SPECIFICATION NO: **SECTION 01030**

SPECIFICATION TITLE: **ENVIRONMENTAL PROTECTION**

PROJECT NO: **444853**

PROJECT TITLE: **ONONDAGA LAKE SEDIMENT MANAGEMENT SYSTEM FINAL DESIGN**

CLIENT: **HONEYWELL, INC.**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
0	23May11	11	Original	DDS	TCD	NA

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☐ In-house Review ☐ Bid

☐ Client Review/Approval ☒ Construction

☐ Information Only ☐ *Other*

SECTION 01030

ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.01 DESCRIPTION

A. The Work specified in this Section consists of all labor, equipment, tools, materials, services, supervision and incidentals necessary for environmental pollution control and abatement for the Work as described herein, shown on the Project Drawings, or as directed by the Engineer. Work in this Section includes, but is not limited to controlling environmental pollution requiring the consideration of air, water, and land; management of noise, solid and hazardous waste, and other pollutants.

1. Related Work specified in other Sections includes, but is not limited to:
   b. Section 02200 – Earthwork

1.02 PERFORMANCE REQUIREMENTS

A. The Contractor shall comply with all applicable Federal, State, and Local codes, ordinances, regulations, statutes and standards.

1.03 REFERENCES

A. New York State Standards and Specifications for Erosion and Sediment Control, (Latest Version).

B. New York Department of Transportation: Standard Specifications (US Customary), 2009.

C. New York State Department of Environmental Conservation: Draft 6 NYCRR Part 375, Environmental Remediation Programs, 2006.

D. New York State Department of Environmental Conservation: 6 NYCRR Part 360 Regulations.

E. Resource Conservation and Recovery Act (RCRA)

F. Toxic Substances Control Act (EPA)

1.04 DEFINITIONS

A. Environmental Pollution shall be defined as the presence of chemical, physical, or biological elements or agents which:

1. Adversely affect human health or welfare.
2. Unfavorably alter ecological balances of importance to human life.
3. Affect other species of importance to man.
4. Degrade the utility of the environment for aesthetic and/or recreational purposes.

B. Prohibited Construction Practices include, but are not limited to the following:

1. For any stream corridor, wetland, surface water or any unspecified location:
   a. Dumping of spoil material
   b. Indiscriminate, arbitrary, or capricious operation of equipment
   c. Pumping of silt-laden water from trenches or other excavations
   d. Disposal of trees, brush, and other debris
2. Permanent or unspecified alteration of the flow line of any stream.
3. Explosive blasting.
4. Burning of refuse and debris at the project site.

1.05 SUBMITTALS

A. The Contractor shall submit the following:

1. A Contractor's SWPPP with a description of and illustration showing anticipated stormwater control and erosion control measures to be implemented during construction. This shall be submitted prior to mobilization to the Site.
2. Material Safety Data Sheets (MSDS) for all products having MSDSs 10 working days prior to delivery of such product to Site. MSDSs must be maintained and readily available on-site.
3. The Contractor shall be responsible for completing an inspection form for each piece of equipment, tool or bulk recyclable remnant structure or pipe being removed from the Site that required decontamination.
4. An "Off-Site Disposal Record" as part of the Final Closeout Report.

1.06 PROJECT AND SITE CONDITIONS

A. The Contractor shall carefully examine the site to determine the full extent, nature, and location of the Work required to conform to the Contract Drawings and Specifications. The Contractor shall bring any inaccuracies or

discrepancies between the Contract Drawings and Specifications to the Engineer's attention in order to clarify the exact nature of the Work to be performed.

PART 2 – PRODUCTS

2.01 DECONTAMINATION PRODUCTS

A. Cleaning products anticipated for use in decontamination include, but are not limited to the following:

1. A pressure washer (or equivalent) furnished and used by the Contractor shall be a high-pressure, low-volume unit from an industry-recognized manufacturer.
2. The Contractor shall provide miscellaneous tools such as shovels and brushes.
3. The Contractor shall provide cleaning agents such as non-phosphate detergents for use as necessary.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prior to commencement of the Work, the Contractor shall meet with the Engineer to develop mutual understanding relative to compliance with these provisions and administration of the environmental pollution control program.

B. The Contractor shall schedule and conduct all Work in a manner that will minimize the erosion of soils in the area of the Work and shall provide erosion control measures. All erosion control measures shall be in place and in operating condition in an area prior to any construction activity in that area.

C. The Contractor shall manage construction water and sequence and conduct earthwork activities to limit the generation of construction water as appropriate.

3.02 TEMPORARY ENVIRONMENTAL CONTROL FEATURES

A. The Contractor will dismantle and remove temporary environmental control features only when permanent control features have been installed and assessed as correctly functioning by the Engineer. Permanent control features shall be incorporated into the Project at the earliest practicable time in light of construction scheduling, and shall be in place and functioning upon project completion.

3.03 GENERAL REQUIREMENTS

A. Flow of surface water into excavated areas shall be prevented as much as is practical.

B. Ditches around construction areas shall also be used to carry non-contact surface storm water away from the excavated areas.

C. At the completion of the Work, temporary ditches shall be backfilled and the ground surface restored to its original condition.

3.04 PROTECTION OF STREAMS AND SURFACE WATERS

A. The Contractor shall take all precautions to prevent, or reduce to a minimum, any damage to any stream or surface water from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams or surface water.

B. The Contractor shall take all preventative measures to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with all applicable Federal, State and Local codes, ordinances, regulations, statutes and standards and as approved by the Engineer.

C. Water that has been used for washing or processing, or that contains oils or sediments that will reduce the quality of the water in the stream or surface water shall not be directly returned to the stream or surface water. Such waters shall be diverted to the Geddes Brook Water Treatment Plant or as directed by the Engineer.

3.06 PROTECTION OF LAND RESOURCES

A. The Contractor shall restore land resources within the project boundaries and outside the limits of permanent Work to conditions upon completion of construction such that these will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Contract Drawings or as approved by the Engineer.

B. Outside the Limits of Clearing and Grubbing as indicated on the Contract Drawings, the Contractor shall not de-face, injure, destroy, or remove trees, shrubs, fencing, structures, or other landscape features without prior approval by the Engineer. No ropes, cables, or guys shall be fastened to any existing trees, shrubs, fencing, structures or other landscape features for anchorage unless specifically authorized by the Engineer.

C. Prior to operations, the Contractor shall ensure adequate protection for trees, shrubs, fencing, structures or other landscape features that may possibly be de-faced, bruised, injured or otherwise damaged by the construction equipment or other operations. Monuments and markers shall be similarly protected.

D. Any trees, shrubs, fencing, structures or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Engineer will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.

E. The location of the Contractor's support areas shall be approved by the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of support area locations. Drawings showing support area locations shall be submitted for approval of the Engineer.

F. If the Contractor proposes to construct temporary roads or embankments and excavations for support areas, the following shall be submitted for approval at least 10 days prior to scheduled start of such temporary work:

1. A layout of all temporary roads, excavations, embankments, and drainage to be constructed within the site.
2. Details of temporary road construction.
3. Drawings and cross-sections of proposed embankments and their foundations, including a description of proposed materials.
4. A landscaping drawing showing the proposed restoration of the area. The Drawing must include, but not be limited to the following:
    a. The proposed removal of any trees, shrubs, fencing, structures, or other landscape features outside the limits of clearing and grubbing.
    b. The locations of guard posts or barriers required to protect trees, shrubs, fencing, structures or other landscape features to be maintained undamaged.
    c. The locations of guard posts or barriers required to control vehicular traffic.
    d. The provision for the obliteration of construction scars and for a natural final appearance of the area.

G. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction, including disposal areas will be permitted.

H. The Contractor shall remove all signs of support areas or any other vestiges of construction as directed by the Engineer. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near-natural conditions in order to allow the growth of vegetation. Roadways will be restored to existing conditions or as directed by the Engineer. The disturbed areas shall be prepared and seeded as approved by the Engineer.

3.07 PROTECTION OF AIR QUALITY

A. Dust Control

1. The Contractor is responsible for dust control for all excavations, embankments, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas.
2. An approved method of dust control is sprinkling of water from a water source approved by the Engineer.
3. The use of any other stabilization methods may be permitted with approval from the Engineer. Product samples and manufacturer's literature must be submitted to the Engineer . All products that are approved for dust control shall be used in accordance with the manufacturer's instructions.
4. Sprinkling must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment to accomplish this. Dust control shall be performed as the Work proceeds and whenever a dust nuisance or hazard occurs, or as determined by the Engineer.

B. Odor Control

1. If odors are an issue as determined by the Engineer, the Contractor shall provide an odor control material or applicable procedure acceptable to the Engineer.

3.08 NOISE CONTROL

A. The Contractor shall be aware of all applicable Federal, State, and Local codes, ordinances, regulations, statutes and standards related to noise. The Contractor shall adhere to any local regulations and restrictions regarding the start and stop times of work activities at the site.

3.09 MANAGING WASTE MATERIAL

A. Managing Waste Material Requirements

1. The Contractor shall manage the handling, segregation, stabilization, containment, storage, loading and transportation of all waste materials resulting from the performance of the Work.
2. All waste storage, staging and loading areas shall be in a location determined by the Engineer.
3. Litter, clean construction debris, metal, wood, office trash, etc. or other non-contaminated materials may be disposed of at an approved disposal facility.

B. Waste Segregation

1. The Contractor shall segregate litter, construction debris, hazardous wastes, and non-hazardous wastes based on generator knowledge.
2. The Contractor shall further segregate non-hazardous wastes (contaminated or uncontaminated) in a similar manner.
3. The Contractor shall keep wastes of unknown classification separate from other wastes and manage as if they were hazardous until a waste determination has been made.
4. If wastes cannot be classified based solely on generator knowledge, the Contractor shall collect waste samples as directed by the Engineer.

C. Waste Containers

1. The Contractor shall furnish appropriate containers (metal dumpsters with secure lids or covered roll-off containers), for construction debris and/or uncontaminated non-hazardous waste as required.
2. Waste shall be disposed of at frequent and regular intervals as required to prevent the overfilling of such containers. Place non-hazardous solid wastes, construction debris, and litter in containers in accordance with this specification.
3. The Contractor shall visually inspect all containers of wastes for leaks or damage prior to being loaded for transportation and off-site disposal. Transfer contents of any leaking or damaged container to another container or overpacks and re-inspect prior to loading. Clean up, contain, and label spilled materials for disposal in accordance with the Contract Documents.
4. Any material that spills from containers shall be immediately cleaned and placed back into the waste containers.

D. Waste Transportation and Disposal

1. Dumpsters shall be emptied every two weeks, when full, or as directed by the Engineer. There shall be no liquid allowed in the containers.

2. No waste material shall be buried on-site or used as landfill for any part of grading activities.
3. All Contractor and Subcontract personnel must be trained on correct waste disposal procedures.
4. Honeywell shall agree to the selection of disposal facilities in advance in writing.
5. The Contractor shall dispose of waste oils and petroleum products generated during the Work in a safe and environmentally responsible manner.
6. A Honeywell Representative will sign all waste profile sheets for waste characterization and manifest(s) for off-site waste disposal of all regulated site generated waste.

E. Non-Hazardous Wastes

1. The Contractor shall load, transport, and dispose of non-hazardous wastes generated in performance of the Work.
2. Waste containers shall be "sealed" non-leaking dumpsters, or equivalent; maintained to prevent leakage.
3. Before waste containers become full, the Contractor shall dispose of waste off-site.
4. If required, the Contractor shall dispose of non-hazardous wastes at a permitted off-site facility using a permitted waste transporter.
5. A non-hazardous waste manifest or Bill of Lading, signed by Honeywell, shall accompany each waste shipment. The original paperwork, stamped received and signed by the disposal facility, shall subsequently be returned to the Engineer.
6. The Contractor shall furnish all paperwork to the Engineer.

F. Hazardous & TSCA Waste

1. Honeywell will contract the transportation and disposal (T&D) of all hazardous wastes requiring off-site disposal directly with the T&D facility. Honeywell will decide who will be responsible for waste characterization.
2. Honeywell shall select waste transportation and disposal contractor(s) and issue necessary Purchase Order(s).
3. The Contractor shall:
   a. Manage hazardous wastes in accordance with RCRA and/or TSCA regulations.
   b. Place drummed wastes in a lined temporary staging area with berms, aisle space, stacking height, periodic logged inspections, stormwater management, and security in accordance with applicable RCRA regulations for drum management.

c. Furnish itemized estimated volumes for Hazardous and TSCA Wastes to be generated by their operations (decontamination waste, used PPE, emergency response waste, etc).
d. Place waste materials for off-site disposal in the proper transportation containers, label waste containers, sample and characterize waste, provide temporary storage, prepare waste manifest and coordinate transportation with Honeywell.
e. Coordinate the management, handling, transport and off-site disposal of hazardous or TSCA regulated wastes resulting from the Work.
f. Allow seven working days for Honeywell to review and agree to the characterization and manifest documentation prior to scheduling transportation.

3.10 USE OF CHEMICAL PRODUCTS

A. Chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant or of other classification, shall be approved by the U.S. EPA or U.S. Department of Agriculture or any other applicable regulatory agency.

B. The Contractor shall obtain required certifications, permits, and inspections and comply with all Federal, State, Local, and DOT codes, ordinances, regulations, statutes and standards governing transportation, handling, storage, and use of chemical products and residues.

C. The Contractor shall refer to the pertinent MSDS for information on all chemical products used or present at the Site.

3.11 FUEL AND LUBRICANTS

A. The Contractor shall comply with all applicable Federal, State, and Local codes, ordinances, regulations, statutes and standards concerning transportation and storage of fuels and lubricants.

B. Fuel storage area and fuel equipment shall be approved by the Engineer prior to installation.

C. The Contractor shall report spills or leaks from fueling equipment or construction equipment to the Engineer and cleanup as required.

D. The Engineer will require the Contractor to remove damaged or leaking equipment from Project site.

3.12 DECONTAMINATION

A. The Contractor shall properly decontaminate all tools and equipment before removal from site.

B. The Contractor shall properly decontaminate all supplies and materials before removal from site, or manage as waste materials in accordance with the requirements of this specification.

C. The Contractor shall use decontamination pads in order to separate exclusion and clean zones as required as follows:

1. The decontamination pad shall be used and maintained to accommodate the anticipated construction equipment at the approved location. The area shall be returned to its previous condition upon completion of the Work unless otherwise directed by the Engineer.
2. When not in use, each decontamination pad shall be covered with a waterproof liner to prevent the collection of precipitation.
3. Wood planks may be placed over the impermeable liner at the Contractor's discretion to provide a traveling surface for vehicle wheels and equipment tracks.
4. All decontamination water collected in the decontamination pad shall be managed as construction water.
5. All equipment and material decontamination procedures shall be carried out on the decontamination pad.
6. The collection sump shall be purged at the end of each work day and as required, and/or following a rainfall event.

