaged, the Contractor will pull additional lengths of pipe until the damage is either reduced or eliminated and is acceptable to the Contract Administrator. If damage to the pipe is unacceptable to the Contract Administrator, the Contractor will remove the section, replace if damaged, re-ream the borehole and re-install the product section.

3.9 DRILLING FLUID

.1 The Contractor shall make every effort to maintain circulation and recycle the drilling fluid throughout the drilling process. The drilling fluid recycling system shall be configured and sized to maximize the re-circulation of the drilling fluid throughout the drilling process.

.2 The Contractor shall be proactive about the management of the drilling fluid and specifically (at a minimum);

.1 Measure and document drilling fluid parameters (density, viscosity and sand content at a minimum) every 4 hours, and compare with the Drilling Fluid Plan and adjust as required. Contractor shall provide professional oversight on their Drilling Fluid Plan to ensure formation issues are controlled and fluid is managed appropriately;

.2 Measure and document the volume of fluid in the borehole, fluid return pit, shaker tank and the amount of make-up fluid added to the mixing tanks and throughout the system to ensure any losses are noticed and reported. When a loss is noticed, the Contractor will investigate the drill path for the fracture point and enact the Environmental Response Plan (ERP) as required;

.3 Provide an independent Mud Engineering Report, supplied by the Contractor, outlining the specific compliant products, rheology, and testing for the Work proposed. The Mud Engineer shall be present during baseline setup activities and mitigation measures. An API Compliant Drilling Mud Report shall be displayed on the rig at all times representing the current base setup.

.3 The Contractor shall ensure that all proposed drilling fluids and/or additives are compliant with all municipal landfill reclamation criteria's.

.4 Supply at least three types of loss control material. This material shall be specifically suited for plugging fractures in the formations being drilled and shall be available on site in suitable amounts for three applications of each. The Contractor shall also supply pill tanks and associated pumps and hoses to effectively apply the plugging agent as specified by the manufacturer. Provide adequate and qualified personnel to supervise all aspects of the directional drilling process.

- .5 Control drilling fluid on exit side as required. This may include exit side recycling system, tanks, pumping equipment or other methods to control fluid onsite. Trucking will only be allowed with Contract Administrator approval subject to a review of the impact on landowners, public, and/or surrounding infrastructure.
- .6 Water supply for drilling use shall be supplied by the City. City will supply Contractor a single point of supply (Valve Chamber) in close proximity to the entry side; and supply meter with backflow preventers. All costs for transfer and storage of water are the responsibility of the Contractor. The Contractor shall confirm the status of all permits and shall garner any additional applications/renewals necessary from the City.

3.10 ENVIRONMENTAL RESPONSE PLAN (ERP)

- .1 The Contractor will supply and implement an Environmental Response Plan to monitor the surface of the drill path, respond to a release to the environment, and cleanup and restore the area. The ERP shall contain the following, at a minimum:
 - .1 Communication of all personnel onsite to ensure there is an understanding of the roles and responsibilities in the event of a drilling fluid loss;
 - .2 Designation of a representative on-site at all times during the drilling, reaming, and pipe installation procedures. This representative will be responsible for coordinating the ERP and supply the appropriate information to the Contract Administrator;
 - .3 Surface monitoring of the drill path for 100 m on either side of the drill path a minimum of every 4 hours and report;
 - .4 If a fluid loss is detected, at a minimum the Contractor will:
 - .1 Halt all operations immediately;
 - .2 Inform the Contract Administrator as soon as possible so appropriate regulatory agencies can be notified if appropriate;
 - .3 Isolate the migration site and recover fluids (on land);
 - .4 Contain the drilling fluid and prevent further migration downstream (if in the watercourse or floodplain);
 - .5 If fluid migration does not appear on the surface or water body, the Contractor will increase the frequency of surface monitoring to ensure drilling fluid has not migrated to surface;
 - .5 Attempt to restore circulation by extracting the drill pipe and cleaning the hole, plugging or re-drill the pilot hole;
 - .6 Continue with loss of circulation while ensuring no affect to the environment, this must be approved by the Contract Administrator prior to implementing;
 - .7 The supply of the following equipment and supplies at a minimum:
 - .1 0.5 m³ - Absorbent material for hydrocarbon product spills;
 - .2 1 pallet of sand bags;

