

SECTION 02240**CONSTRUCTION DEWATERING AND GROUNDWATER CONTROL****PART 1 GENERAL****1.01 SUMMARY**

- A. This Section includes requirements for Construction Dewatering (as defined in Paragraph 1.09 of this Specification) and surface water and groundwater control. The Work shall include but not be limited to designing, furnishing, locating, permitting, installing, operating, monitoring, maintaining, and removing temporary dewatering and water handling systems. These systems shall control water infiltration associated with trenchless construction and excavation activities. Sources of water include, but are not limited to, groundwater, surface water, water from nearby water bodies (including the Charles River), water introduced during construction, and equipment cleanup water. The Work shall also include collection, treatment (if required), discharge and disposal of water.
- B. Secure all permits and pay all fees necessary to perform dewatering and for discharging of dewatering effluent.

1.02 RELATED SECTIONS

- A. Section 01060 – Permits and Regulatory Requirements
- B. Section 01300 – Submittals
- C. Section 01390 – Condition Surveys
- D. Section 01565 – Noise Control
- E. Section 01567 – General Environmental Controls
- F. Section 02200 – Earthwork
- G. Section 02311 – Support of Excavation
- H. Section 02370 – Erosion and Sedimentation Control
- I. Section 02495 – Geotechnical Instrumentation
- J. Section 03302 – Miscellaneous Cast-in-Place Concrete

1.03 CODES AND STANDARDS

- A. American Society for Testing and Materials International (ASTM) standards applicable

to piping, equipment, and other items required for a complete Dewatering System.

1. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 2. ASTM A690S – Standard Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments.
 3. ASTM D1785 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 4. ASTM C778 – Standard Specification for Standard Sand.
- B. 780 CMR: Massachusetts State Building Code.
- C. Massachusetts Department of Environmental Protection (MassDEP):
1. 310 CMR 3: Surface Water Discharge Permit Program.
 2. 310 CMR 5: Ground Water Discharge Program.
 3. 310 CMR 42.00: Certification and Operation of Environmental Analysis Laboratories.
 4. WSC-310-91 Standard References for Monitoring Wells.
- D. United States Environmental Protection Agency Publication (USEPA):
1. National Pollutant Discharge Elimination System (NPDES) Construction General Permit (2022 CGP) for Discharges from Construction Activities, issued in January 2022.
 2. National Pollutant Discharge Elimination System (NPDES) General Permit for Dewatering and Remediation Activity Discharges - (2022 DRGP) in Massachusetts (MAG910000).
- E. American Institute of Steel Construction (AISC) applicable standards.

1.04 SUBMITTALS

- A. Submit the following in accordance with Specification Section 01300 – Submittals.
- B. Submit qualifications and work experience records of the dewatering contractor, the Contractor's Engineer responsible for the dewatering and drainage system, the Contractor's supervisor and personnel to provide evidence of compliance with the

requirements of Section 1.06. Do not submit plans until workforce qualifications have been reviewed and approved by the Authority.

- C. Sixty (60) days prior to start of construction, submit a Dewatering and Drainage Plan prepared, signed and sealed by the Contractor's Engineer. At a minimum, include the following:
1. Description of the proposed dewatering and drainage system, including a description of the methods, pumping equipment, types, sizes, diameters, filter materials and placement techniques, sealing materials, number and locations of dewatering points, proposed treatment, setting tank, discharge points, and details on the monitoring and sampling of the dewatering and drainage systems.
 2. Description of the on-site surface water control and stormwater management system.
 3. Water Treatment Plan for handling, treatment, measuring, and disposal of groundwater, surface water, and other water waste generated from the construction activities.
 4. Working drawings showing the proposed types and planned locations of surface water control, the Dewatering System (as defined in Paragraph 1.09 of this Specification) to be used and proposed discharge locations. Working drawings will include location and size of well points, sumps, dewatering wells, ditches, and water discharge lines, including their relation to water disposal points, the arrangements, locations, footprint sizes, and depths of the Dewatering System at scale on the proposed site plan with other existing and proposed equipment and structures in the area shown. Piping plans, profiles, and details provided will be sufficient for the review of slope, inverts, daylighting, shielding, and other elements deemed necessary.
 5. Basis of design and calculations confirming the adequacy of the proposed Dewatering System to achieve groundwater control and treatment, including depths to groundwater within the excavation limits, the flow capacity of the system accounting for all contributing flows, work plan, seepage analysis, drawdown in adjacent water bodies, holding periods, settlement calculations conforming with threshold values provided in Specification Section 02495 – Geotechnical Instrumentation, buoyancy calculations for all new, temporary, and existing structures in the zone of influence, and equipment used as protection for flows in excess of design flow.
 6. Calculations and requisite technical data on well screens and filter materials and gradations to demonstrate the adequacy of proposed systems to prevent the pumping of fines.