[END OF SECTION]

SPECIFICATION NO: **SECTION 02100**

SPECIFICATION TITLE: **SITE CLEARING**

PROJECT NO: **444853**

PROJECT TITLE: **ONONDAGA LAKE SEDIMENT MANAGEMENT SYTEM FINAL DESIGN**

CLIENT: **HONEYWELL, INC.**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
0	23May11	4	Original	DDS	TCD	NA

☒ **Entire Specification Issued this Revision** ☐ **Revised Pages Only Issued this Revision**	SPECIFICATION ISSUED FOR: ☐ **In-house Review** ☐ **Bid** ☐ **Client Review/Approval** ☒ **Construction** ☐ **Information Only** ☐ ***Other***

SECTION 02100
SITE CLEARING

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. The Work specified in this Section consists of all labor, equipment, tools, materials, services, supervision and incidentals necessary to remove and dispose of debris, brush, trees, vegetation, topsoil, and other objectionable materials from Work areas as described herein, shown on the Contract Drawings, or as directed by the Engineer. Work in this Section includes, but is not limited to:

1. Clearing to establish access routes, support areas, and other work areas as shown on the Contract Drawings, as necessary to complete the Work, or as directed by the Engineer;
2. Protection and preservation of trees and vegetation outside the Limits of Clearing; and
3. Cutting, chipping, and on-site use or disposal of above-grade timber and brush.

1.02 RELATED WORK

A. Work in this section includes, but is not limited to:

1. Section 01030 Environmental Protection
4. Section 02200 Earthwork

1.03 PERFORMANCE REQUIREMENTS

A. The Contractor shall comply with all applicable Federal, State, and Local codes, ordinances, regulations, statutes and standards.

1.04 SUBMITTALS

A. The Contractor shall submit the following:

1. The Limits of Clearing; and
2. The proposed methods for managing debris, brush, trees, stumps, vegetation, and other debris.

1.05 PROJECT AND SITE CONDITIONS

A. The Contractor shall carefully examine the site to determine the full extent, nature, and location of work required to conform to the Contract Drawings and Specifications. The Contractor shall bring any inaccuracies or discrepancies between the Contract Drawings and Specifications to the Engineer's attention in order to clarify the exact nature of the Work to be performed.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.01 SITE CLEARING

A. Provide erosion control measures prior to and throughout all clearing activities.

B. Limit clearing activities to the Limits of Disturbance shown on the Contract Drawings, or as otherwise approved by the Engineer.

C. Manage construction water and sequence clearing activities to limit the generation of construction water as appropriate.

D. Remove vegetation within the limits of work as needed for installation. Dispose of all removed material on the areas of Wastebed (WB) 13 not designated for SCA or other facility construction.

E. Immediately restore or replace any damaged items.

G. Do not burn on or off-site.

3.02 GUARANTEE

A. The Contractor shall guarantee that Work performed under this Section will not permanently damage trees, shrubs, turf or plants designated to remain, or other adjacent work or facilities. If damage resulting from operations appears during a period up to 12 months after completion of the project, the Contractor must replace damaged items.

[END OF SECTION]

SPECIFICATION NO: **02140**

SPECIFICATION TITLE: **CONSTRUCTION WATER MANAGEMENT**

PROJECT NO: **444853**

PROJECT TITLE: **ONONDAGA LAKE SEDIMENT MANAGEMENT SYSTEM FINAL DESIGN**

CLIENT: **HONEYWELL**

				APPROVALS		
Issue	**Date**	**Pages**	**Issue Description**	**Prepared**	**Checked**	**Approved**
0	23May11	11	Original	DDS	TCD	NA

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☐ In-house Review
☐ Client Review/Approval
☐ Information Only
☐ Bid
☒ Construction
☐ *Other*

PART 1 GENERAL

1.01 DESCRIPTION

A. The Work specified in this Section consists of all labor, equipment, tools, materials, services, supervision and incidentals necessary to collect, handle, store, analyze, treat, transport and dispose of construction water and associated residual solids as described herein, shown on the Contract Drawings, or as directed by the Engineer. Work in this Section includes, but is not limited to:

1. Performance of all specified and necessary sampling and analyses to ensure compliance with the Contract Documents, required permits, applicable Federal, State and Local codes, ordinances, regulations, statutes and standards.

B. Related Work specified in other Sections includes, but is not limited to:

1. Section 01300 - Environmental Protection
2. Section 02200 –Earthwork

1.02 PERFORMANCE REQUIREMENTS

A. The Contractor shall comply with all applicable Federal, State and Local codes, ordinances, regulations, statutes and standards.

B. The Contractor is to obtain and operate within all applicable Local, State, and Federal permits and requirements necessary to implement the proposed Construction Water Management Procedures. Any and all civil, criminal, and monetary penalties associated with non-compliance in any regard shall be the responsibility of the Contractor.

1.03 REFERENCES

A. New York State Standards and Specifications for Erosion and Sediment Control, (Latest Version).

B. New York State Stormwater Management Design Manual, (Latest Version).

1.04 DEFINITIONS

A. Construction Water shall be defined as water/liquids that contact contaminated materials, and includes the following:

1. Water which has come in contact with contaminated soils, sediments, fill or debris that have had the surface disturbed by construction-related activities; with the exception of water classified as stormwater as defined in 1.4.B, or floodwater as defined in 1.4.C.
2. Liquids generated during decontamination activities.

B. Stormwater shall be defined as water/liquids that do not contact disturbed contaminated materials, and includes the following:

1. Water incident upon or draining from undisturbed excavation areas. This water shall be diverted from the excavation area as required to prevent contact with the construction operations.
2. Water incident upon or draining from fill areas, graded areas, and excavation areas in non-containated areas. .
3. If disturbed contaminated materials are covered by clean materials (e.g. soil, geotextile, plastic sheeting) or otherwise stabilized, waters that stand on or flow over/from that surface shall be defined as storm water.

Stormwater shall be controlled and managed as described in the project SWPPP.

C. Floodwater shall be defined as waters that flow onto the site from adjacent surface water bodies at elevations at least 1 ft above the median surface water elevations. Floodwater that drains by gravity from the site, is pumped down to a clean or undisturbed material surface, or to within 6 inches of a disturbed contaminated material, shall be managed as storm water.

D. Residual solids shall be defined as solids resulting from the construction water management operations, including sediment accumulated in settling ponds or basins, chemically flocculated sediments, precipitates and filtered suspended solids.

1.05 SUBMITTALS

A. The Contractor shall submit the following:
   1. Quality Control Work Plan.
   2. Name and Qualifications of Independent Testing Laboratory.
   3. Test results as specified herein shall be submitted to the Engineer for review immediately upon receipt of results:
      a. Waste Characterization

1.06 QUALITY CONTROL

A. The Contractor shall submit a Quality Control (QC) Work Plan for review. Once instituted, the Contractor shall use the QC Work Plan to ensure that the Work meets the requirements of the Contract Documents.

B. The Contractor shall submit the name of a qualified Independent Testing Laboratory (ITL) to the Engineer for review.

1.07 PROJECT AND SITE CONDITIONS

A. The Contractor shall carefully examine the site to determine the full extent, nature and location of work required to conform to the Contract Drawings and Specifications. The Contractor shall bring any inaccuracies or discrepancies between the Contract Drawings and Specifications to the Engineer's attention in order to clarify the exact nature of the Work to be performed.

PART 2 PRODUCTS

2.01 GENERAL

A. Construction Water Management Procedures

1. The acceptable methods of managing construction water are limited to collection and:
    a. For construction water collected during pipeline construction, transfer to the Geddes Brook temporary water treatment plant for treatment and discharge.
    b. For construction water collected during construction on Wastebed 13, manage in accordance with the project SWPPP.
    c. Off-site disposal at a permitted treatment facility.
2. The acceptable methods of managing residual solids generated by the Contractor's management of construction water are limited to:
    a. procedures defined for management of excavated waste defined in Specification 02200 Earthwork.
    b. If directed by the Engineer, collection, analytical testing, transport and off-site treatment and disposal, which shall be conducted in accordance with all applicable Federal, State and Local codes, ordinances, regulations, statutes and standards.

B. Services, Facilities and Personnel: The Contractor shall provide all means, methods, services, facilities, power, equipment, tools, material, consumables, incidentals, labor and supervision necessary to collect, handle, store, analyze, treat, transport, dispose and otherwise manage construction water.

C. Stormwater shall be diverted to existing drainage features with no further treatment necessary, following the procedures in the SWPPP. Trapped stormwater may be pumped to existing drainage features with no further treatment necessary, following the procedures in the SWPPP.

PART 3 EXECUTION

3.01 PREPARATION

A. The Contractor shall be responsible for estimating the quantity and quality of construction water and residual solids expected for this project based on the existing site conditions and proposed activities.

B. It shall be the responsibility of the Contractor to investigate and comply with all applicable Federal, State and Local codes, ordinances, regulations, statutes and standards governing the collection, handling, storage, analysis, treatment, transportation and disposal of all construction water and associated residual solids generated during the execution and completion of the Work. All construction water

shall be disposed of in a manner which meets applicable permit requirements, codes, ordinances, regulations, statutes and standards.

C. The Contractor shall obtain all required permits, manifests, and approvals required for the collection, handling, storage, analysis, treatment, transportation and disposal of all construction water and associated residual solids generated during the execution and completion of the Work.

D. Sampling and analyses necessary to protect the health and welfare of the Contractor's employees and/or agents and/or to characterize collected water, treated water or residual solids shall remain the sole responsibility of the Contractor.

E. Construction water shall be managed using equipment compatible with anticipated contaminants which may be present.

3.02 ON-SITE DISCHARGE

A. No construction water shall be discharged on-site. Construction water shall be rransferred to the Geddes Brook temporary water treatment plan for treatment and discharge.

3.03 ON-SITE DISPOSAL OF RESIDUAL SOLIDS AND OTHER WASTES

A. The Contractor shall dispose of construction water related waste and associated residuals in accordance with the procedures defined for management of excavated waste defined in Specification 02200 Earthwork..

3.04 OFF-SITE DISPOSAL OF RESIDUAL SOLIDS AND OTHER WASTES

A. If directed by the Engineer, the Contractor shall characterize construction water related wastes and any associated residuals as necessary for off-site disposal.

B. No Contractor-proposed facility for off-site disposal shall be used without prior approval by Honeywell. For all wastes disposed of off-site, the Contractor is responsible for characterizing such material and arranging for proper temporary storage in accordance with all applicable Federal, State and Local regulations at no additional cost to Honeywell. Honeywell will contract off-site transportation and disposal of wastes directly.

C. The Contractor shall dispose of wastes designated for off-site disposal within 90 days of filling the storage container.

D. The Contractor shall mark, label, placard, package and manifest wastes in accordance with applicable codes, regulations, and statutes.

3.04 MINIMIZATION OF CONSTRUCTION WATER

A. The Contractor shall make every effort to minimize the generation of construction water and associated residual solids. Methods to minimize generation of construction water include, but are not limited to:

1. Erection of temporary berms or construction of temporary ditches.
2. Use of low permeability tarpaulins or suitable means to cover exposed contaminated areas and materials.
3. Use of 6-inches of uncontaminated soil as daily cover to cover exposed contaminated areas and materials.
4. Limiting the amount of exposed contaminated areas.
5. Grading to control run-on and run-off.
6. Engineering controls on construction activities to minimize contact of personnel and equipment with contaminated areas, thus minimizing the amount of decontamination or other methods required.
7. The Contractor will also have the option to use water from Onondaga Lake for dust control or other site operations.

[END OF SECTION]

SPECIFICATION NO: **SECTION 02200**

SPECIFICATION TITLE: **EARTHWORK**

PROJECT NO: **444853**

PROJECT TITLE: **ONONDAGA LAKE SEDIMENT MANAGEMENT SYSTEM FINAL DESIGN**

CLIENT: **HONEYWELL, INC.**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
0	**23May11**	**9**	**Original**	**DDS**	**TCD**	**---**
			•			

☒ **Entire Specification Issued this Revision**

☐ **Revised Pages Only Issued this Revision**

SPECIFICATION ISSUED FOR:

☐ **In-house Review** ☐ **Bid**
☐ **Client Review/Approval** ☒ **Construction**
☐ **Information Only** ☐ ***Other***

SECTION 02200

EARTHWORK

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, supervision, and incidentals necessary to perform all excavation, backfilling, and grading necessary for completion of the work shown on the Drawings and as specified herein. The work shall include, but is not necessarily limited to: site preparation, dewatering, excavation, relocating, screening, stockpiling, preparing and/or hauling soils for proper disposal offsite or reuse onsite, subgrade preparation and grading, provision of imported fills, placement and compaction of fill, survey control associated with earthworks, appurtenant work completed in accordance with the Drawings and Specifications, and all related work, as directed by the Engineer.

D. All excavation, trenching, sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR PART 1926.650 Subpart P).

1.02 RELATED WORK

A. Work in this section includes, but is not limited to:

1. Section 01030 Environmental Protection
4. Section 02100 Site Clearing

1.03 REFERENCES

A. Latest version of American Society for Testing and Materials (ASTM) Standards:

1. ASTM D 422 Standard Test Method for Particle Size Analysis of Soils.
2. ASTM D 698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D 1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
4. ASTM D 2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

5. ASTM D 2487 Standard Test Method for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
6. ASTM D 2937 Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.
7. ASTM D 4318 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
8. ASTM D 2974 Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
9. ASTM D 6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
10. ASTM C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

1.04 SUBMITTALS

A. The Contractor shall submit the following information to Engineer for review and approval 30 calendar days prior to initiating earthwork activities:

1. List of equipment proposed for the earthwork;
2. Proposed offsite borrow source(s);
3. Dewatering methods and techniques;
4. Dust control equipment and procedures;
5. Methods for supporting trenches, backfilling, compaction, grading, and stormwater control;
6. Coordination of survey requirements for the earthwork;
7. Locations of on-site temporary soil stockpile areas;
8. Coordination of earthwork activities with surface-water management and erosion and sediment control measures;
9. Schedule for earthwork activities; and
10. Quality Control Work Plan.

B. The Contractor shall be responsible for the adequacy and safety of the methods.

C. Test results as specified herein shall be submitted to the Engineer for review within two (2) working days of receipt of results. The Contractor shall not deliver material to the site prior to submission and approval by the Engineer of the geotechnical and analytical chemistry test results.

1.05 CONSTRUCTION QUALITY CONTROL

A. The Contractor shall submit a Quality Control (QC) Workplan for review to the Engineer. Once instituted, the Contractor shall use the QC Workplan to ensure that the Work performed under the contract meets the requirements of the Contract Documents.

B. The Contractor shall submit the name of a qualified Independent Testing Laboratory (ITL) to the Engineer for review.

1. The Contractor shall submit to the Engineer for approval, the company name, address, and qualifications of the selected ITL proposed for use at the project. Included in this submittal will be the names and qualifications of the individuals who are proposed for assignment to the site. The Engineer reserves the right to request other information regarding the qualifications of the ITL for use in the evaluation process.