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- .3 2 – 4” trash pumps with 200m of hose and associated fittings;
 - .4 20 - T-posts;
 - .5 Light towers suitable for personnel working on entry and exit sides safely;
 - .6 2 rolls - Silt fence;
 - .7 1 - Post pounders;
 - .8 50 m - Geo-textile/ plastic sheeting;
 - .9 100m - Plastic snow fence;
- .8 This is recommended for emergency response only. If further equipment or materials are required for continuance, the Contractor shall provide it;
- .2 Fracture plugging/bridging agents shall be supplied to be pumped down the borehole and set per the manufacturer’s recommendations. If positive circulation is restored, drilling can be continued. If positive circulation is not established, pumps will be halted and a re-application shall be made. This process may be repeated until plugging occurs. All plugging agents will be specifically designed for the formations being drilled and supplied onsite as specified in this specification. If plugging cannot be achieved, the following continuance options may be utilized, upon approval by the Contract Administrator and all applicable regulatory bodies:
- .1 Installation of casing or extension of existing casing where possible to eliminate the point of fracture;
 - .2 Partial recovery of circulation where fracture to the surface can be managed by pumping fluid back to either the entry or exit point and may be allowed. This may be sufficient if a diligent monitoring program is undertaken to ensure fluid is not being released to the environment. This must be approved by the Contract Administrator;
 - .3 Pilot hole re-drill along a different drill path designed to avoid the area where loss circulation occurred;

3.11 RECORD OF CONSTRUCTION TO BE PROVIDED

- .1 Daily Reports:
 - .1 Tower Sheets showing equipment, manpower, and activities on an hourly basis;
 - .2 Drilling fluid volume (fluid loss/gain) and parameter (weight, viscosity, and sand content) reports;
 - .3 Steering survey data;
 - .4 Surface monitoring report;
 - .5 Water use;
 - .6 Safety tailgate meetings and investigations as required;

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- .2 Submissions within 7 days of completion:
 - .1 As-built information including pipe centerline in plain view and tabulation of coordinates referenced to the drill entry point and to the global survey systems;
 - .2 Pipe Pullback Report showing pull force per joint vs. time;
 - .3 Drilling Fluid Disposal Report (location, permits, volumes, approvals, testing);
 - .3 Submission within 10 working days of receiving Notice of Award:
 - .1 HDD Execution Plan;
 - .2 Construction Schedule;
 - .3 Environmental Response Plan (ERP) / Frac Response Plan that meets all requirements of Department of Fisheries and Oceans and Manitoba Conservation and Water Stewardship;
 - .4 Drilling Fluid Disposal Plan;
 - .4 A project schedule shall be updated weekly during drilling operations with progress reports showing site-specific and project-wide progression on a *percent complete* basis. Contractor's schedule shall address continuity of supervision, quality management, and communication between shifts.
 - .5 The drilling fluid properties shall be tested at least every 4 hours during drilling operations and reported daily unless operating conditions change. The Contract Administrator may require more frequent testing as warranted.

3.12 HDD EXECUTION PLAN AND SCHEDULE

- .1 The Contractor shall supply a site specific HDD Execution Plan that is used to complete the specific work. Any operational deviation from the submitted HDD Execution Plan shall be presented to the Contract Administrator in written form. This may include a change in any process, borehole condition, equipment, or pipe installation technique. Contract Administrator shall review and approve any deviations of the Drilling Execution Plan prior to implementation by the Contractor. The HDD Execution plan shall consist of:
 - .1 A description of steps required to complete all aspects of the project including casing install, pilot hole (steering/tracking procedures, and equipment proposed), reaming (number of passes, sizes, types), cleaning pass (reamer size, orientation) and pullback operation (configuration of pull assembly);
 - .2 Complete description of all equipment to be supplied on both the entry and exit sides to complete the work including, but not limited to, the drill rig(s) (pull force/rotary torque), pumps (type, capacity, number), anchor system, recycling equipment (number, type, and description of tanks, shakers, de-silters, de-sanders, centrifuges, etc.), drill pipe (size and type), mud motors (size and type), drill bits (size and type), steering tools (type, accuracy, etc.), reaming equipment (type, size, number) and noise mitigation equipment (if required);

