PART B
ENGINEERING REPORT

CORRECTIVE ACTION DESIGN
OLD FALL RIVER ROAD LANDFILL FINAL CLOSURE
452 OLD FALL RIVER ROAD, DARTMOUTH, MA

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APPENDICES

1.0 INTRODUCTION

1.1 General

Mary Robinson is the owner of an inactive unlined landfill located at 352 Old Fall River Road in Dartmouth, Massachusetts (the "Landfill"). Mary Robinson has entered into an agreement with Boston Environmental Corporation (BEC) to cap and close the Landfill. On or about March 28, 2014, the Massachusetts Department of Environmental Protection issued an Administrative Consent Order (#ACO-SE-14-4001 ("ACO") to Mary Robinson and BEC. This Corrective Action Design ("CAD") is being submitted consistent with paragraph 54 of the ACO.

1.2 Application Documents

This document is included as a component of the CAD submission for the Final Closure Construction of the Old Fall River Road Landfill. Documents that comprise the entire application are listed below:

PART A: Permit Application Forms
PART B: Engineering Report
PART C: Construction Quality Assurance Plan
PART D: Technical Specifications
PART E: Drawings

1.3 Site Description

The Landfill is located at 452 Old Fall River Road in Dartmouth, Massachusetts. The Landfill was an active landfill from 1954 to 1974. The Landfill was privately operated and was used primarily for the disposal of construction and demolition waste during this period. The materials that were placed in the landfill generally consisted of demolition debris, brick, concrete and granite, along with scrap metal and tires.

The site is bisected by an active Algonquin Gas transmission line and a New England Electric electrical transmission line. The area of the property originally approved for landfill operations, according to the Site Assignment issued by the Town of Dartmouth in 1975, is 60 acres. BEC excavated 44 test pits at the Site, which determined that the extent of buried waste from the historic landfilling operation is approximately 25 acres in size.

The area which was used for landfilling is surrounded by the Algonquin Gas line on one side and wetlands on the other three sides. The Landfill is listed as an inactive, uncapped landfill according to the MassDEP Facility Master File listing. The land surrounding the Landfill is predominately wooded and undeveloped. Some residential homes and one commercial property, Gosselin & Sons Landscape Materials, are located to the north of the Site. Residential properties and undeveloped land abuts the Site to the south and undeveloped land along Old Fall River Road abuts the Site to the east. The Site is bordered to the west by residential properties, wetlands and woodland and the

Cole Brook Swamp. The Site is bordered by Old Fall River Road to the north and Hixville Road to the south.

The topography of the area surrounding the Site gently slopes from east to west. Stormwater runoff from the Site ultimately drains into the Cole Brook Swamp located to the north and west of the former Landfill and then Into an unnamed stream that extends from the east side, across the north side and along the west side of the Landfill Site.

1.4 Site History

In 1954, a sand and gravel excavation operation began on Site and portions of the Site were used for disposal of solid waste, primarily demolition debris. The area of the sand and gravel excavation operation was subsequently used for waste disposal.

In the 1960s the Site was used for the disposal of demolition debris which generally consisted of brick, wood, steel granite, and general demolition debris from buildings. During this period the Site was also used to store salvageable materials principally scrap metals.

These practices continued until 1983 when the operations ceased due to a dispute with the Town of Dartmouth. Although a landfill site assignment was granted to the Site, the sanitary landfill that had been contemplated in the site assignment was never built or operated.

In July 2009, MassDEP performed a Site inspection in response to a compliant of alleged illegal activity occurring at the Site. During the inspection MassDEP observed that areas of the Landfill had been excavated to retrieve recyclable materials. The reclaimed recyclable materials were observed to have been culled and stockpiled adjacent to the excavation areas.

In August 2009, the MassDEP issued a Unilateral Administrative Order ("#UAO-SE-09-4001) which required the respondent (Mary Robinson) to prepare and submit to MassDEP a Remedial Action Plan. The respondent did not submit the Remedial Action Plan and consequently the MassDEP issued a Notice of Enforcement Conference. As a result of the Enforcement Conference conducted on June 22, 2011, MassDEP issued an Administrative Consent Decree that set forth the terms and conditions of achieving compliance. The Administrative Consent Order was not executed by the respondent and MassDEP.

In December 2012, MassDEP received a conceptual landfill closure proposal (the "Conceptual Closure Proposal") from BEC pursuant to the Department's "Inactive Landfill Closure Guidelines." As proposed, the existing footprint of the Landfill would be excavated/consolidated to a final size of 23-acres, and an estimated one-million cubic-yards of approved grading shaping materials would be used to achieve final landfill closure grades/configuration.

In mid-January 2013, MassDEP advised BEC that pursuant to the outlined procedures in the Department's "Inactive Landfill Closure Guidelines", MassDEP would conduct a public informational session within the community of Dartmouth regarding the "Conceptual Closure

Proposal". The purpose of the public informational sessions was to solicit input from the Town of Dartmouth officials and the community at large regarding the proposed landfill closure project.

In March 2013, BEC submitted a Notice of Intent ("NOI") to the Town of Dartmouth for the excavation/removal of solid waste from wetland resource areas surrounding the Landfill. The wetlands project was assigned Wetlands File Number #SE 15-2186.