C. Sampling

1. The Contractor shall be responsible for collecting samples and conducting tests using a qualified ITL to document material property compliance with the specifications.
2. The Contractor shall be responsible for collecting samples and conducting tests using a qualified ITL to certify and document that imported material meets the allowable analytical compound concentrations and properties specified in this Section. These samples will be collected and transported in compliance with the QC Workplan. The Engineer reserves the right to observe sampling and testing of the materials. The Contractor shall provide at least 24-hours notice of a sampling event to the Engineer.
3. Representative samples of each specific material type from each specific material source will be obtained by compositing at least five randomly selected individual samples of approximately equal weight. The total composite sample mass shall be at least the minimum size required to conduct all of the required material property and analytical chemistry tests for that material type. Each of the individual samples will be obtained from within the boundaries of the material mass that the composite sample represents. In addition, at least one (1) pound of each individual sample will be retained in a separate, sealed clean glass jar for mercury testing and for additional duplicate testing, if needed.
4. Contractor quality control samples may be obtained from in situ samples for pre-approval of a dedicated borrow source area. The sampling methodology and means for assuring the material dedication to the project shall be submitted to the Engineer for approval prior to the commencement of sampling.

5. Contractor quality control samples may also be obtained from dedicated stockpiles or storage/transportation vessels. The sampling methodology and means for assuring the material dedication to the project shall be submitted to the Engineer for approval prior to the commencement of sampling.

D. Sample Frequency

1. A representative composite sample will be obtained from each 2,500 cubic yards or part thereof with a minimum of 1 sample from each borrow source area with consistent appearance.

E. Analytical Chemistry Testing

1. These samples will be sent to an Analytical Chemistry Testing Laboratory (ACTL) selected by the Engineer. Each composite sample for each material shall be tested for the compounds in Table 375-6.8(b) "Restricted Use Soil Cleanup Objectives" in NYSDEC Subpart 375. All test results shall be below the Commercial cleanup objective concentrations provided in this table, with exceptions as allowed by NYSDEC, but in no case greater than Industrial Standards. Failure of a single compound test result shall mean that the entire material batch will be rejected unless specifically accepted on a test-by-test basis in writing by the Engineer, or

2. Originate from a borrow site that has been otherwise verified as having no compounds exceeding the limits in Table 375-6.8(a) "Unrestricted Use Soil Cleanup Objectives" in NYSDEC Subpart 375

F. Material Property Testing

1. Each composite sample shall be tested for material properties as defined in the specific specification section or sub-section for that material type.

G. General

1. No imported materials shall be delivered to the project site before the required material property and analytical chemistry testing for that batch has been provided to the Engineer and written approval received from the Engineer. Unapproved material shall be removed from the site at the Contractor's expense.
2. Contractor shall be responsible for repairing or reconstructing the deficiencies at his own expense to meet this specification and other Contract Documents.

1.06 CONSTRUCTION QUALITY ASSURANCE

A. The Engineer may conduct quality assurance sampling on materials delivered to the site.

1. The Contractor shall provide access and support to the delivered materials in order for representative sampling and testing to be conducted.
2. The Engineer shall have the right to visit the borrow source at any time during borrow pit working hours to observe mining, manufacturing, stockpiling or loading operations.

1.07 AS-BUILT DOCUMENTATION

A. The Contractor shall provide clearly marked-up set of contract drawings showing all field changes, additions, deletions, and/or corrections.

B. In addition to preparation of as-built revisions to the Project Drawings, the Contractor shall provide as-built documentation for the top surface of placed fill.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Common Fill

1. Common Fill shall consist of natural mineral soil substantially free of organic materials, topsoil, wood, trash, debris, frozen materials, and other objectionable materials that may be compressible or cannot be properly compacted. Common Fill shall have the following gradation:

Sieve Size	Percent Finer by Weight
12-in	**100**
4-in	**80-100**
1/4-in	**30 to 75**
No. 40	**5 to 60**
No. 200	**Less than or equal to 25**

B. Structural Fill

1. Structural Fill shall meet the requirements of NYSDOT 304-2 Type 2 or 4.

C. Gravel

1. Gravel shall meet the requirements of NYSDOT 703-4, Type 2.

C. The Contractor shall perform the following material property tests, prior to material being delivered to the site, at the frequency specified in Section 1.05:

1. Grain size (ASTM D 422 or ASTM C 136)
2. Moisture (ASTM D 2216)
3. Standard Proctor (ASTM D 698)
4. Atterberg Limits (ASTM D 4318)
5. Organic Content (ASTM D 2974)

D. These control tests will be performed at each visual or textural change in source material, or as directed by the Engineer. Test results shall be submitted to the Engineer in accordance with Part 1.04.

E. Re-Use of On-Site Soils: On-site soils may be re-used in re-grading and re-shaping operations. On-site soils may only be excavated for re-use from areas that have been approved by the Engineer and may only be placed in areas that have been approved by the Engineer.

2.02 EQUIPMENT

A. Contractor shall furnish equipment to perform the scope of work described in this specification, including excavation, hauling, placement, spreading, and compacting fill.

PART 3 – EXECUTION

3.01 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Material not immediately used as fill shall be stockpiled in areas approved by Engineer.

B. Stockpiled material shall be managed in accordance with the Contractor's procedures approved by Engineer.

3.02 SITE PREPARATION

A. Contractor shall coordinate the work such that required inspections and testing of work that will be covered up by the placement of fill will be complete prior to placement of the fill.

B. The Contractor shall construct staging and stockpile areas in approved areas if needed.

C. The Contractor shall construct temporary haul roads and drainage structures as required for the Contractor to access the staging areas and soil stockpiles.

D. Locate monitoring wells, piezometers, utilities, and other subsurface structures in the work area. Protect and maintain or abandon these structures and utilities during the excavation and grading activities in accordance with the notes on the Project Drawings.

E. Prior to earthwork and pipeline installation activities, the Contractor shall perform clearing and preparation of work areas in accordance with Section 02100 – Site Clearing. No additional preparation prior to pipeline installation is planned.

F. Prior to the start of construction, notify the appropriate organizations and have underground utilities staked or marked. Utilities include, but are not limited to water, gas, electric, telephone, cable, storm sewer, sanitary sewers, laterals, and services. If utility locations indicate a possible interference, or points of connection to existing facilities need to be identified, perform exploratory excavations to determine the utility's location and elevation. Provide the utility owner with results from exploratory excavations for review. Allow the Engineer sufficient time to review exploratory excavation results and evaluate if changes are required to the Contract Documents prior to the start of construction.

3.03 EXCAVATION

A. SCA Basin sump excavation shall be performed to achieve the grades shown on the Project Drawings. Appropriate excavation protection measures shall be taken to protect the stability of the excavation and safety of workers.

B. SCA Basin sump excavation shall be carried out during the presence of the Engineer. Sump excavation schedule shall be closely coordinated with the Engineer and subsequent liner construction activities to minimize the time the excavation remains open. Temporary backfill may be used as an interim excavation protection measure if it is not feasible to complete the liner system construction in the sump area and install the piping and backfill with the drainage layer gravel within a reasonable period of time.

C. Material excavated from the SCA Basin sump area shall be placed in an area of Wastebed 13, as directed by the Engineer and rough graded to blend into the surrounding topography. If excavated material is placed outside of the area for SCA operations, the area shall be stabilized after placement by vegetation with a seed mix that shall be approved by the Engineer.

D. Material from excavation in other areas, soil cuttings from trenchless installation activities, and residual solids from stormwater management shall be evaluated for contamination. Evaluation methods will include visual observations, olfactory responses, and responses by hand-held photo-ionization detectors employed at the work sites. In the event evidence of hydrocarbon impact is observed, media will be handled and disposed in accordance with established NYSDEC regulations. In the event Solvay Waste is encountered in Wastebeds 1 through 8, it shall be disposed of on Wastebeds 1 through 8 in areas designated by NYSDEC. If contamination is not detected, the material will be used for backfill or transported to either the SCA or to LCP for beneficial re-use. Excess drilling fluids from trenchless installation activities shall be disposed of at NYSDEC-certified disposal sites.

3.06 DUST CONTROL

A. Contractor shall provide and operate necessary equipment and personnel to maintain dust control during construction. Contractor is responsible for establishing the means and methods for dust control.

B. Contractor shall implement dust control measures during periods of site construction activities. Areas to receive dust control measures include active work areas, site access roads, and other areas of the site with activities that may generate dust.

3.07 STOCKPILING

A. The Contractor shall stockpile soils as needed in areas approved by Engineer.

B. The Contractor shall construct stockpiles no steeper than 3-horizontal to 1-vertical (3H:1V) grade to drain and seal by tracking perpendicular to the slope contours with a bulldozer and dress daily during periods when fill is taken from the stockpile. Stock piles shall not exceed a height of 10 feet without prior approval on a case by case basis by the Engineer.

C. The Contractor shall stabilize stockpiles that will remain out of active use for a period greater than 6 months by vegetation with a seed mix that shall be approved by the Engineer.

3.08 SITE GRADING

A. Perform earthworks to the lines and grades as shown on the Project Drawings.

B. In work areas where water ponding is observed, implement measures to remove the water.

3.09 FILL

A. Use fill material that meets the material requirements of this Section. Place fill material to the limits and grades shown on the Project Drawings.

B. Place fill material on surfaces that are free of debris, branches, mud or other deleterious materials.

C. Place structural fill material in loose lifts with a thickness of 8" $\pm$ 2". In areas where compaction is to be performed using hand-operated equipment, place the fill material in loose lifts with a thickness of 4" $\pm$ 1". The first lift shall be placed with a loose lift thickness of up to 24" $\pm$ 2". If 24" lifts are not adequate to bridge the soft subgrade, the Contractor shall propose alternate methods, to be approved by the Engineer, for achieving compaction requirements on subsequent lifts (e.g., placement of a nonwoven geotextile [minimum 8 oz./yd^2] or other geotextile demonstrated to be suitable).

D. For structural fill, remove visible rock particles such that adequate compaction can be achieved. As a guide, rock particles with a nominal dimension larger than 4" for 8" $\pm$ 2" thick loose lifts and 2" for 4" $\pm$ 1" should be removed.

E. Prior to placing a succeeding lift of structural fill material over a previously compacted lift or the prepared subgrade, thoroughly scarify the previous lift to a depth of 2" by discing, raking, or tracking with a dozer. Moisture condition the preceding lift if the moisture content is not within the range of acceptable moisture contents specified in this Section.

F. Fill slopes steeper than three horizontal to one vertical shall be constructed by overfilling beyond the planned finished fill surface and cutting the slope back to expose properly compacted fill.

G. Trafficking of scarified surfaces by trucks or other equipment, with rubber tires is not permitted.

I. Structural fill shall be compacted to a minimum dry density of 90 percent of the maximum dry density, and -2 to 2 percent of the optimum moisture content as measured using ASTM D 698. The first lift is not subjected to this compaction requirement. Test structural fill for compaction in accordance with ASTM D 6938 at a frequency of one test per 1,000 cubic yards.

J. Moisture condition the fill material to achieve the compaction requirements of this Section. Use a water spraying system for wetting. During wetting or drying, regularly disc, rake, or otherwise mix the material to thoroughly blend the moisture throughout the lift. Use discing, raking, or other appropriate methods to dry the material as required.

K. Replace and rework materials that become unsuitable or unstable as a result of work during inclement weather.

L. Rework or remove and replace structural fill that does not meet the compaction requirements of this Section.

3.10 SURVEY CONTROL

A. Survey the limits and elevations of completed prepared subgrade and top of finished fill surface. The thickness of layers shall be verified to be within specified tolerances prior to placement of overlying layers. Thickness verification may be by survey, or by the placement of marker rods or posts on the top of the completed lift indicating the maximum lift thickness before placement of the loose soil materials, or by excavation of potholes to measure loose lift thickness following placement and before compaction.

B. Provide As-Built drawings that include all field changes, additions, deletions, and/or corrections clearly marked.

3.11 TOLERANCES

A. Construct the finished surface of fill and excavations slopes to a tolerance of +0.2% of the slopes indicated on the Project Drawings when measured at any point along a 50 feet straight-edge. These tolerances shall not result in slopes that are less than the minimum slopes required on the Project Drawings.

[END OF SECTION]

SPECIFICATION NO: **SECTION 02201**

SPECIFICATION TITLE: **HELICAL TIEBACK ANCHORS**

PROJECT NO: **444853**

PROJECT TITLE: **ONONDAGA LAKE SEDIMENT MANAGEMENT SYSTEM FINAL DESIGN**

CLIENT: **HONEYWELL, INC.**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
0	23May11	12	Original	DDS	TCD	

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☐ In-house Review ☐ Bid

☐ Client Review/Approval ☒ Construction

☐ Information Only ☐ *Other*

PART 1 - GENERAL

1.01 PURPOSE OF SPECIFICATION

A. The purpose of this specification is to detail the furnishing of all materials, tools, equipment, labor and supervision, and installation techniques necessary to install CHANCE HELICAL TIEBACK ANCHORS as detailed on the drawings, including connection details. This shall include provisions for load testing that may be part of the scope of work

1.02 QUALIFICATIONS OF THE HELICAL TIEBACK ANCHOR CONTRACTOR

A. The helical anchor Contractor shall be experienced in performing design and construction of helical tieback anchors and shall furnish all materials, labor, and supervision to perform the work. The Contractor shall be trained by CHANCE® Civil Construction in the proper methods of design and installation of screw anchor tiebacks. The Contractor shall provide names of on-site personnel materially involved with the work. At a minimum, these personnel shall include foreman, machine operator, and project engineer/manager.

B. The helical tieback anchor Contractor shall not sublet the whole or any part of the contract without the express written permission of the Engineer.

1.03 DEFINITIONS

A. A partial list follows.

1 **Bearing Stratum:** Soil layer(s) of sufficient strength capable of resisting the applied axial load transferred by the helical tieback.

2 **Contractor:** The person/firm responsible for performing the helical tieback anchor work.

3 **Coupling:** Central steel shaft connection means formed as integral part of the plain extension shaft material. For Type SS anchors, couplings are external cast sleeves, or hot upset forged sockets.

4 **Coupling Bolt(s):** High strength, structural steel fasteners used to connect helical anchor segments together. For Type SS segments, the coupling bolt transfers axial load only.

5 **Design Load (DL):** Maximum anticipated service load applied to the helical anchor. A.k.a. Working Load (WL).

6 **Free Length:** Length of plain extension acting as a tendon, which is free to elongate elastically. A.k.a. un-bonded length or stressing length. Helix plates shall not be located in free length section of tieback. Minimum free length shall be specified on a project specific basis.