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- .3 Description and drawings of the preparation of the work pads, access and layout and confirmation of suitability for Contractor's equipment. Drawings showing the intended drill path in plan and profile, depth of cover, entry and exit angles, and depth/size of surface casings;
 - .4 Description of all auxiliary equipment such as light plants, auxiliary pumps, generators, rig mats, and all other equipment to complete the work;
 - .5 Provide a description of its down hole survey instruments and surface location equipment;
 - .6 A description of drill pipe maintenance during construction that will include inspection as required and how the Contractor will minimize stress in the drill pipe during the drilling operations;
 - .7 Water usage estimate per day and onsite storage requirements;
 - .8 Fracture mitigation strategy that shall be implemented by the Contractor and at a minimum shall pertain specifically to three parts of the drilling process: Drilling Fluid Parameters Control, Pressure and Volume monitoring:
 - .1 The Contractor shall specify the parameters of drilling fluid planned for this project. The Drilling Fluid Program (DFP) will be provided for the specific formation for each crossing and maintain the program throughout the crossing including providing a Mud Engineer. The DFP specifically will provide guidelines that control drilling fluid parameters to ensure cuttings removal, borehole stabilization and production concerns are addressed and optimized. The DFP shall also address the placement of pills or select products to address borehole stability, frac-outs, or other anticipated drilling concerns. The DFP shall be supplied with resumes of personnel to be responsible for the DFP and the frequency of site overview by a properly trained Mud Engineer;
 - .2 The Contractor shall monitor the annular pressure throughout the pilot hole and compare with an approved model. The Contractor will be responsible for maintain pressure below the approved model.
 - .3 The Contractor shall develop a procedure to balance the drilling fluid losses into the formation with makeup water, tank volumes and borehole production;
 - .9 Sample of daily drilling report format including Tower Sheets, Drilling Fluid Parameters, Steering, and Surface Monitoring reports;
 - .10 Resumes of personnel (with related experience) that will be onsite on these projects;
 - .11 Provide a description of all safety and medical equipment and personnel to meet the regulatory requirements for the work;
 - .12 The Contractor shall provide a list of standard drilling procedures that address the processes that are typically undertaken on an HDD project. At a minimum, this document shall be a quality control document that identifies the

Contractor's standard procedures for casing installation, pilot hole drilling procedure (Jet / Motor), reaming procedures, cleaning pass procedure, pullback procedure, continuance plan in the event of partial loss of drilling fluid, and plugging procedures to be undertaken in the event of higher than expected annular pressure, loss of drilling fluid volume, and conditions of high rotary torque. Also these procedures shall describe the required make-up torque for drill string proposed and the rotary torque and RPM for the reamers proposed;

.13 Emergency procedures for inadvertent utility strikes, including: power, natural gas, water, sewer, or telecommunication lines. Procedures must comply with regulations;

.14 Independently assess the requirement for casing. If casing is required, provide a Casing Plan and drawings including installation/removal methodology, equipment, and testing;

.15 A detailed noise control plan that conforms to all municipal by-laws with respect to noise, hours of work, night work, and holiday work;

.16 A detailed rehabilitation plan of the effected construction sites, including returning the sites to their original state;

.17 A detailed Drag Section Handling plan that includes timing, equipment, safety, and applicable road closures;

.18 Traffic Management Plan, in accordance with the Contract Document provisions and Contractor's Drag Section Handling Plan;

.19 Schedule of work including installation sequence for the project including:

.1 Work pad, layout and access preparation;

.2 Mobilization;

.3 Topographical survey;

.4 Casing installation (if required);

.5 Pilot hole;

.6 All Reaming passes;

.7 Cleaning Pass;

.8 Pipe Pullback;

.9 Demobilization;

.10 Area cleanup;

.20 The Construction Schedule shall also include working hours/days per week:

.21 A detailed plan for the disposal of drilling fluid; with the identification of suitable disposal locations.