7. A complete description of methods, equipment, and materials to be used and the procedures to be followed in installation, operation, and maintenance in relation to the proposed sequence of excavation, drilling, construction, backfilling, development of dewatering wells, well points, monitoring wells, and piezometers.
 8. The standby equipment and standby power supply details.
 9. Contingency plan if components fail, complete with options to address potential emergencies including, but not limited to, power failures, overflows and effluent parameters exceeding the discharge limits specified in all applicable permits for Construction Dewatering.
 10. Anticipated Zone of Influence of dewatering activities and action levels and remedial actions to be employed to address impacts to adjacent existing and proposed structures.
 11. Procedures for cleaning and disposal of sediment to be removed, and floating matter and other settled matter from oil/water separators.
 12. Protocols to be followed for discharge monitoring, sampling, and analysis of Dewatering System effluent, and the name and qualifications of the laboratory that will be testing the quality of dewatering effluent prior to disposal.
 13. Instrumentation and monitoring including, but not limited to, flow meters and other water flow measuring devices to be installed on the control of water outlet system(s), including calibration procedures for each measuring device and instrumentation.
 14. Copies of all necessary permits obtained by Contractor to conduct dewatering and discharge and sediment disposal in accordance with the requirements of this section, including permits from the USEPA, MassDEP, and local authorities as applicable.
 15. Resubmit the above information, as appropriate, if the system or system components are modified during installation or operation.
- D. Approval of the Dewatering and Drainage Plan by the Authority will not in any way relieve the Contractor from full responsibility for the complete and adequate design and performance of the Dewatering System to provide the necessary Construction Dewatering, obtain satisfactory working conditions, and maintain progress of the Work.
- E. Fourteen (14) days prior to the start of Construction Dewatering, submit as-built conditions of the Dewatering System. As-built data are to include, but are not limited to:

1. Plans and sections showing as-built locations, and surveyed elevations of the Dewatering System and its components.
 2. Drawings to indicate changes made to the original working drawings to accommodate field conditions and to comply with design standards.
 3. Details of installation, including dimensions and materials used, description and drawings of all installations, all procedures, soil strata encountered, and logs with descriptions of soil samples and stratification.
 4. For each sump, well, wellpoint, monitoring well, and piezometer installed, provide details including, but not limited to, diameters of the borehole, screen type, screen opening size, screen top and bottom elevations, product information and installation methods and depths for filter, seal and grout, pump type and capacity.
- F. Fourteen (14) days prior to the start of Construction Dewatering:
1. Submit a report comparing site groundwater quality data with the water quality standards to be complied with under permit(s) as applicable to the Project or required herein.
 2. Details of abandoning each sump, wellpoint, and monitoring well after its use has been completed.
 3. Submit a Sampling and Testing Plan detailing:
 - a. Parameters to be tested for respective sampling and testing standards to be used in accordance with all applicable permits.
 - b. Alert levels and shut down values for testing parameters.
 - c. Contingencies for controlling each parameter.
- G. Maintain and submit on a weekly basis shift records in accordance with all applicable permit requirements to the Authority prior to submittal to the permitting agency. The submittal shall include, at a minimum, a summary of relevant data including, but not limited to, pump run times, pumping rates, hourly and daily discharge rates, water levels at dewatering and monitoring locations, sampling dates and locations, water quality test results, equipment outages, corrective actions, maintenance activities, and a summary of site conditions and construction activities affecting the Dewatering System.
- H. Submit manufacturer's instructions for pumps, water meters, flow measuring devices, and other Dewatering System's equipment.
- I. Resubmit the above information, as appropriate, if the system or system components

are modified during installation or operation.