7 **Helical Extension:** Helical tieback anchor component installed immediately following the lead or starter section, if required. This component consists of one or more helix plates welded to a central steel shaft of finite length. Function is to increase bearing area.

8 **Helical Tieback Anchor:** Bearing type anchor used to transfer tensile loads to soil. Helical tieback anchors consist of a central steel shaft, helix bearing plates, coatings, corrosion protection, and a wall connection.

9 **Helix Plate:** Generally round steel plate formed into a ramped spiral. The helical shape provides the means to install the helical tieback anchor, plus the plate transfers load to soil in end-bearing. Helix plates are available in various diameters and thicknesses.

10 **Lead Section:** The first helical tieback anchor component installed into the soil, consisting of single or multiple helix plates welded to a central steel shaft. A.k.a Starter Section.

11 **Performance Test:** Similar to a Proof Test except a cyclic loading method is used to analyze total, elastic, and net movement of the helical anchor. Often used for pre-contract or pre-production load tests, in addition to a specified percentage of production anchors.

12 **Plain Extension:** Central steel shaft of finite length without helix plates. It is installed following the installation of the lead or starter section or helical extension (if used). The units are connected with couplings and bolts. Plain extensions are used to extend the helix plates beyond the specified minimum free length and into competent load bearing stratum.

13 **Proof Test:** Incremental loading of a helical anchor, holding for a period of time, and recording the total movement at each load increment.

14 **Safety Factor:** The ratio of the ultimate capacity to the working or design load used for the design of any structural element.

15 **Square Shaft (SS):** Solid steel, round-cornered-**S**quare central **S**haft elements ranging in size from 1-1/4" to 2-1/4". A.k.a. Type SQ.

16 **Thread Bar Adapter:** Section of central steel shaft used to connect the helical anchor to the wall face via a high tensile strength pre-stressing thread bar.

17 **Torque Strength Rating:** The maximum torque energy that can be applied to the helical tieback anchor during installation in soil, a.k.a. allowable, or safe torque.

1.04 ALLOWABLE TOLERANCES

A. The angular tolerance between installed tieback anchor angle and design angle shall be ±3° as shown on the drawings.

1.05 QUALITY ASSURANCE

A. Contractors authorized by CHANCE Civil Construction shall install helical tieback anchors. These Contractors shall have satisfied the requirements relative to the technical aspects of the product and installation procedures as therein specified.

B. The Contractor shall employ an adequate number of skilled workers who are experienced in the necessary crafts and who are familiar with the specified requirements and methods needed for proper performance of the work of this specification.

C. All helical tieback anchors shall be installed in the presence of a designated representative of the Engineer unless said representative informs the Contractor otherwise. The designated representative shall have the right of access to any and all field installation records and test reports.

D. Screw anchor components as specified therein shall be manufactured by a facility whose quality systems comply with ISO (International Organization of Standards) 9001 requirements. Certificates of Registration denoting ISO Standards Number shall be presented upon request to the Engineer or their representative.

E. CHANCE Civil Construction provides a standard one-year warranty on materials and workmanship of the product. Any additional warranty provided by the Contractor shall be issued as an addendum to this specification.

F. Design of helical tieback anchors shall be performed by an entity as required in accordance with existing local code requirements or established local practices. This design work may be performed by a licensed professional engineer, an authorized CHANCE Civil Construction Contractor, or designer depending upon local requirements or practices.

1.06 DESIGN CRITERIA

A. Helical tieback anchors shall be designed to meet the specified loads and acceptance criteria as shown in Table B in the Appendix to this specification.

1 The allowable working load on the helical tieback anchor shall not exceed the following values:

$$P_{allowt} = S_{ut} / FS$$

Where: P_{allowt} = allowable working load in tension (kip)
S_{ut} = Min. ultimate tensile strength of central steel shaft segment (at coupling joint) (kip)
FS = factor of safety suitable for application, i.e. temporary or permanent structures

2 The ultimate structural capacity shall be determined as:

$$P_{ultt} = S_{ut}$$

Where: Pultt = Ultimate structural capacity in tension (kip)
Sut = Minimum ultimate tensile strength of central steel shaft (kip)

PART 2 - REFERENCED CODES AND STANDARDS

A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title, or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation. In case of conflict, the particular requirements of this specification shall prevail. The latest publication as of the issue of this specification shall govern, unless indicated otherwise.

2.01 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM):

A. ASTM A29/A29M Steel Bars, Carbon and Alloy, Hot-Wrought and Cold Finished.

B. ASTM A36/A36M Structural Steel.

C. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

D. ASTM A153 Zinc Coating (Hot Dip) on Iron and Steel Hardware.

E. ASTM A252 Welded and Seamless Steel Pipe Piles.

F. ASTM A775 Electrostatic Epoxy Coating

G. ASTM A193/A193M Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service.

H. ASTM A320/A320M Alloy-Steel Bolting Materials for Low Temperature Service.

I. ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

J. ASTM A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

K. ASTM A536 Standard Specifications for Ductile Iron Castings

L. ASTM A572 HSLA Columbium-Vanadium Steels of Structural Quality.

M. ASTM A615 Standard Specification for Deformed and Plain Steel Bars for Concrete Reinforcement

N. ASTM A656 Hot-Rolled Structural Steel, High-Strength Low-Alloy Plate with Improved Formability.

O. ASTM A958 Standard Specification for Steel Castings, Carbon, and Alloy, with Tensile Requirements, Chemical Requirements Similar to Wrought Grades.

P. ASTM A1018 Steel, Sheet and Strip, Heavy Thickness Coils, Hot Rolled, Carbon, Structural, High-Strength Low-Alloy, Columbium or Vanadium, and High-Strength Low-Alloy with Improved Formability.

Q. ASTM D1784 Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds.

R. ASTM D1785 Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

S. ASTM D3034 Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

T. ASTM D3689 Method of Testing Individual Piles Under Static Axial Tensile Load.

2.02 AMERICAN WELDING SOCIETY (AWS):

A. AWS D1.1 Structural Welding Code – Steel.

B. AWS D1.2 Structural Welding Code – Reinforcing Steel.

2.03 AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE):

A. ASCE 20-96 Standard Guidelines for the Design and Installation of Pile Foundations.

2.04 ASSOCIATION OF DRILLED SHAFT CONTRACTORS (ADSC) THE INTERNATIONAL ASSOCIATION OF FOUNDATION DRILLING:

A. GEC No. 4 - Ground Anchors and Anchored Systems

B. ADSC Mechanical Anchor Product Data

2.05 POST TENSIONING INSTITUTE (PTI):

A. Recommendations for Prestressed Rock and Soil Anchors, Third Edition, Copyright 1996 By the Post-Tensioning Institute.

2.06 SOCIETY OF AUTOMOTIVE ENGINEERS (SAE):

A. SAE J429 Mechanical and Material Requirements for Externally Threaded Fasteners.

PART 3 - SUBMITTALS

3.01 INSTALLATION RECORDS

A. The Contractor shall provide the Engineer copies of helical tieback anchor installation records after each installation is completed. Formal copies shall be submitted on a weekly basis. These installation records shall include, but are not limited to, the following information.

1 Name of project and Contractor

2 Name of Contractor's supervisor during installation

3 Date and time of installation

4 Name and model of installation equipment

5 Type of torque indicator used

6 Location of helical anchor by assigned identification number

7 Elevation of anchorage

8 Actual helical tieback anchor type and configuration – including lead/starter section (number and size of helix plates), number and type of extension sections (manufacturer's SKU numbers)

9 Helical tieback anchor installation duration and observations

10 Total length of installed helical anchor

11 Inclination of helical anchor

12 Installation torque at one-foot intervals for the final 10 feet

13 Comments pertaining to interruptions, obstructions, or other relevant information

14 Rated load capacities

PART 4 - PRODUCTS AND MATERIALS

4.01 CENTRAL STEEL SHAFT:

A. The central steel shaft, consisting of lead sections, helical extensions, and plain extensions, shall be Type SS as manufactured by CHANCE Civil Construction (Centralia and Independence, MO).

1 SS5 1-1/2" Material: Shall be hot rolled Round-Cornered-Square (RCS) solid steel bars meeting dimensional and workmanship requirements of ASTM A29. The bar shall be modified medium carbon steel grade (similar to AISI 1044) with improved strength due to fine grain size.

a. Torsional strength rating = 5,500 ft-lb

b. Minimum yield strength = 70 ksi

4.02 HELIX BEARING PLATE:

A. Shall be hot rolled carbon steel sheet, strip, or plate formed on matching metal dies to true helical shape and uniform pitch. Bearing plate material shall conform to the following ASTM specifications.

1 SS5 Material: Per ASTM A572, or A1018, or A656 with minimum yield strength of 50 ksi. Plate thickness is 3/8".

4.03 BOLTS:

A. The size and type of bolts used to connect the central steel shaft sections together shall conform to the following ASTM specifications.

1 SS5 1-1/2" Material: ¾" diameter bolt per ASTM A325 or A320 Grade L7.

4.04 COUPLINGS:

A. For type SS5 material, the coupling shall be formed as an integral part of the plain and helical extension material as hot upset forged sockets.

PART 5 - EXECUTION

5.01 SITE CONDITIONS

A. Prior to commencing helical anchor installation, the Contractor shall inspect the work of all other trades and verify that all said work is completed to the point where helical tieback anchors may commence without restriction.

B. The Contractor shall verify that all helical tieback anchors may be installed in accordance with all pertinent codes and regulations regarding such items as underground obstructions, right-of-way limitations, utilities, etc.

C. In the event of a discrepancy, the Contractor shall notify the Engineer. The Contractor shall not proceed with helical tieback anchor installation in areas of discrepancies until said discrepancies have been resolved. All costs associated with unresolved discrepancies shall be the responsibility of the Engineer.

5.02 INSTALLATION EQUIPMENT

A. Shall be rotary type, hydraulic power driven torque motor with clockwise and counter-clockwise rotation capabilities. The torque motor shall be capable of continuous adjustment to revolutions per minute (RPM's) during installation. Percussion drilling equipment shall not be permitted. The torque motor shall have torque capacity 15% greater than the torsional strength rating of the central steel shaft to be installed.

B. Equipment shall be capable of applying adequate down pressure (crowd) and torque simultaneously to suit project soil conditions and load requirements. The equipment shall be capable of continuous position adjustment to maintain proper helical anchor alignment.

5.03 INSTALLATION TOOLING

A. Shall consist of a Kelly Bar Adapter (KBA) and Type SS drive tool as manufactured by CHANCE Civil Construction and used in accordance with the manufacturers written installation instructions.

B. A torque indicator shall be used during helical tieback anchor installation. The torque indicator can be an integral part of the installation equipment or externally mounted in-line with the installation tooling.

1 Shall be capable of providing continuous measurement of applied torque throughout the installation.

2 Shall be capable of torque measurements in increments of at least 500 ft-lb

5.04 INSTALLATION PROCEDURES

A. Central Steel Shaft:

1 The helical tieback anchor installation technique shall be such that it is consistent with the geotechnical, logistical, environmental, and load carrying conditions of the project.

2 The lead section shall be positioned at the location as shown on the working drawings. The lead section may be started perpendicular to the wall face to assist initial advancement into the soil. After initial penetration, the required inclination angle shall be established. The helical tieback anchor sections shall be engaged and advanced into the soil in a smooth, continuous manner at a rate of rotation of 5 to 20 RPM's. Extension sections shall be provided to obtain the required minimum overall length and installation torque as shown on the working drawings. Connect sections together using coupling bolt and nut torqued to 40 ft-lb.

3 Sufficient down pressure shall be applied to uniformly advance the helical tieback anchor sections approximately 3 inches per revolution. The rate of rotation and magnitude of down pressure shall be adjusted for different soil conditions and depths.

PART 6 - HELICAL TIEBACK ANCHOR LOAD TESTS

A. The Contractor shall submit for review and acceptance the proposed helical tieback anchor load testing procedure. Production and pre-production test procedures shall be in conformance with the helical anchor test procedures as detailed below, and shall provide the minimum following information:

1 Type and accuracy of load equipment

2 Type and accuracy of load measuring equipment

3 Type and accuracy of anchor-head deflection equipment

4 Calibration report for complete load equipment, including hydraulic jack, pump, pressure gauge, hoses, and fittings.

APPENDIX

TABLE-A

CHANCE Civil Construction

MECHANICAL STRENGTH RATINGS – Type SS HELICAL ANCHORS

RATING TYPE	**CENTRAL STEEL SHAFT PRODUCT FAMILY**						
	SS125 1-1/4" RCS	**SS1375 1-3/8" RCS**	**SS5 1-1/2" RCS**	**SS150 1-1/2" RCS**	**SS175 1-3/4" RCS**	**SS200 2" RCS**	**SS225 2-1/4" RCS**
Torque Strength Rating (ft-lb)	4,000	5,500	5,500	7,000	11,000	16,000	23,000
Ultimate Strength Per Helix (kip) (Tension/Compression)	*30	*35	*40	*40	*50	60	60
Tension Capacity Limit[1] (kip)	40	55	55	70	#110	#160	#230
Ultimate Tension Strength[2] (kip)	60	75	70	70	100	150	200

*** For 14" Dia. 3/8" Thick Helix Plates, Reduce the Ultimate Capacity by 20%**

1 - Based on torque rating – Tension Capacity Limit = Torque Rating x Kt; "Default" Kt for Type SS = 10

2 – Based on mechanical strength of coupling

 # - Limited by mechanical strength of coupling bolt

Actual installed capacities are dependent on site specific soil conditions.

TABLE-B

Specified Loads

SLOPE	Required Anchor Axial Bearing Capacity (lbs)	Required Anchor Lateral Bearing Capacity (lbs)
1H:1V	1,354	1,354
2H:1V	2,134	1,333
3H:1V	2,113	1,372

SPECIFICATION NO: **SECTION 02735**

SPECIFICATION TITLE: **GEOCOMPOSITE LEAKAGE COLLECTION LAYER**

PROJECT NO: **444853**

PROJECT TITLE: **ONONDAGA LAKE SCA FINAL DESIGN**

CLIENT: **HONEYWELL, INC.**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
0	**23May11**	**10**	**Original**	**RK**	**JFB**	**JFB**

☐ **Entire Specification Issued this Revision**

☐ **Revised Pages Only Issued this Revision**

SPECIFICATION ISSUED FOR:

☐ **In-house Review** ☐ **Bid**

☐ **Client Review/Approval** ☒ **Construction**

☐ **Information Only** ☐ ***Other***

SECTION 02735

GEOCOMPOSITE LEAKAGE COLLECTION LAYER

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section describes the materials, installation, and testing requirements to perform the installation, quality control, and maintenance of the geocomposite leakage collection layer for the base liner system of the Sediment Consolidation Area (SCA) basins.