.2 Approval of the HDD Execution Plan by the Contract Administrator does not relieve Contractor of any responsibility or liability for safety, damages, compliance with

permits and Engineering Inspection Certifications of drill pipe, drilling tools, steering tools, pull heads and swivels to be used on the project;

- .3 This plan shall be part of the technical evaluation of the tender and are all subject to the Contract Administrator's approval.

3.13 DRILLING FLUID STORAGE AND DISPOSAL PRACTICES

- .1 The Contractor will manage all drill fluids (fluids and solids) from the site.
- .2 The Contractor shall be responsible for permanent disposal of all waste drilling fluids (liquids and solids) in conformance to all environmental regulations. Drilling fluids shall not be permitted to become contaminated with any substance that would prevent the use of landspreading.
- .3 Disposal cuttings and fluids shall be disposed of in strict compliance with the Local Authorities having jurisdiction. Disposal of drilling cuttings and fluids shall be conducted in compliance with all relevant environmental regulations, landowner agreement, workspace agreements, and permit requirements.
- .4 Prior to disposal, testing of drilling fluids and cuttings shall be performed by a third party at the Contractor's expense with the results provided thereafter to the Contract Administrator. (If required based on disposal location.)
- .5 All drilling fluids and cuttings shall be removed from the site during City and permit approved daylight hours. The frequency of the transportation shall occur at a rate that ensures that the site is operated efficiently and safely while reducing public impact.
- .6 All costs associated with the management and disposal of drilling fluid and returns are the sole responsibility of the Contractor.
- .7 Contractor shall ensure:
 - .1 That all transportation permits are in conformance to environmental regulations;
 - .2 That transportation of fluids (solids and liquids) to the disposal site shall be at a frequency and time as determined by the contractor and must meet with City of Winnipeg bylaws;
 - .3 Precautions shall be taken to keep drilling fluids out of streets, manholes, sanitary and storm sewers, and other drainage systems including streams and rivers;
 - .4 Transportation of wastes shall adhere to applicable Manitoba Infrastructure and Transportation guidelines;
 - .5 If working in an area of contaminated ground, the circulated drilling fluid shall be tested for contamination and disposed of in a manner that meets government requirements;

.6 The Contractor shall make a diligent effort to minimize the amount of drilling fluids and cuttings spilled during the drilling operation and shall clean up all drilling mud overflows and spills;

.7 After product pipe is installed, entry and exit pits shall be cleaned of drilling fluids and cuttings, and backfilled with native material or select backfill in accordance with the Contract Documents;

3.14 ACCEPTANCE

- .1 Pipeline product shall be installed along the pre-specified alignment tolerance as shown on the drawings and provided in the project specifications.
- .2 Once installed pipe shall meet the requirements of the specifications including (but not limited to):
 - .1 Results of the drill profile survey information;
 - .2 Results of any pull force / stress data;
 - .3 Hydrostatic test data;
 - .4 Any material inspection data.

END OF SECTION

1 General

1.1 QUALITY ASSURANCE

.1 Qualifications of Welders:

.1 Welding of load supporting components shall be performed by companies certified by Canadian Welding Bureau in accordance with CSA W47.1.

.2 Welders shall be qualified by Canadian Welding Bureau for classification of Work being performed.

.2 Workmanship Standards:

.1 Resistance Welding: to CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.2 Fusion welding: to CSA W59, Welded Steel Construction (Metal Arc Welding).

1.2 SUBMITTALS

.1 Submit shop drawings clearly indicating:

.1 Components

.2 Core metal thicknesses

.3 Finishes

.4 Dimensions

.5 Fabrication details

.6 Installation details

.2 Submit paint manufacturer's product data.

1.3 PRODUCT DELIVERY AND STORAGE

.1 Schedule delivery of components to site to coincide with installation of this work.

.2 Store components to prevent damage and distortion.

.3 Protect finishes from scratches and soiling.

2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CSA-G40.20/G40.21, Grade 300W.

.2 Deformed steel bars: of billet steel to CSA G30.18, grade 300.

.3 Anchor bolts and nuts: to ASTM A307, hot dip galvanized where noted.