- J. Submit for review and approval, the qualifications and certifications of the entity proposed to conduct the laboratory tests. The submittal shall include qualifications of the firm and the resumes of the technician(s) assigned to the project. The Authority reserves the right to request substitution of technician(s) assigned to field work. Assigned technician(s) shall not be substituted without the prior approval of the Authority.
- K. A copy of all analytical results will be submitted to the Authority for review and approval, no later than one (1) day after receipt of such data. Provide for prompt sampling and turn-around times so as not to delay the project, but in no case will turn-around time be longer than five (5) working days.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements:

- 1. Comply with all necessary permits from federal, state and local agencies required for operation of the Dewatering System, monitoring groundwater, and disposal of effluent from the Dewatering System and any solids and byproducts removed by the Dewatering System in accordance with Specification Section 01060 – Permits and Regulatory Requirements.
- 2. Collect Dewatering System effluent samples at intervals as required by the permits and the Dewatering and Drainage Plan. Continue to collect effluent samples during dewatering operations and analyze all listed parameters at intervals based on dewatering discharge volume as a verification of discharge compliance.
- 3. Manage and dispose of all groundwater removed during dewatering activities in accordance with standards set by the USEPA, MassDEP, and other stakeholders for discharge to receiving body of water.
- 4. Dewatering System must be designed, constructed, modified and operated in such a manner that the flows to the receiving water bodies do not exceed the effluent limit parameters set forth in all applicable permits.
- 5. Perform all necessary sampling and laboratory testing by an approved laboratory in accordance with the requirements stated in this Section, and the NPDES permit(s).

- B. All discharges from dewatering and construction process operations must be treated prior to discharge in accordance with all applicable state and federal standards and permits.

- C. Maintain and monitor the performance of the dewatering and drainage system by keeping a log of the Dewatering System operations.
- D. Comply with all allowable settlement limits and monitoring data submittals required in Specification Section 02495 – Geotechnical Instrumentation and Contract Drawings.
- E. Comply with all noise level and sound monitoring data submittals required in Specification Section 01565 – Noise Control.
- F. Comply with all erosion and sedimentation control required for discharge in Specification Section 02370 – Erosion and Sedimentation Control.

1.06 QUALIFICATIONS

- A. The Contractor shall have a minimum of five (5) years of recent continuous experience performing dewatering/groundwater control and treatment work similar to that specified herein.
- B. Dewatering System, including all treatment equipment, will be designed by the Contractor's Engineer, who will be a Registered Professional Engineer licensed in the Commonwealth of Massachusetts having a minimum of ten (10) years of professional experience in design and construction of groundwater control/treatment and drainage systems, and have completed not less than five (5) successful groundwater control/treatment and drainage projects of equal type, size, and complexity and in similar site conditions to that required for the Work.
- C. Well drillers shall be licensed in the Commonwealth of Massachusetts.
- D. Assign only personnel having a minimum of five (5) years experience (or as approved by the Authority) in groundwater control/treatment systems that include groundwater treatment design and operations as presented herein. Supervisor(s) assigned to oversee the work shall have a minimum of five (5) years experience (or as approved by the Authority) being in charge of dewatering similar to the work proposed herein.
- E. Qualifications of personnel responsible for operation and maintenance of the Dewatering System will comply with the requirements of the NPDES permit(s).
- F. All samples collected for the evaluation of dewatering effluent quality shall be analyzed by a laboratory certified under MassDEP 310 CMR 42.00: Certification and Operation of Environmental Analysis Laboratories.

1.07 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.08 PROJECT/SITE CONDITIONS

- A. Refer to the Appendix to the Contract Specifications for subsurface conditions.

- B. Notify the Authority if obstructions are determined to be in conflict with the location of the site Dewatering System.
- C. All existing utilities to be located and marked in accordance with Specification Section 01390 – Condition Surveys. Markings will be updated if damaged, lost, or otherwise found to be inaccurate while work, including dewatering, is occurring at the site.