1.02 RELATED WORK

A. Work in this section includes, but is not limited to:

1. Section 01030 Environmental Protection
2. Section 02100 Site Clearing
3. Section 02740 Geomembrane Liner
4. Section 02300 Gravel Drainage Layer

1.03 REFERENCES

A. Latest version of American Society for Testing and Materials (ASTM) standards:

1. ASTM D 1505. Standard Test Method for Density of Plastics by the Density-Gradient Technique.
2. ASTM D 1603. Standard Test Method for Carbon Black in Olefin Plastics.
3. ASTM D 4218. Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by Muffle-Furnace Technique.
4. ASTM D 4491. Standard Test Method for Water Permeability of Geotextiles by Permittivity.
5. ASTM D 4533. Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
6. ASTM D 4632. Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

7. ASTM D 4716. Standard Test Method for Constant Head Hydraulic Transmissivity (In-Plane Flow) of Geotextiles and Geotextile Related Products.
8. ASTM D 4751. Standard Test Method for Determining Apparent Opening Size of a Geotextile.
9. ASTM D 4833. Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
10. ASTM D 4873. Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
11. ASTM D 5199. Standard Method for Measuring Nominal Thickness of Geosynthetics.
12. ASTM D 5261. Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.
13. ASTM F 904. Standard Test Method for Comparison of Bond Strength or Ply Adhesion of Similar Laminates Made from Flexible Materials.

1.04 SUBMITTALS

A. Submit the following to the Engineer for review not less than 21 calendar days prior to shipment.

1. Geocomposite Manufacturer and product name.
2. Certification of minimum average roll values and the corresponding test procedures for all geocomposite properties listed in Table 1.
3. Projected geocomposite delivery dates.
4. Manufacturer quality control tests and manufacturer certifications per Section 2.02.

B. Submit to the Engineer for review at least 14 calendar days prior to geocomposite shipment, manufacturing quality control certificates for each roll of geocomposite as specified in this Section. This documentation must be reviewed and approved by the Engineer to satisfy the requirements of these specifications prior to transporting any geocomposite to the site.

1.05 AS-BUILT DOCUMENTATION

A. The Contractor shall provide as-built revisions to the Project Drawings.

B. In addition to preparation of as-built revisions to the Project Drawings, the Contractor shall provide as-built documentation for the placed geocomposite.

1.06 CONSTRUCTION QUALITY ASSURANCE

A. The installation of geocomposite will be monitored as part of the geomembrane installation.

B. The Contractor shall be aware of the activities required of the Engineer by the CQA Plan and shall account for these activities in the construction schedule.

C. The Contractor shall correct all deficiencies and nonconformances identified by the Engineer at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 GEOCOMPOSITE

A. The geocomposite shall be composed of a high density polyethylene drainage net with a nonwoven, needlepunched geotextile bonded to each side of the drainage net. The geotextile shall not be glued or bonded to the geonet in any manner other than heat bonding. Along edges, six inches of the geotextile shall not be heat bonded to the geonet to allow connection in the field.

B. Furnish geocomposite having properties that comply with the required property values shown in Table 1. The Manufacturer shall provide test results for these procedures, as well as certification that the materials meet or exceed the specified values.

C. During shipment and storage, the geocomposite shall be protected from mud, dirt, dust, cutting, or other damaging or deleterious conditions.

2.02 MANUFACTURING QUALITY CONTROL

A. Sample and test the geocomposite to demonstrate that the material conforms to the requirements of this Section.

B. Perform manufacturing quality control tests to demonstrate that the geocomposite properties conform to the values specified in Table 1. Perform as a minimum, the following manufacturing quality control tests at a minimum frequency as shown:

Test	Procedure	Frequency (min)
Geonet		
Polymer Density	ASTM D 1505	one per 90,000 ft^2
Thickness	ASTM D 5199	one per 90,000 ft^2
Carbon Black	ASTM D 1603 or ASTM D 4218	one per 90,000 ft^2
Geotextile		
Mass per unit area	ASTM D 5261	one per 90,000 ft^2
Apparent opening size	ASTM D 4751	one per 90,000 ft^2
Permittivity	ASTM D 4491	one per 90,000 ft^2
Grab strength	ASTM D 4632	one per 90,000 ft^2
Puncture strength	ASTM D 4833	one per 90,000 ft^2
Geocomposite		
Hydraulic Transmissivity	ASTM D 4716	one per 90,000 ft^2
Peel strength	ASTM D F 904	one per 90,000 ft^2

C. Submit quality control certificates signed by the geocomposite Manufacturer quality control manager. Certificates shall state that the material is resistant to UV exposure and that the geocomposites are continuously inspected and are needle-free. The quality control certificates shall also include: lot, batch, and roll number and identification; and results of manufacturing quality control tests including description of test methods used.

D. Do not supply any geocomposite roll that does not comply with the manufacturing quality control requirements.

E. If a geocomposite sample fails to meet the quality control requirements of this Section, sample and test rolls manufactured at the same time or in the same lot as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply failing rolls.

2.04 PACKING AND LABELING

A. Supply geocomposite in rolls wrapped in relatively impermeable and opaque protective wrapping. Wrapping which becomes torn or damaged shall be repaired with similar materials.

B Mark or tag geocomposite rolls in accordance with ASTM D 4873 with the following information:

1. manufacturer's name;
2. product identification;
3. lot or batch number;
4. roll number; and
5. roll dimensions.

C. Geocomposite rolls not labeled in accordance with this Section or on which labels are illegible shall be rejected and replaced.

2.05 HANDLING AND STORAGE

A. Protect geocomposite from sunlight, moisture, excessive heat or cold, puncture, mud, dirt, and dust or other damaging or deleterious conditions. Follow all geocomposite manufacturer recommendations for handling and storage.

B. Store geocomposite rolls on pallets or other elevated structures. Do not store geocomposite rolls directly on the ground.

C. Outdoor storage of rolls shall not exceed the manufacturer's recommendation or longer than 6 months, whichever is less.

PART 3 EXECUTION

3.01 HANDLING AND PLACEMENT

A. The geocomposite shall be handled in such a manner as to ensure the geocomposite is not damaged in any way.

B. Necessary precautions shall be taken to prevent damage to underlying layers during placement of the geocomposite.

C. The geocomposite shall only be cut using Manufacturer's recommended procedures.

D. In the presence of wind, all geocomposite panels shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until geocomposite is properly secured.

E. Care shall be taken during placement of geocomposite not to entrap dirt or excessive dust in the geocomposite that could cause clogging of the drainage system, and/or stones that could damage the adjacent geosynthetic.

F. Unless otherwise specified, geocomposites shall not be welded to geomembranes.

G. The geocomposite shall be positioned by hand after being unrolled to minimize wrinkles.

H. Tools and sandbags shall not be left on, in, or under the geocomposite.

I. After unwrapping the geocomposite from its opaque cover, the geocomposite shall not be left exposed for a period in excess of 30 days, unless if approved by the Engineer.

3.02 SEAMS AND OVERLAPS

A. The components of the geocomposite (i.e., geotextile - geonet - and geotextile) are not to be bonded together at the edges of the rolls. Each component shall be secured or seamed to the like component at overlaps.

B. Geonet Components:

1. The geonet components shall be overlapped by at least 4 inches. These overlaps shall be secured by tying.
2. Tying shall be achieved by plastic fasteners or polymer braid. Tying devices shall be white or yellow for easy inspection. Metallic devices shall not be used.
3. Tying shall be every 5 feet along the slope, every 2 feet on end-to-end seams.

C. Geotextile Components:

1. The bottom layers of geotextile shall be overlapped a minimum of 4 inches prior to seaming. The top layers of geotextiles shall be

continuously sewn (i.e., spot sewing or thermal bonding is only allowed for repairs). Geotextiles shall be overlapped a minimum of 6 inches prior to seaming.

2. To the extent practical, installing horizontal seams on the side slopes shall be avoided. If it is not practical to avoid horizontal seams on the side slopes, then the horizontal seams shall be discontinuous (i.e., staggered) between adjacent panels.
3. Polymeric thread, with chemical resistance properties equal to or exceeding those of the geotextile component, shall be used for all sewing. The seams shall be sewn using Stitch Type 401. The seam type shall be Federal Standard Type SSN-1.

3.03 REPAIR

A. If the geonet is undamaged but the geotextile is damaged, the damaged area shall be repaired as follows:

1. remove damaged geotextile;
2. cut patch of new geotextile to provide minimum 12-inch overlap in all directions; and
3. thermally bond geotextile patch to existing geocomposite.

B. All seams that have no geotextile flaps available for sewing shall have a geotextile patch, extending 1-ft beyond the edges of the panel, thermally bonded.

C. Any holes or tears in the geocomposite shall be repaired by removing the damaged portion of the geonet, placing a patch extending 0.5 ft beyond the edges of the hole or tear. The patch shall be secured by tying fasteners through the bottom geotextile and the geonet of the patch, and through the panel. The patch shall be secured every 6 inches with approved tying devices. A geotextile patch shall be heat sealed to the top of the geocomposite needing repair. If the hole or tear width across the panel is more than 50 percent of the width of the panel, the damaged area shall be cut out and the two portions of the geonet shall be joined in accordance with this Section.

3.04 PRODUCT PROTECTION

A. All means necessary shall be used to protect prior work and materials and completed work of other Sections.

[END OF SECTION]

TABLE 1. REQUIRED PROPERTY VALUES FOR GEOCOMPOSITE

PROPERTIES	QUALIFIER	UNITS	SPECIFIED VALUES[1]	TEST METHOD
Geonet Component: Polymer composition	Minimum	%	95% polyethylene by weight	---
Polymer density	Minimum	g/cm^3	0.935	ASTM D 1505
Carbon black content	Range	%	2 - 3	ASTM D 1603 or D 4218
Nominal thickness	Minimum	mils	200	ASTM D 5199
Geotextile Components: Type	None	none	needlepunched nonwoven	---
Polymer composition	Minimum	%	95 polyester or polypropylene	
Mass per unit area	Minimum	oz/yd^2	8	ASTM D 5261
Apparent opening size	Maximum	mm	$O_{95} \leq 0.21$ mm	ASTM D 4751
Permittivity	Minimum	sec^{-1}	0.9	ASTM D 4491
Grab strength	Minimum	lb	180	ASTM D 4632[2]
Tear strength	Minimum	lb	75	ASTM D 4533[2]
Puncture strength	Minimum	lb	a load equivalent to 3,000 psf.	ASTM D 4833[3]
Geocomposite Transmissivity	Minimum	m^2/s	2×10^{-3}	ASTM D 4716[4]
Peel strength	Minimum	lb/in	0.5	ASTM F 904

Notes:
1. All values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the values in this table).
2. Minimum value measured in machine and cross machine direction.
3. Tension testing machine with a 1.75-in. diameter ring clamp, the steel ball bearing replaced with 0.31-in. a solid steel cylinder with a flat tip centered with the ring clamp.
4. The transmissivity is the hydraulic transmissivity of the geocomposite drainage layer measured using water at 68ºF with a gradient of not less than 0.10, under a compressive stress of not less than 3,000 psf.
5. % = percent; g/cm^3 = gram per cubic centimeter; oz/yd^2 = ounces per square yard; mm = millimeter; m^2/s = square meter per second; mils = milli inches; lb = pound; sec = seconds; lbs/in. = pounds per inch

SPECIFICATION NO: **SECTION 02741**

SPECIFICATION TITLE: **SMOOTH GEOMEMBRANE LINER**

PROJECT NO: **444853**

PROJECT TITLE: **ONONDAGA LAKE SEDIMENT MANAGEMENT SYSTEM FINAL DESIGN**

CLIENT: **HONEYWELL, INC.**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
0	**23May11**	**21**	**Original**	**DDS**	**TCD**	**---**
			•			

☒ **Entire Specification Issued this Revision**

☐ **Revised Pages Only Issued this Revision**

SPECIFICATION ISSUED FOR:

☐ **In-house Review** ☐ **Bid**
☐ **Client Review/Approval** ☒ **Construction**
☐ **Information Only** ☐ ***Other***

SECTION 02741

SMOOTH GEOMEMBRANE LINER

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. The work covered in this Section consists of the installation of a 60-mil high density polyethylene (HDPE) geomembrane in the Separated Material Management Area. These geomembranes shall be placed in accordance with the Project Specifications and Drawings. The Contractor shall furnish all labor, materials, equipment, supervision, and incidentals necessary to perform the scope of work.

B. All geomembrane material placed as a part of this project shall be placed, tested, and documented in accordance with this Section unless specifically approved by the Engineer.

1.02 RELATED WORK

A. Work in this section includes, but is not limited to:

1. Section 01030 Environmental Protection

1.03 REFERENCES

A. Latest version of the American Society for Testing and Materials (ASTM) standards:

1. ASTM D 792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
2. ASTM D 1004 Standard Test Method of Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
3. ASTM D 1238 Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
4. ASTM D 1505 Standard Test Methods for Density of Plastics by the Density-Gradient Technique.
5. ASTM D 3895 Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
6. ASTM D 4218 Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique

7. ASTM D 5397 Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test.
8. ASTM D 5596 Standard Test Method for Microscopic Examination the Dispersion of Carbon Black in Polyolefin Geosynthetics.
9. ASTM D 5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics

.

0. ASTM D 6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
11. ASTM D 6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.
12. GRI GM 9 Cold Weather Seaming of Geomembranes.

1.04 SUBMITTALS

A. Submit the following information to the Engineer for review not less than 45 calendar days prior to use for all geomembrane furnished.

1. Geomembrane manufacturer capabilities, including daily production capacity available for this contract and manufacturing quality control procedures.
3. Origin (resin supplier's name, resin production plant) and identification (brand name, number) of the polyethylene resin used.
4. Certification of minimum average roll values (95 percent lower confidence limit) for physical, mechanical, and environmental properties and the corresponding test procedures for the geomembrane properties listed in Table 1 for the 60-mil base liner geomembrane. Submit values that are specific to the resin used in manufacturing of the geomembrane.
5. Certification that HDPE welding rod is compatible with the specifications and consists of the same resin as the geomembrane.
6. Manufacturer warranty as specified in this Section.

B. Submit to the Engineer for review not less than 14 calendar days prior to geomembrane use the following documentation on the resin used to manufacture any geomembranes:

1. Copies of quality control certificates issued by the resin supplier including the production dates and origin of the resin used to manufacture the geomembrane for this Contract.

2. Results of tests conducted by the Manufacturer to verify the quality of the resin used to manufacture the geomembrane rolls assigned to the project.
3. Certification that no reclaimed polymer is added to the resin during the manufacturing of the geomembrane to be used for this project except as allowed by this specification.

C. Submit to the Engineer for review the following documentation on geomembrane roll production at least 5 calendar days prior to transporting any geomembrane to the site.

1. Manufacturing certificates for each shift's production of geomembrane, signed by the Manufacturer quality control manager.
2. Certificate shall include roll numbers and identification, sampling procedures and results of Manufacturer quality control tests, including descriptions of the test methods used (the Manufacturer quality control tests to be performed are given in Part 2 of this Section).