2.2 FABRICATION

- .1 Shop fabricate components where possible.
- .2 Fabricate components square, straight, true, free from warpage and other defects. Accurately cut, machine, file and fit joints, corners, copes and mitres.
- .3 Exposed joints and connections shall be tight, flush and smooth unless otherwise indicated.
- .4 Where work of other Sections is to be attached to work of this Section, prepare work by drilling and tapping holes as required to facilitate installation of such work.
- .5 Work of this Section, supplied for installation under other Sections, shall be prepared as required ready for installation.

2.3 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating to ASTM A123/A123M.

2.4 ACCESS LADDERS

- .1 Stringers: 65 x 13mm thick, steel
- .2 Steel Rungs: 20 mm diameter, welded to stringers at 300 mm oc.
- .3 Brackets: sizes and shapes as indicated, weld to stringers at 1200 mm o.c., complete with fixing anchors.
- .4 Finish: Galvanized

2.5 TRENCH COVERS AND FRAMES

- .1 Type 30-102, 38 x 4.8mm steel grating set in L 45 x 45 x 6mm frame. Include anchors as shown on drawings.
- .2 Finish: Galvanized

3 Execution

3.1 ERECTION

- .1 Perform welding work in accordance with CSA W59 unless specified otherwise.
- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Provide components for building by other sections in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CAN/CSA-S16.1, or weld.
- .7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
- .10 Install access ladders in locations as indicated.

3.2 TRENCH COVERS

- .1 Install trench covers in locations as indicated.

3.3 CHANNEL FRAMES

- .1 Install steel channel frames to openings as indicated.

END OF SECTION

1 General

1.1 DESCRIPTION

- .1 This section specifies elastomeric waterproofing required over the exterior of the reservoir, as shown in the drawings.

1.2 QUALITY ASSURANCE

- .1 Membrane: applied by applicator trained and approved by manufacturer for application of its products. To be compatible with other materials used in the installation.
- .2 Applicators: minimum 5 years proven experience.
- .3 Manufacturer's representative:
 - .1 Inspect subgrade prior to commencement of work, during application of membrane and upon completion of work.
 - .2 Provide technical assistance to applicator and assist where required in correct installation of membrane.

1.3 WARRANTY

- .1 Provide warranty for the elastomeric membrane waterproofing against leakage for a period of ten years from date of notice of acceptance.

1.4 SHIPMENT, PROTECTION AND STORAGE

- .1 Deliver, store and handle materials in accordance with manufacturer's recommendations.

2 Products

2.1 ACCEPTABLE PRODUCTS

- .1 Membrane:
 - .1 Bituthene 3000 by Grace Construction Products
 - .2 Jiffy Seal 140/60 by Protecto Wrap Company.
- .2 Protection Layer: Concrete Faced Polystyrene: Type 4: to CAN/ULC S701-01, tongue and groove, 50 mm thick with 10 mm thick laytex modified concrete factory applied complete with securement clips and fasteners. Acceptable material: Styrofoam Brand CT Insulation as manufactured by Dow Chemical Company or equivalent installed to thickness indicated on the drawings.

2.2 MATERIALS

- .1 A self-adhering rubberized asphalt integrally bonded in a layer of cross laminated velron polyethylene.
- .2 Primers and lap sealants as recommended by membrane manufacturer.
- .3 Dampproofing material: to one (1) or more of the following:
 - .1 CAN/CGSB-37.1-M89, Chemical Emulsified Type, Emulsified Asphalt for Dampproofing.
 - .2 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral-Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coating.
 - .3 CGSB 37-GP-6Ma, Asphalt, Cutback, Unfilled, for Dampproofing.
 - .4 CAN/CGSB-37.16-M89, Filled, Cutback Asphalt for Dampproofing and Waterproofing.
- .4 Water: potable.
- .5 Joint Sealing Compound: rubber-asphalt, to CAN/CGSB-37.29-M89.

2.3 APPLICATION

- .1 Apply and install all required materials as per manufactures specifications.

2.4 PRETECTION OF COMPLETED WORK

- .1 Ensure membrane is undamaged before application of protective layer.
- .2 Apply insulation layer to cover membrane below grade as shown.

END OF SECTION