1.09 DEFINITIONS

- A. Construction Dewatering – Controlling groundwater levels, hydrostatic pressures and controlling surface water, such that the site excavation and grading shown on the Drawings can be performed to required depths in substantially dry and stable conditions.
- B. Dewatering System – System of wells, wellpoints, sumps, ejectors, pumps, piping, power supply, treatment equipment, flow meter and other equipment designed by the Contractor, submitted to and approved by the Authority prior to dewatering, that will effectively dewater the site as shown and specified. Adequate monitoring wells/piezometers will be included in the Dewatering System to verify drawdown levels inside the excavation area and monitor groundwater levels outside the limits of the excavation near adjacent structures.
- C. Where the phrase dry is used in this Section, it will be defined as an excavation subgrade where the groundwater level has been lowered to below the lowest level of the excavation, is stable with no ponded water, mud, or muck, is able to support construction equipment without rutting or disturbance and is suitable for the placement and compaction of fill material, pipe or concrete foundations.
- D. Construction Water – All water, whatever the source, pumped from underground excavations or surface and near-surface excavations. This also includes storm water runoff from the construction areas and sites as well as snow melt.
- E. Excavation – Includes all open cut excavations and trenchless crossing.

1.10 TOLERANCE (NOT USED)

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Dewatering Systems shall be capable of dewatering the excavations and maintaining workable condition. These systems include, but are not limited to, tanks, sumps, pumps, electrical and mechanical equipment and accessories, power lines, poles, piping, discharge lines, valves, controls, oil skimmers, instrumentation, and other appurtenances required to dewater the areas and to handle and transport the

Construction Water satisfactorily to treatment facilities.

- B. Pipes and well screens will consist of Schedule 40 PVC or stronger in accordance with ASTM D1785.
- C. Sand will consist of clean, single-size filter sand of adequate gradation in accordance with ASTM C778.
- D. For well construction, grout will consist of cement-bentonite grout of adequate mix proportion and consistency. Seals will consist of bentonite pellets.
- E. Equipment used in the Dewatering System will adhere to accepted industry standards and be in good operating condition and able to perform satisfactorily over the required duration of Construction Dewatering.
- F. Backup equipment for the Dewatering System including, but not limited to, backup power supply will be identical to the primary equipment and will be available in operating condition at all times.
- G. Pumps, meters, hoses, and controls will be suitable for the intended purpose and application.
- H. Water meters will be furnished and installed by the Contractor in the Dewatering System to gauge the quantity of water pumped. Provide flowmeters in the pipe(s) measuring all contributing flows upstream of the water treatment plant. The flowmeters will be capable of measuring pumped water, containing abrasive suspended solids, with an accuracy of +/- 0.5 percent. A continuous recording flow meter(s) with flow totalizing capability will be provided.
- I. Provide means to continuously measure and record flows.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Design, size, provide, install, operate, modify, maintain, and remove the Construction Water control/treatment and Dewatering System as necessary to:
 - 1. Ensure the water in the excavation is sufficiently controlled to develop a workable subgrade and maintain the groundwater levels to facilitate construction in accordance with the Contract Documents and approved submittals.
 - 2. Maintain stable slopes and subgrade and prevent loss of fines from surrounding soils with properly sized filters and screens.
 - 3. Minimize settlement of surrounding facilities to level below Threshold Values

provided in Contract Documents.

4. Allow work to be safely performed and not result in loss of ground, disturbance to bearing soils of piping and structures or damage to adjacent properties, buildings, structures, utilities, and other work. Promptly repair to the Authority's satisfaction any damage, disruption, or interference resulting directly or indirectly from control of water operations at no cost to the Authority.
 5. Drawdown shall be in accordance with specified limits in Specification Section 02495 – Geotechnical Instrumentation, or in accordance with approved submittal. Minimize drawdown of existing surface water bodies and groundwater levels outside of construction site.
- B. Use additional ground improvements as necessary to support Construction Dewatering and direct the flow of water from all sources away from the excavations and adjacent areas.
 - C. The Dewatering System shall be designed, repaired and modified if needed, to accommodate the quantity and quality of water as required to meet the effluent discharge standards in accordance with the Contract Documents and all applicable standards and permits.
 - D. Where hydrostatic pressures during the Work could result in floating or otherwise damage structures, pipelines or subgrade, a pumped Dewatering System will be required for pre-drainage of the soils prior to excavation, and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged.
 - E. Provide primary and standby power, including, but not limited to, establishing service from the utility company, usage, generators, installation, energy, and fuel.