D. Submit to the Engineer for review the following information from the Installer at least 14 calendar days prior to mobilization of the Installer to the site.

1. Layout drawings showing the installation layout identifying geomembrane panel configurations, dimensions, details, locations of seams, as well as any variance or additional details which deviate from the Construction Drawings. The layout drawings shall be adequate for use as a construction plan and shall include dimensions, details, etc. The layout drawings, as modified and/or approved by the Engineer, shall become part of the contract.
2. Installation schedule.
3. Copy of Installer's letter of approval or license by the Manufacturer.
4. Installation capabilities, including information on equipment proposed for this project, average daily production anticipated for this project and quality control procedures to include quality control organization.
6. Resumes of the Installer Superintendent and quality control chief to be assigned to this project, including dates and duration of employment.
7. Resumes of all personnel who will perform seaming operations on this project, including dates and duration of employment.
8. Evidence that the installation crew has the following experience.
    a. The foreman shall have supervised the installation of a minimum of 50 acres of comparable geosynthetic systems, on a minimum of 5 different projects.
    b. At least one seamer shall have experience seaming a minimum of 500,000 square feet of polyethylene geomembrane using the same type of seaming apparatus to be used at this site. Seamers with such

experience will be designated "master seamers" and shall provide direct supervision over less experienced seamers.

c. All other seaming personnel shall have seamed at least 100,000 square feet of polyethylene geomembrane using the same type of seaming apparatus to be used at this site. Personnel who have seamed less than 100,000 square feet of seams shall be allowed to seam only under the direct supervision of the master seamer or Superintendent.

E. Submit to the Engineer for review at least 14 days prior to geomembrane placement, a Certificate of Calibration less than 12 months old for the field tensiometer. Tensiometer shall be calibrated within one year of date of test. Calibration shall be traceable to national or industry recognized standards where possible.

F. Submit subgrade acceptance certificates, signed by the Installer, for each area to be covered by the geomembrane prior to that area being covered by geomembrane.

G. Within 14 calendar days of completion of the geomembrane installation, submit a one-year installation warranty to the Engineer.

1.05 AS-BUILT DOCUMENTATION

A. The Contractor shall submit as-built revisions to the Project.

B. In addition to preparation of as-built revisions to the Project Drawings, the Contractor shall provide as-built documentation for the placed geomembrane.

1.06 CONSTRUCTION QUALITY ASSURANCE

A. The construction of the geomembrane will be monitored as required in the CQA Plan.

B. The Engineer will perform quality assurance testing of the geomembrane seams.

C. The Contractor shall be aware of the activities required of the Engineer and shall account for these activities in the construction schedule.

D. The Contractor shall correct all deficiencies and nonconformances identified by the Engineer at no additional cost.

PART 2 – PRODUCTS

2.01 RESIN

A. Provide geomembrane manufactured from new, first-quality polyethylene resin. Do not add reclaimed polymer to the resin. The use of polymer recycled during the manufacturing process is permitted if performed with appropriate cleanliness and if the recycled polymer during the manufacturing process does not exceed 10 percent by weight of the total polymer weight. The percentage of recycled polymer shall not affect the quality of the finished product.

B. Use high density polyethylene (HDPE) resin having the following properties:

1. Formulated Sheet Density: 0.940 g/ml maximum (ASTM D792 Method A or ASTM D1505)
2. Resin Specific Gravity: 0.93 g/ml minimum (ASTM D792 Method B or ASTM D1505).
3. Melt Flow Index: 1.0 g/10 min., maximum (ASTM D1238 Condition E)

2.02 GEOMEMBRANE PROPERTIES

A. The Contractor shall furnish HDPE geomembrane having properties that comply with the required values shown in Table 1 for 60-mil HDPE geomembrane.

B. In addition, furnish geomembrane that:

1. contains a maximum of 1 percent by weight of additives, fillers, or extenders not including carbon black;
2. does not have striations, pinholes, bubbles, blisters, nodules, undispersed raw materials, or any sign of contamination by foreign matter on the surface or in the interior;
3. is free of holes, blisters, modules, undispersed raw materials, or any sign of contamination by foreign matter; and
4. is manufactured in a single layer (thinner layers shall not be welded together to produce the final required thickness).

2.03 MANUFACTURING QUALITY CONTROL

A. Resin:

1. Sample and test resin at a minimum frequency of one test per rail car to demonstrate that the resin complies with the requirements of this Section.

Perform tests on resin after the addition of additives to the virgin resin. Certify in writing that the resin meets the requirements of this Section.

2. Do not use any noncomplying resin.

B. Rolls:

1. Continuously monitor for geomembrane defects during manufacturing.
2. Do not supply geomembrane that exhibits any defects.
3. Regularly monitor for geomembrane thickness during manufacturing.
4. Do not supply geomembrane that fails to meet the specified thickness.
5. Sample and test the geomembrane, to demonstrate that its properties conform to the values specified in Table 1. Perform the following quality control tests at a minimum frequency, as shown:

Test	Procedure	Frequency
Thickness	ASTM D 5994	one per 50,000 ft^2
tensile strength	ASTM D 6693	one per 50,000 ft^2
tensile elongation	ASTM D 6693	one per 50,000 ft^2
tear resistance	ASTM D 1004	one per 50,000 ft^2
carbon black content	ASTM D 1603	one per 50,000 ft^2
carbon black dispersion	ASTM D 5596	one per 50,000 ft^2
specific gravity	ASTM D 1505	one per 50,000 ft^2
asperity height	ASTM D 7466	one per 50,000 ft^2
oxidative induction time	ASTM D 3895	one per formulation
Stress Crack Resistance	ASTM D 5397	one per formulation[1]

[1]ASTM D 5397 is not appropriate for use on textured geomembranes. The test should instead be conducted on smooth edges of the textured geomembrane rolls or on smooth sheets made from the same formulation as being used for the textured geomembrane.

6. If a geomembrane sample fails to meet the quality control requirements of this Section, sample and test rolls manufactured, in the same resin batch, or at the same time, as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply any failing rolls.

C. Permit the Engineer to visit the manufacturing plant for project specific visits. If possible, such visits will be prior to, or during, the manufacturing of the geomembrane rolls for this project.

2.04 LABELING

A. Label the geomembrane rolls with the following information.

1. thickness of the material;
2. length and width of the roll;
3. name of Manufacturer;
4. product identification;
5. lot number; and
6. roll number.

B. Geomembrane rolls not labeled in accordance with this Section or on which labels are illegible will be rejected and replaced.

2.05 TRANSPORTATION, HANDLING, AND STORAGE

A. Deliver geomembranes to the site at least 14 calendar days prior to the planned deployment date to allow the Engineer adequate time to perform conformance testing on the geomembrane samples as described in the CQA Plan.

B. Provide proper handling and storage of the geomembrane at the site. Protect the geomembrane from excessive heat or cold, dirt, puncture, cutting, or other damaging or deleterious conditions. Provide any additional storage procedures required by the Manufacturer.

C. Store geomembrane rolls on palates or other elevated structures. Do not store geomembrane rolls directly on the ground surface. Do not store more than 3 rolls high.

PART 3 – EXECUTION

3.01 FAMILIARIZATION

A. Prior to implementing any of the work described in this Section, the Contractor shall become thoroughly familiar with all portions of the work falling within this Section.

B. Inspection:

1. Prior to implementing any of the work in this Section, the Contractor shall carefully inspect the installed work of all other Sections and verify that all work is complete to the point where the installation of this section may properly commence without adverse impact.
2. If the Contractor has any concerns regarding the installed work of other Sections, the Contractor shall immediately notify the Engineer in writing. Failure to inform the Engineer in writing or continuance of installation of the geomembrane will be construed as the Contractor's acceptance of the related work of all other Sections.

3.02 SUBGRADE SURFACE PREPARATION

A. The Contractor shall provide certification in writing from the Geomembrane Installer that the surface on which the geomembrane will be installed is acceptable. This certification of acceptance shall be given to the Engineer prior to commencement of geomembrane installation in the area under consideration.

B. Special care shall be taken to maintain the prepared soil surface.

C. Any damage to the subgrade caused by installation activities shall be repaired at the Contractor's expense.

3.03 GEOMEMBRANE DEPLOYMENT

A. General:

1. The Contractor shall produce layout drawings prior to geomembrane deployment. These drawings shall indicate the geomembrane configuration, dimensions, details, locations of seams, etc. The layout drawings must be approved by the Engineer prior to the installation of any geomembranes. The layout drawings, as modified and/or approved by the Engineer, shall become part of these specifications.
2. Do not deploy geomembrane until the layout drawings are approved by the Engineer.
3. Do not deploy a geomembrane panel in an area until the Engineer has been provided with a certificate of subgrade acceptance for that area.
4. Do not deploy geomembranes until Engineer completes conformance evaluation of the geomembrane and performance evaluation of previous work, including evaluation of Contractor's survey results for previous work.
5. Deploy each geomembrane panel in accordance with the approved layout drawings.

B. Field Panel Identification:

1. A geomembrane field panel is a roll or a portion of roll cut in the field.
2. Give each field panel an identification code (number or letter-number). This identification code shall be agreed upon by the Engineer and the Installer.

C. Field Panel Placement:

1. Place each geomembrane panel one at a time and seam each panel immediately after its placement.

2. Use temporary rubsheets as required to prevent displacement or damage to underlying geosynthetics. High spots in geomembrane-backed geosynthetic clay liners shall be covered by a temporary rubsheets during placement of geomembrane.
3. Do not place geomembrane panels when the ambient temperature is below 40° Fahrenheit (F), unless authorized in writing by the Engineer. For cold weather (<40°F) deployment, use the additional procedures authorized in writing by the Engineer. Additional procedures authorized by the engineer for cold weather seaming shall include, more trial welds, deploying panels the night before to maintain consistent temperatures between the panels being seamed, and utilizing temporary enclosed structures with heaters. In addition, all manufacturer specifications for cold weather seaming and panel placement for the selected geomembrane shall be followed. The procedures will also address placement of the gravel during cold weather. The manufacturer recommendations for cold weather will be followed.
4. Do not place geomembranes during any precipitation, in the presence of heavy fog or dew, in an area of ponded water, or in the presence of wind in excess of 20 miles per hour.
5. Ensure that:
    a. No vehicular traffic drives directly on the geomembrane.
    b. Equipment used does not damage the geomembrane by handling, trafficking, or leakage of hydrocarbons (i.e., fuels).
    c. Personnel working on the geomembrane do not smoke, bring glass onto the geomembrane, or engage in other activities that could damage the geomembrane.
    d. The method used to unroll the panels does not scratch or crimp the geomembrane and does not damage lower geosynthetics or the supporting soil.
    e. The method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels). The method used to place the panels results in intimate contact with geosynthetic clay liner, where present. Adjust or repair any area of geomembrane wrinkles where the wrinkle height causes a concern for wrinkle to fold over during placement of material on top. A wrinkle height of 4 inches measured perpendicular to the slope can be used as a general guide. The method used to place the panels does not cause the panels to lift up or trampoline during the coolest portion of the day.
    g. The geomembrane is anchored or weighted with sandbags, or the equivalent, to prevent damage or uplift from wind. Install sufficient anchoring or weighting to prevent uplift and maintain such system until overlying material is placed.

6. Replace any field panel or portion thereof that becomes damaged (torn, twisted, or crimped). Remove from the work area damaged panels or portions of damaged panels.

3.04 FIELD SEAMING

A. Personnel shall be experienced as specified in this Section. Do not perform seaming unless a "master seamer" and the Engineer are on-site.

B. Orient seams parallel to the line of maximum slope (i.e., oriented down, not across, the slope). Minimize the number of seams in corners and at odd-shaped geometric locations. No horizontal seam shall be less than 10 feet from the toe of the slope, except where approved by the Engineer. Do not locate seams at an area of potential stress concentration.

C. Weather Conditions for Seaming:

1. Do not seam geomembrane at ambient temperatures below 40°F or above 104°F, unless authorized in writing by the Engineer. Do not seam geomembrane at sheet temperatures above 158°F. For cold (<40°F) or hot (>104°F) weather seaming, use the additional procedures authorized in writing by the Engineer. Cold weather procedures (including manufacturer specifications) will be a contractor submittal that will be made available to the regulators.
2. Measure ambient temperatures between 0 to 6 inches above the geomembrane surface.
3. In all cases the geomembrane seam areas shall be dry and protected from wind. Do not seam geomembrane during periods of precipitation or if winds are in excess of 20 miles per hour.

D. Overlapping and Temporary Bonding:

1. Sufficiently overlap geomembrane panels for welding and to allow peel tests to be performed on the seam. Any seams that cannot be destructively tested because of insufficient overlap are failing seams.
2. Control the temperature of the air at the nozzle of heat bonding apparatus such that the geomembrane is not damaged.

E. Seam Preparation:

1. Prior to seaming, clean the seam area and ensure that area to be bonded is free of moisture, dust, dirt, debris of any kind, and foreign material.

2. If seam overlap grinding is required, complete the process according to the Manufacturer's instructions or within 60 minutes of the seaming operation. Do not grind to a depth that exceeds ten percent of the geomembrane thickness. Grinding marks shall not appear beyond 0.25 inch of the extrudate after it is placed.
3. Align seams with the fewest possible number of wrinkles and "fishmouths".

F. General Seaming Requirements:

1. Extend seams to the outside edge of panels to be placed in the anchor trench.
2. If required, place a firm substrate such as a flat board or similar hard surface directly under the seam overlap to achieve proper support.
3. Cut fishmouths or wrinkles at the seam overlaps along the ridge of the wrinkle to achieve a flat overlap. Seam the cut fishmouths or wrinkles and patch any portion where the overlap is less than 6 inches with an oval or round patch of geomembrane that extends a minimum of 6 inches beyond the cut in all directions.
4. Place the electric generator used for power supply to the welding machines outside the area to be lined or mount it on soft tires such that no damage occurs to the geomembrane. Properly ground the electric generator. Place a smooth insulating plate or fabric beneath the hot welding apparatus after use.

G. Seaming Process:

1. Approved processes for field seaming are extrusion welding and fusion welding. The primary method of welding shall be fusion. Seaming equipment shall not damage the geomembrane. Use only geomembrane Manufacturer-approved equipment.
2. Extrusion Equipment and Procedures:
   a. Maintain at least one spare operable seaming apparatus on site.
   b. Equip extrusion welding apparatus with gauges giving the temperature in the apparatus and at the nozzle.
   c. Prior to beginning a seam, purge the extruder until all heat-degraded extrudate has been removed from the barrel. Whenever the extruder is stopped, purge the barrel of all heat-degraded extrudate.

3. Fusion Equipment and Procedures:
   a. Maintain at least one spare operable seaming apparatus on site.

b. Fusion-welding apparatus shall be automated self-propelled devices equipped with gauges giving the applicable temperatures and pressures.
c. Fusion-welding apparatus shall produce a double-track seam.
d. Abrade the edges of cross seams to a smooth incline (top and bottom) prior to extrusion welding.