3.02 SURFACE WATER COLLECTION

- A. Surface water (stormwater) on and around the site will be collected into local sumps by means of trenches, pipes, or other means as shown on Contractor's Dewatering Plan.
- B. Direct surface water to minimize surface erosion, ponding and softening of slopes and berms, including haul roads and equipment working stations.
- C. Slope protection will be provided locally as required and as indicated on the Contractor's working drawings.
- D. At the perimeter of the excavation, surface water is to be directed into the site drainage system and not permitted to enter the excavation.

3.03 Measures for preventing the pollution of and discharging of stormwater will be in

accordance with Specification Section 02370 – Erosion and Sedimentation Control.

3.04 SYSTEM OPERATION AND MAINTENANCE

- A. The Dewatering System will be installed to handle the dewatering needs of construction activities and any groundwater drawdown and maintenance necessary to perform site excavation. Equipment will be installed in accordance with manufacturer recommendations or instructions.
- B. Maintain continuous and complete effectiveness of the control of water and groundwater disposal system.
- C. The Dewatering System will provide for an uninterrupted flow of pumped water and will be maintained and pumped as necessary to drawdown and maintain the groundwater levels as specified. Unless otherwise specified, pumping will maintain those depressed levels until the permanent drainage system has been installed, tested, accepted and is operational or until the permanent structure, or a portion thereof, is capable of withstanding hydrostatic pressures as demonstrated with calculations by the Contractor's Engineer submitted to and approved by the Authority.
- D. Dewatering operations will be maintained in accordance with Specification Section 02612 - Reinforced Concrete Pipe, and Specification Section 03302 – Miscellaneous Cast-in-Place Concrete, and pipe, masonry, and concrete will not be placed in water or be submerged within 24 hours after being installed. Water will not flow over new masonry or concrete within four (4) days after placement.
- E. Furnish, operate and maintain sufficient drainage and pumping facilities to dewater the site and its underlying soil. Dewatering operations will operate in such a manner so that the excavation can proceed while maintaining stable slopes and the designed lateral support for the perimeter support of excavation walls, without disturbing the bearing subgrades for the structure and provide stable conditions.
- F. The Dewatering System will be installed and operated in such a manner as to avoid the movement of fines or loss of ground below the bearing level and will not influence the stability of surrounding areas. Wellpoints and deep wells will be properly sanded in, and sumps will be sheeted and provided with proper filter material.
- G. In accordance with the Dewatering and Drainage Plan and Specification Section 02495 – Geotechnical Instrumentation, monitoring wells will be installed to sufficient depth to allow continuous monitoring of groundwater levels at any stage of the dewatering or subsequent construction work, and water levels monitored daily to demonstrate that the goals of the Dewatering System are being met. If applicable, make use of existing monitoring wells as shown on the Drawings.
- H. Open pumping with sumps and ditches resulting in boils, loss of fines, softening of the

ground or instability of slopes will not be permitted.

- I. If the subgrade of the trench or excavation bottom becomes disturbed, excavate below normal grade as directed by the Authority and refill with structural fill, granular material, crushed stone, or CLSM as specified in Specification Section 02200 - Earthwork at no additional cost to the Authority.
- J. Report immediately to the Authority sign of subgrade disturbance or unaccountable reduction in effluent flow rate and steps immediately taken to correct the condition at no additional cost to the Authority.
- K. Cooperate with and provide assistance to the Authority in sampling and performance testing of the Dewatering System. The Authority may witness and perform inspections of:
 - 1. Testing of filter materials and suspended solids from dewatering wells.
 - 2. Drawdown and performance testing of Dewatering System.
 - 3. Performance testing of standby power source and backup Dewatering System.

3.05 DISCHARGE TESTING

- A. Monitoring of dewatering efforts will be conducted to determine if the Project and related permit requirements are being met. Provide monitoring wells and other means to monitor the dewatering as detailed in the Dewatering and Drainage Plan.
- B. Determine the presence of contaminants in dewatering discharge, including the quantity of fines in the pumped water, by sampling and analyzing in accordance with permit requirements.

3.06 DEWATERING TREATMENT

- A. The Contractor shall manage and dispose of groundwater generated during control of water activities in accordance with all applicable federal, state, and local requirements. The Contractor shall acquire all necessary permits and/or applications for disposal of groundwater and dewatering effluent.
- B. Provide an appropriately sized treatment system to meet the requirements of the standards and permits specified in Paragraph 1.05 and in accordance with all applicable standards and permits.
- C. Oil-Water Separation / Sediment Tanks / Gravity Settling Tanks
 - 1. Furnish all material, labor, and equipment necessary to install oil-water separation and sediment tanks. The tanks shall be capable of trapping and retaining oil and

sediments prior to pumping the water to discharge locations.

2. The storage volume of the sediment tanks should be at least 1.5 times the following: pump(s) discharge (Gallon Per Minute (gpm)) x 16 = cubic foot storage.
 3. Clean out the sedimentation tank(s) when 25% of the tank is filled with sediments. All sediments collected in the tank(s) shall be disposed of off-site.
- D. The treatment system components shall be equipped with an overflow collection system to prevent accidental release of dewatering effluent.
 - E. Carry out routine inspection of the treatment system daily to ensure that system integrity is being maintained, and that all provisions are in place to avoid accidental discharge.
 - F. Clean settling tanks/ponds frequently to prevent excess deposition of solids which could overflow from the tank/pond.
 - G. Treatment system solids that are removed shall be properly disposed of in accordance with the requirements of Specification Section 01567 – General Environmental Controls.
 - H. Provide treatment for or remove from the site to an approved disposal facility (whichever is applicable), all Dewatering System effluent or groundwater which exceeds any limit set for surface water or sewer discharge..
 - I. Classification and disposal will conform to Specification Section 01567 – General Environmental Controls, Specification Section 02200 – Earthwork, and all applicable standards and permits.
 - J. Dewatering System effluent may be affected by rainfall or snowfall. Provide adequate equalization and holding tanks/ponds to allow work to proceed in the case of restricted discharge capability during rain or snow events.
 - K. Obtain and pay for all permits, applications and licenses required by law that are associated with the disposal of Dewatering System effluent.

3.07 COFFERDAM

- A. The water level within the cofferdam shall be continuously maintained at a level which will provide a stable subgrade until completion of the construction. The Dewatering System shall prevent degradation to the quality of material and shall have reliable standby equipment and power supply.
- B. After completion of the permanent construction, the water level within the cofferdam shall be continuously maintained, by the Dewatering System, at a level that prevents

flotation of the structure.

3.08 RESTORATION

- A. At the completion of the excavation and backfilling work, and when approved by the Authority, all pipe, deep wells, wellpoints, pumps, generators, observation wells, other equipment and accessories used for the groundwater and surface water control systems will be removed from the site, except as specified otherwise within this Section. All materials and equipment will remain the property of the Contractor. All areas disturbed by the installation and removal of groundwater control systems and observation wells will be restored to their original condition.
- B. Leave in place any casings for deep wells, wellpoints or observation wells located within the plan limits of structures or pipelines or within the zone below 1H:1V planes extending downward and out from the edges of foundation elements or from the downward vertical footprint of the pipe, or where removal would otherwise result in ground movements causing adverse settlement to adjacent ground surface, utilities, or existing structures.
- C. Where casings are pulled, holes will be filled with sand. Where left in place, casings should be filled with cement grout and cut off a minimum of 3 feet below finished ground level or 1-foot below foundation level so as not to interfere with finished structures or pipelines.
- D. When directed by the Authority, observation wells should be left in place for continued monitoring. When so directed, cut casings flush with final ground level and provide protective lockable boxes with locking devices. The protective boxes will be suitable for the traffic and for any other conditions to which the observation wells will be exposed.

**** END OF SECTION ****