H. Trial Seams:

1. Make trial seams on excess pieces of geomembrane to verify that seaming conditions are adequate. Conduct trial seams on the same material to be installed and under similar field conditions as production seams. Conduct trial seaming at the beginning of each seaming period, after every four hours of continuous seaming, every time seaming equipment is changed and if significant changes in geomembrane temperature are observed, for each seaming apparatus used that day prior to seaming. In addition, each seamer shall make at least one trial seam each day, for each day that seaming is performed by that seamer. Conduct trial seaming under the same conditions as the actual seaming. Prepare trial seams that are at least 15 feet long by 1 foot wide (after seaming) with the seam centered lengthwise for fusion equipment and at least 3 feet long by 1 foot wide for extrusion equipment. Prepare seam overlap as indicated in the "Overlapping and Temporary Bonding" Article of this Part.
2. Cut four specimens, each 1.0 inch wide, from the trial seam sample. Test two specimens in shear and two in peel, using a field tensiometer. The test specimens shall not fail in the seam. If a specimen fails, repeat the entire operation. If the additional specimen fails, do not accept the seaming apparatus or seamer until the deficiencies are corrected and two consecutive successful trial seams are achieved. A seamer may start production seaming prior to testing of the trial seams. In the event the trial seam fails, all production seams by the seamer are failed seams.

I. Nondestructive Seam Continuity Testing:

1. Nondestructively test for continuity field seams over their full length. Perform continuity testing as the seaming work progresses, not at the completion of field seaming. Record the location, date, unit number of test apparatus, name of tester and results of testing. Complete any required repairs in accordance with the "Defects and Repairs" Article of this Part. Apply the following procedures:
   a. use vacuum testing for extrusion welds; and
   b. use air pressure testing for double-track fusion seams.

2. Vacuum Testing:
   a. Use the following equipment:
      i. A vacuum box assembly consisting of a stiff housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge.
      ii. A system for applying 5 pound per square inch (psi) gauge suction to the box.
      iii. A bucket of soapy solution and applicator.

   b. Follow these procedures:
      i. Energize the vacuum pump and reduce the tank pressure to 5 ±1 psi gauge.
      ii. Wet an area of the geomembrane seam larger than the vacuum box with the soapy solution.
      iii. Place the box over the wetted area.
      iv. Close the bleed valve and open the vacuum valve.
      v. Ensure that a leak tight seal is created.
      vi. Examine the geomembrane through the viewing window for the presence of soap bubbles for not less than 20 seconds.
      vii. If no bubbles appear after 20 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 inch overlap, and repeat the process.
      viii. Mark all areas where soap bubbles appear with a marker that will not damage the geomembrane and repair in accordance with the "Defects and Repairs" Article of this Part.

3. Air Pressure Testing:
   a. Use the following equipment:
      i. an air pump (manual or motor driven) or air reservoir, equipped with a pressure gauge, capable of generating and sustaining a pressure between 25 and 30 pounds per square inch;
      ii. a rubber hose with fittings and connections; and
      iii. a hollow needle, or other approved pressure feed device.

   b. Follow these procedures:
      i. Seal both ends of the seam to be tested.
      ii. Insert needle, or other approved pressure feed device, into the tunnel created by the fusion weld.
      iii. Insert a protective cushion between the air pump and the geomembrane.
      iv. Energize the air pump to a pressure between 25 and 30 pounds per square inches, close valve, and sustain the pressure for not less than 5 minutes.

v. If loss of pressure exceeds 3 pounds per square inches, or does not stabilize, locate faulty area and repair in accordance with the "Defects and Repairs" Article of this Part.

vi. Cut opposite end of air channel from pressure gauge and observe release of pressure to ensure air channel is not blocked.

vii. Remove needle, or other approved pressure feed device, and seal both ends in accordance with the "Defects and Repairs" Article of this Part.

J. Destructive Testing:

1. Destructive testing shall be performed by the CQA Personnel. The Contractor shall provide assistance if requested by the CQA Personnel to obtain samples. Perform destructive seam tests to evaluate seam strength and integrity (see Table 2 for seam properties of 60-mil HDPE). Perform destructive testing as the seaming work progresses, not at the completion of field seaming.
2. Sampling and Testing:
   a. Collect destructive test samples at a minimum average frequency of one test location per 500 feet of seam length and at additional locations of suspected nonperformance. A minimum of one test sample for each seaming machine operating on a given day is required. The Engineer will select test locations, including locations with evidence of excess geomembrane crystallinity, contamination, offset seams, or any other evidence of inadequate seaming.
   b. Cut samples at the locations designated by the Engineer at the time the locations are designated. Number each sample and identify the sample number and location on the panel layout drawing. Immediately repair all holes in the geomembrane resulting from the destructive seam sampling in accordance with the repair procedures described in the "Defects and Repairs" Article of this Part. Test the continuity of the new seams in the repaired areas according to "Nondestructive Seam Continuity Testing" Article of this Part.
   c. Cut two strips 1 inch wide and 12 inch long with the seam centered parallel to the width from either side of the sample location. Test the two 1-inch wide strips in the field tensiometer in the peel mode. The Engineer may request an additional test in the shear mode. If these samples pass the field test, prepare a laboratory sample at least 1 foot wide by 3.5 feet long with the seam centered lengthwise. Cut the laboratory sample into three parts and distribute as follows:

      i. one portion 1 foot long to the Installer;
      ii. one portion 1.5 feet long to the Engineer for testing; and

iii. one portion 1 foot long to the Engineer for archival storage.

3. In the event of failing field or laboratory test results, the Contractor may reconstruct the entire seam between two passing destructive tests; otherwise, the Engineer will identify the extent of the nonconforming area following the procedures given in the CQA Plan. Obtain additional samples for testing as requested by the Engineer.

K. Defects and Repairs:

1. Inspect the geomembrane before and after seaming for evidence of defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of inspection. Sweep or wash the geomembrane surface if surface contamination inhibits inspection.
2. Test each suspect location, both in seam and non-seam areas, using the methods described in the "Nondestructive Seam Continuity Testing" Article of this Part. Repair each location that fails nondestructive testing.
3. Cut and reseam wrinkles not conforming with Part 2 of this Section. Test the seams thus produced like any other seam.
4. Repair Procedures:
   a. Repair any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test. Use the most appropriate of the available procedures:
      i. patching, used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter;
      ii. abrading and reseaming, used to repair small sections of extruded seams;
      iii. spot seaming, used to repair minor, localized flaws;
      iv. capping, used to repair long lengths of failed seams;
      v. topping, used to repair areas of inadequate seams, which have an exposed edge less than 4 inches in length; and
      vi. removing bad seam and replacing with a strip of new material seamed into place (used with long lengths of fusion seams).

   b. When making repairs, satisfy the following:
      i. abrade surfaces of the geomembrane that are to be repaired no more than 20 minutes prior to the repair;
      ii. clean and dry all geomembrane surfaces immediately prior to repair;
      iii. only use approved seaming equipment; and

iv. extend patches or caps at least 6 inches beyond the edge of the defect, and round corners of patches to a radius of at least 3 inches.

5. Repair Verification:
   a. Test each repair using the methods described in the "Nondestructive Seam Continuity Testing" Article of this Part. Repairs that pass the nondestructive test are adequate unless the Engineer elects to also perform destructive tests. Re-repair and retest failed tests.

3.05 MATERIALS IN CONTACT WITH THE GEOMEMBRANE

A. Take all necessary precautions to prevent damage to the geomembrane during the installation of other components of the liner system.

B. Do not drive equipment directly on the geomembrane. Only use low ground pressure equipment above the geomembrane.

C. The protection measures for the liner along the perimeter channel area include, restricting traffic to foot traffic and low weight portable equipment and tools on an as-needed basis, performing routine visual inspections, and repairing the liner. At the start of every dredge season, the exposed liner will be inspected. Repairs will be performed as necessary based on the inspection.

3.06 SURVEY CONTROL

A. Survey the installed geomembrane for preparing the as-built panel layout drawing.

B. Locate panel seams and intersections as requested by the Engineer.

3.07 GEOMEMBRANE ACCEPTANCE

A. The Contractor shall retain all ownership and responsibility for the geomembrane until accepted by the Engineer.

B. The geomembrane shall be accepted by the Owner when:

1. The installation is finished;
2. All documentation of installation is completed including the Engineer's final report; and
3. Verification of the adequacy of all field seams and repairs, including associated testing, is complete.

3.08 PROTECTION OF WORK

A. The Contractor shall protect all prior work and all materials and completed work of other Sections.

B. In the event of damage, the Contractor shall make all repairs or replacements necessary to be in full compliance with the Contract Documents.

TABLE 1
REQUIRED GEOMEMBRANE PROPERTIES FOR 60-MIL HDPE

Properties	Qualifiers	Units[(1)]	Specified Values	Test Method
Physical Properties				
Thickness	minimum average	Mils	60	ASTM D 5199
Density	minimum	g/cm^3	0.932	ASTM D 1505
Carbon Black Content	range	%	2.0-3.0	ASTM D 4218
Carbon Black Dispersion	N/A	None	category 1 or 2	ASTM D 5596
Tensile Properties (each direction)				
1. Tensile Strength (force per unit width at break)	minimum	lb/in	90	ASTM D 6693
2. Elongation at Break	minimum	%	100	ASTM D 6693
3. Tensile Strength (force per unit width at yield)	minimum	lb/in	126	ASTM D 6693
4. Elongation at Yield	minimum	%	12	ASTM D 6693
Tear Resistance	minimum	Lb	42	ASTM D 1004 Die C Puncture
Puncture Resistance	minimum	Lb	90	ASTM D 4833
Oxidative Induction Time (OIT)	minimum average	Minutes	100	ASTM D 3895
Stress Crack Resistance	minimum	Hours	300	ASTM D 5397

Notes:

1. mils = milli-inches
   % = percent
   g = grams
   g/cm^3 = grams per cubic centimeter
   lb = pound
   lb/in = pounds per inch

TABLE 2
REQUIRED GEOMEMBRANE SEAM PROPERTIES FOR 60-MIL HDPE

Properties	Qualifiers	Units[3]	Specified Values	Test Method
Shear Strength[1]				
Fusion	minimum	lb/in	120	ASTM D 6392
Extrusion	minimum	lb/in	120	ASTM D 6392
Peel Adhesion			FTB[2]	
Fusion	minimum	lb/in	91	ASTM D 6392
Extrusion	minimum	lb/in	78	ASTM D 6392

Notes:

1. Also called "Bonded Seam Strength".
2. FTB = Film Tear Bond. (Maximum 10 percent seam separation)
3. lb/in = pounds per inch

[END OF SECTION]

SPECIFICATION NO: **SECTION 15125**

SPECIFICATION TITLE: **HDPE PIPE AND FITTINGS**

PROJECT NO: **444853**

PROJECT TITLE: **ONONDAGA LAKE SEDIMENT MANAGEMENT SYSTEM FINAL DESIGN**

CLIENT: **HONEYWELL, INC.**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
0	23May11	5	Original	DDS	TCD	

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☐ In-house Review ☐ Bid

☐ Client Review/Approval ☒ Construction

☐ Information Only ☐ *Other*

SECTION 15125

HDPE PIPE AND FITTINGS

PART 1 – GENERAL

1.01 DESCRIPTION

The contractor shall install a high density polyethylene (HDPE) dual containment pipe system as shown on the drawings. The contractor is responsible for installation and testing of a complete and operational piping system.

1.02 PERFORMANCE REQUIREMENTS

The Contractor shall comply with all applicable Federal, State, and Local codes, ordinances, regulations, statutes and standards.

1.03 REFERENCES

The following publications listed form a part of this specification to the extent referenced.

A. American Society for Testing and Materials (ASTM)

1. ASTM D-638, Tensile Properties
2. ASTM D-1238, Flow Rates of Thermal Plastics
3. ASTM F-1248, Environmental Stress Crack Resistance (ESCR)
4. ASTM D-1505, Density of Plastics by Gradient Technique
5. ASTM D-2837, Hydrostatic Design Basis for Thermal Plastics
6. ASTM D-3261, Butt Heat Fusion for Polyethylene (PE)
7. ASTM D-3350, Specs for Polyethylene Pipe and Fittings
8. ASTM F-714 - 95, Polyethylene Plastic Pipe (SDR-PR) Based on outside diameter
9. ASTM D-2321, Underground Installation of Flexible Thermoplastic Sewer Pipe

B. Other Publications

1. ASME B32.8, Hydrostatic Testing Guidelines
2. Plastic Piping Institute Best Practices TR 31/9-79
3. Performance Pipe *Heat Fusion Joining Procedures and Qualification Guide PP-750*

4. Performance Pipe *Field Bending of PE Pipe PP-819-TN*

5. Honeywell Onondaga Lake Cleanup Sediment Management System Construction Project - *Slurry Pipeline Hydrostatic Testing Plan* (Parsons, March 2011)

PART 2 – PRODUCTS

2.01 DUAL CONTAINMENT PIPE SYSTEM

A. The dual containment pipe system shall consist of pre-assembled HDPE carrier and containment pipe, centralizers, and fittings.

B. Pipe supplied under this specification shall have IPS (Iron Pipe Size) outside diameter (OD) and shall meet ASTM D-3035.

C. All pipe and fittings shall meet the pressure requirements of the system as specified and in *Slurry Pipeline Hydrostatic Testing Plan* (Parsons, March 2011).

D. Fittings shall be manufactured to the same pressure rating as the carrier pipe.

1. All molded fittings shall be manufactured per ASTM D-3261.

2. Pipe joints and fittings shall be supplied to the job site ready for simultaneous butt fusion. The fabricator shall show that the materials are capable of butt fusion and shall provide a procedure to consistently produce sound welds.

E. Centralizers welded to the carrier pipe shall support the carrier pipe within the containment pipe. Centralizer support spacing and other pipe system requirements shall be in accordance with the drawings.

1. The centralizers shall be machined from pipe grade resin sheet stock HDPE. Centralizers should be placed in the pipe system such that the openings are positioned as shown in the drawings.

F. Tie-ins to other piping systems and/or equipment, where butt fusion is not applicable, shall be with HDPE flange-adapters unless otherwise specified in the drawings.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prior to commencement of the Work, the Contractor shall verify the locations of all potentially conflicting utilities and structures as indicated on the drawings.

3.02 PRE-ASSEMBLY

A. Dual containment pipe and fittings shall be pre-assembled prior to shipment to the job site. Pre-assembly shall consist, at a minimum, of placement of the carrier pipe within the containment pipe with all required centralizers in place.

3.03 STORAGE

A. Pipe shall be stored on a clean, level ground free of standing water. If the pipe must be stacked for storage, such stacking should be done in accordance with the pipe suppliers recommendations. The handling of the pipe should be done in such a manner that the pipe is not damaged by dragging over sharp objects or cut by lifting equipment.

B. Segments of pipe having cuts or gouges in excess of 20% of the wall thickness, shall not be incorporated into the system.

3.04 INSTALLATION

A. Sections of HDPE dual containment pipe shall be joined into continuous lengths on the job site following the guidelines of ASTM D-2657, using the simultaneous butt fusion method of joining the pipe.

B. The pipe system supplier shall approve all fusion equipment used for the pipe system. The butt fusion equipment used to join the pipe and fittings shall be equipped with a data-logger capable of quality control documentation for pipe fusion parameters such as the time, temperature, and pressure for each fusion made.

C. Fused segments of pipe shall be handled according to pipe system supplier's recommendations. Bending of the pipe during installation shall be limited and shall not exceed the pipe system supplier's recommendations.

D. Buried pipe shall be installed in accordance with ASTM D-2321, Underground installation of flexible thermoplastic sewer pipe, and in accordance with project design drawings.

3.05 HYDROSTATIC TESTS

The carrier and containment pipe shall be subjected to both a pressure test and a visual test. Testing shall be the responsibility of the contractor. The test may be witnessed by the Engineer. The Engineer shall be notified at least 3 days in advance of such tests. The final test report shall be delivered to the Engineer within 30 days of the test.

A. Pressure Test: After the pipe fusion is completed and the pipe installed , the carrier pipe shall be hydrostatic tested in accordance with Honeywell Onondaga Lake Cleanup Sediment Management System Construction Project - *Slurry Pipeline Hydrostatic Testing Plan* (Parsons, March 2011). The pipeline shall be subjected to a test pressure for a period of a least 1 hour. The test time should not exceed 3 hours.
B. Containment Pipe Testing: The carrier pipe shall be pneumatic pressure tested in accordance with Honeywell Onondaga Lake Cleanup Sediment Management System Construction Project - *Slurry Pipeline Hydrostatic Testing Plan* (Parsons, March 2011). Extreme caution should be used to insure that the annular space is not over pressurized. Air is a compressible gas and is very dangerous. Always build and release pressure slowly. The test period shall be limited to 10 minutes. The pipe shall be brought up to test pressure and held for 10 minutes or until the pressure stabilizes. The test shall begin when the pressure stabilizes. If no significant pressure drop is noted, the pipe has passed the test.
C. Retesting: If any deficiencies are revealed during the test, such deficiencies shall be corrected. The tests shall be reconducted until the results of the tests are within specified allowances with no additional cost to the owner.
D. Visual Test: All exposed joints, fittings, and valves shall be examined for leaks. Visible leaks shall be stopped and/or the defective pipe, fitting, joint, or valve shall be replaced

SPECIFICATION NO:	SECTION 15136
SPECIFICATION TITLE:	VAPOR GRANULAR ACTIVATED CARBON TREATMENT SYSTEM
PROJECT NO:	444853
PROJECT TITLE:	ONONDAGA LAKE SEDIMENT MANAGEMENT FINAL DESIGN
CLIENT:	HONEYWELL, INC.

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
0	16May11	4	Original	TCD	DDS	

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☒	In-house Review	☐	Bid
☐	Client Review/Approval	☐	Construction
☐	Information Only	☐	*Other*

Vapor Granular Activated Carbon Treatment System

1.0 GENERAL INFORMATION

1.1 SCOPE OF WORK

A. The vendor is to design and supply a vapor-phase granular activated carbon filtration system that will meet the design and performance criteria listed below. The equipment shall include skid-mounted VGAC vessels, carbon, interconnecting piping, manual valves, distribution and collection laterals, and accessories and controls for a completely assembled, ready to install and operate system.

B. Vendor shall supply all applicable calculations and drawings, stamped by a registered Professional Engineer, that demonstrate the proposed system meet the design and performance criteria.

C. The system is planned to be installed (by others) at the Owners outdoor processing facility, and operated approximately seven months out of each year (April 15th through November 15th) for four years beginning in the year 2012. Vendor shall identify required means, methods and procedures needed to prepare units for storage over the winter months. As part of the Service Contract described in the Bid Tab Items, Vendor will be responsible for filling units, and bringing system on-line and fully operational each year prior to April 15th, and emptying/removal of carbon (if required) and rendering system safe for winter downtime/storage immediately after the November 15th yearly shutdown.

D. Provide a maintenance/service contract for operational change-out services on an annual basis. The Manufacturer should appropriately size the equipment hydraulically and estimate change-out frequency based upon criteria (estimated influent and removal criteria) presented herein. It is assumed that spent carbon would need to be classified as Hazardous.

1.2 CODES AND STANDARDS

E. Comply with the latest revision of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

a. American Society of Mechanical Engineers (ASME)
b. American Society for Testing and Materials (ASTM)
c. American National Standards Institute (ANSI)
d. NACE International

1.3 SAFETY AND HEALTH

A. All equipment shall comply with the most current edition of the following applicable codes: ANSI, ASME, ASTM, EPA, IEEE, ISA, NEC, NEMA, NFPA, OSHA, UL (and/or FM). If manufacturing standards differ from operating standards defined by the applicable codes they shall be stated and identified in the submittals otherwise operations standards shall prevail relating to working clearances.

1.4 SUBMITTAL REQUIREMENTS

A. The Vendor shall submit detailed calculations and drawings with Professional Engineer stamped calculations showing the proposed system meet the design and performance criteria.

1.5 PERFORMANCE GUARANTEE

A. Performance shall be warrantied and proven. Performance shall be demonstrated continuously for four weeks after start-up under full operating conditions. Performance testing is by others. GAC Vendor shall be present at the site (assume 8 hours) to witness performance testing and provide input as requested. The provided GAC system shall be designed to achieve required removals, given the estimated influent concentrations provided in Section ~~1~~2.1. If the equipment fails to continuously meet this removal requirement during the warranty period, the Manufacturer shall, at no additional cost to the Owner or Buyer, provide and install replacement equipment, parts, and labor to correct demonstrated performance deficiencies as needed to achieve the required performance.

2.0 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. The VGAC vessels shall be suitable for contact removal of VOCs and SVOCs from the air stream at the concentrations, required removal rates, and airflows specified below.

B. The system shall treat air from a 3 tank system at a total flowrate of 200 cfm.

C. The system shall provide a minimum of 95% removal efficiency for contaminants from the air stream. Estimated contaminant loadings to the VGAC system (g/day) are as follows:

Compound	Daily Loading (g/day)	Compound	Daily Loading (g/day)
Benzene	875	1,2 Dichlorobenzene	839
1,4 Dichlorobenzene	459	1,2,4 Trichlorobenzene	469
Chlorobenzene	704	1,1,1 Trichloroethane	365
Ethylbenzene	956	Acetone	134
Naphthalene	5,575	MEK	165
Toluene	2,651	Methylene Chloride	119
Xylene	9,628	1,2,4 Trimethylbenzene	196

D. The system shall consist of at least two (2) carbon tanks, and be designed for lead/lag operation. Manually operated valves and manifold piping shall be provided such that either unit may operate in the lead position. Operator should be able to select (by manual manipulation of valve operators) which of the vessels is to serve as the lead vessel. Also, design of the entire system shall allow the isolation of any unit for carbon change-out while maintaining full flow through the other unit(s).

E. The Vendor shall size the carbon tanks, based on the contaminant loading provided above, such that carbon change out will occur not more than once a month.

F. The Subcontractor shall provide GAC media that meets the design requirements. The depth of media shall be provided by the Manufacturer. Coal-based carbon shall be used. A cost comparison will be performed to evaluate the use of virgin carbon vs. reactivated carbon (as shown in the Bid Items). If reactivated carbon is used, the initial carbon fill would be with virgin carbon. Thereafter, the same carbon would be reactivated and returned to the site. This reactivated carbon would be dedicated solely to this Honeywell project. Additional carbon used to supplement the reactivated carbon, as needed, would be virgin type carbon. Carbon shall meet the following criteria:

~~Reactivated~~ Virgin Carbon		Reactivated Carbon	
Iodine Number, mg/g (min)	1000	Iodine Number, mg/g (min)	900
Moisture, weight % (max)	2	Moisture, weight % (max)	2
Abrasion Number (min)	75	Abrasion Number (min)	75
Effective Size (mm)	0.55-0.75	Effective Size (mm)	0.55-0.75
Uniformity Coefficient (max)	1.9	Uniformity Coefficient (max)	1.9
Apparent Density, g/cc (min)	9	Apparent Density, g/cc (min)	9
Screen Size, US Sieve Series, weight %	0.44	Screen Size, US Sieve Series, weight %	0.44
Larger than No. 12 (max)	5	Larger than No. 12 (max)	5
Smaller than No. 40 (max)	4	Smaller than No. 40 (max)	4

G. The Vendor shall conduct shop testing to satisfy pressure ratings of each tank. The GAC vessels shall be pressure tested by the manufacturer at the shop prior to delivery to the site. Certified test reports for each unit shall be provided prior to delivery.

H. Test ports shall be provided on the inlet and discharge piping of the carbon vessels, to allow for the withdrawl and testing of air samples to verify the effectiveness of the carbon control.

I. The discharge stack of the treated air shall be at a minimum height of 20 feet.

3.2 SHOP FINISHES

A. All surfaces to be coated shall be prepared in accordance with PIP VESV1003HA. Surface preparation prior to coating application shall be in accordance with the NACE standard SP0178 and NACE SP0178 Appendix C NACE Weld Preparation Designation C, and coating Manufacturer's instructions, whichever is more stringent.

B. The Manufacturer shall provide a shop-applied protective coating system for all non-wetted metal surfaces of the GAC system.

END OF SECTION

SPECIFICATION NO: **SECTION 17111**

SPECIFICATION TITLE: **BITUMINOUS ASPHALT**

PROJECT NO: **444853**

PROJECT TITLE: **ONONDAGA LAKE SEDIMENT MANAGEMENT FINAL DESIGN**

CLIENT: **HONEYWELL, INC.**

				APPROVALS		
Issue	Date	Pages	Issue Description	Prepared	Checked	Approved
0	4May11	4	Original	WM	DDS	

☒ Entire Specification Issued this Revision

☐ Revised Pages Only Issued this Revision

SPECIFICATION ISSUED FOR:

☐	In-house Review	☐	Bid
☒	Client Review/Approval	☒	Construction
☐	Information Only	☐	*Other*

Bituminous Asphalt Pavement

SECTION 17111

PART 1 - GENERAL INFORMATION

1.01 SCOPE OF WORK

A. The work covered in this section consists of the placement of bituminous asphalt in the Slurry Processing Area (SPA). The asphalt shall be placed on a prepared gravel subbase in accordance with the project specifications and drawings. The contractor shall furnish all labor, material and equipment necessary to complete the work including the placement of tack coat on all underlying asphalt surfaces.

B. The Bituminous Asphalt placed on the foot print of the SPA is to be constructed out of One (1) of Type 3 binder equaling a thickness of 3.5" and one (1) lift of Type 7 top equaling a thickness of 1.5".

1.02 RELATED WORK

A. Work in this section includes, but is not limited to:
   1. Section 01030 Environmental Protection
   2. Section 02200 Earthwork

1.03 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes and standards except where more stringent requirements have been specified:
   1. New York State Department of Transportation section 400 of the Standard Specifications.
   2. ASTM D 2041 Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
   3. Payment terms and submittal requirements included in NYSDOT standards do not apply to this section.

1.04 SUBMITTAL REQUIREMENTS

A. The Contractor shall submit the following information to the Engineer for review and approval Calendar days prior to initiating Bituminous Asphalt Placement.

   1. Job Mix designs with approval (Certification) of each job mix being used for this work
   2. Material certifications from the manufacturer of bituminous asphalt
   3. Equipment and methods to place bituminous asphalt courses
   4. Quality Assurance results as required by Section 1.5
   5. A Subcontractor Safety Plan

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications – A Bituminous Asphalt manufacturer/supplier approved by the New York State Department of Transportation.

B. Regulatory Requirements – Comply with means, methods, materials or other requirements deemed acceptable by the New York State Department of Transportation.

C. Pre Pave Meeting - Conduct a pre-installation conference at project field office for all involved parties.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Hot Mix Bituminous Asphalt approved by the New York State Department of Transportation. All mixes used for this work must comply with the following requirements

1. NYSDOT Type 3 Binder – NYSDOT Item No. 403.138902, dense binder for general use.
2. NYSDOT Type 7 Top Course – NYSDOT Item No. 403.198902, dense course for single course resurfacing.
3. Tack Coat – NYSDOT Item No. 407.0101 slow setting emulsified asphalt.

PART 3 - PRODUCTS

3.01 INSTALLATION

A. Ensure subbase is ready to receive asphalt paving and that subbase is free of loose material.

B. A thin uniform layer of Bituminous Tack Coat shall be placed on top of the binder course before placing the top course and where joints have been saw cut at the beginning of a new pull.

C. Spread Asphalt with a paving machine on a prepared surface regulating the paving machine to obtain a smooth surface free from tears in the asphalt mat. Spread mix at a temperature range of 250 degrees F. to 330 degrees F. placing to the required grades and thicknesses shown on the project plans. Correct all irregularities behind paver immediately after they are created and while the asphalt is still hot enough to prevent segregation and obtain a smooth surface on the asphalt mat. In areas that cannot be accessed by a paving machine place material by hand using hand tools that are acceptable hand tools to prevent segregation and provide a smooth surface.

D. All utilities that penetrate the asphalt will need to be surrounded with asphalt and sealed with crack filler.

3.02 COMPACTION

A. Begin compaction as soon as asphalt will bear weight of roller without displacement. In areas that are not accessible to rollers compact with vibratory plate compactors. Compaction should be performed in a three step process initial rolling, intermediate rolling and finish rolling.

1 Initial Rolling – Roll joints and outside edge of mat then complete initial rolling looking for correct grade and smoothness.

2 Intermediate Rolling – Intermediate rolling should be done immediately after initial rolling while the asphalt mat is still hot enough to achieve specified density of 92% of the reference theoretical density not less than 90% and more than 96% according to ASTM D 2041 Standards.

3 Finish Rolling – Finish roll surface to remove roller marks and achieve a smooth sealed surface when mix is still warm.

B. Trim and bevel all edges to achieve a straight aligned edge while asphalt is being compacted.

C. Make sure all joints where paver stops operations and resumes at a later time are saw cut and hammered to provide a straight edge to pull the asphalt mat from.

3.03 FIELD TESTING

A. The mat thickness tolerance for binder shall not exceed ½ inch

B. The mat thickness tolerance for surface course shall not exceed ¼" inch

C. The surface tolerance shall not exceed ¼ inch for both binder and surface courses..

D. There shall be no depressions in the finished surface that will retain standing water.

E. Variations exceeding ¼" or depressions in the finished surface shall be satisfactorily corrected.

*** END OF SECTION ***