In March 2013, BEC submitted a BRPWW10-Water Quality Certification application to MassDEP for proposed work within wetland resource areas surrounding the Landfill.

On March 28, 2013, the first public informational session on BEC's "Conceptual Closure Proposal" was conducted. As a result of public interest, two (2) additional public informational meetings were conducted on June 27, 2013 and on July 11, 2013.

In July 2013, BEC submitted their draft "Response to Public Comments" concerning issues that were raised during the three public informational sessions conducted on March 23, 2013, June 27, 2013 and on July 11, 2013.

In March 2014, BEC submitted its final/revised "Conceptual Closure Proposal" in accordance with the Department's Inactive Landfill Guidelines. As proposed in BEC's revised/final "Conceptual Closure Proposal", the project will include the following:

1. The existing foot-print of the Landfill will be reduced from approximately 25-acres to approximately 23-acres through the excavation of waste from surrounding wetland resource areas that abut the Landfill.
2. A four (4) year operational timeframe will be established, whereby approved landfill closure grading/shaping materials will be placed during the first three (3) years, in order to achieve proper Landfill closure grades/configuration, and during the fourth and final year of operation the Landfill's final capping system will be installed.
3. The total amount of approved landfill closure grading/shaping materials that will be used to close the Landfill will be approximately 926,000 cubic-yards ("yds^3").

On March 28, 2014, MassDEP issued an Administrative Consent Order ACO-SE-14-4001, which found that BEC's final/revised "Conceptual Closure Proposal" met the requirements of the "Inactive Landfill Closure Guidelines", and notified the Respondents that they could proceed with the preparation and submission of requisite permit applications pursuant to the applicable requirements set forth at 310 CMR 19.000, and as required by the Consent Order regarding the assessment and closure of the Landfill. A copy of ACO-SE-14-4001 in included in Appendix B-1.

2.0 FINAL CLOSURE PLAN

2.1 Site Preparation

Prior to the start-up of construction activities within buffer zones to adjacent bordering vegetated wetland ("BVW") areas, temporary erosion control devices will be installed adjacent to BVW and proposed work areas. These devices will include staked haybales and silt fence along with staked

silt socks where appropriate. These devices will be installed at locations along both sides of the entrance road to the site, at the existing crossing of the perennial stream and along the perimeter of the Landfill where initial work activities are to occur. These erosion control devices will be extended in advance of construction activities to ensure that there are no inadvertent disturbances to adjacent BVW. These devices will be maintained during the project and until vegetative cover is established to prevent erosion.

Entrance road improvements will be completed to establish suitable access/egress to the Landfill site. These improvements include a widening of the existing narrow access road to accommodate vehicular traffic and the placement of road surfacing materials that will prevent the tracking of dirt or mud to adjacent roadways. These surfacing materials include asphalt grindings from highway improvement projects and the construction of a crushed stone entrance apron at Old Fall River Road as one element to prevent tracking mud off-site.

The installation of project infrastructure facilities, including a truck scale, an office trailer and a wheel wash station, will occur along the entrance road from Old Fall River Road. The truck scale and office trailer will be installed along the westerly side of the entrance road just prior to the culvert crossing into the Landfill site. Installing the scale at this location will provide an adequate queuing area along the road for trucks delivering grading and shaping materials or final clover soils to the Landfill site. Trucks will not be allowed to queue up along Old Fall River Road. A wheel wash station will be installed and operated along the easterly side of the entrance road just north of the truck scale. Exiting trucks will be required to pass through the tire wash to ensure that there is no mud tracking off-site. The wheel wash station is to be a self-contained unit that does not discharge wash-water to adjacent areas.

An existing concrete culvert situated within the unnamed perennial stream located at the northerly Landfill entrance will be replaced in order to widen the entrance to accommodate truck traffic. The existing culvert has been determined to be a 46" diameter reinforced concrete culvert. Sitec proposes that this culvert be removed and replaced with a new sixty (60) inch diameter reinforced concrete culvert embedded into the bottom of the stream a minimum of fifteen (15) inches in accordance with the Massachusetts River and Stream Crossing Standards. Concrete block retaining walls will be constructed on both sides of the access road at the stream crossing. Widening of the access road at the stream crossing will allow for the passage of two-way truck traffic with sufficient shoulder width and turning radius.

2.2 Final Closure Grading

This CAD includes the use of specific waste materials for grading and shaping the site to achieve final grades for the Landfill, under the MassDEP's July 6, 2001 *Revised Guidelines for Determining Closure Activities at Inactive Unlined Landfill Sites* (Unlined Landfill Policy). Specifically the proposed final closure grades of the Landfill will be achieved by reusing soils or other materials, that are specifically approved by MassDEP for use as shaping and grading materials in unlined landfills. The materials that are to be accepted at the facility and the methods of accepting and screening the materials are described in *Section 4.0 Landfill Grading Materials Acceptance Plan* of this CAD.

The proposed shaping and grading will be conducted in a manner that will allow final cap construction to be completed in phases. As indicated on the plans included in PART E - DRAWINGS, the shaping and grading that is proposed by this CAD will begin with Phase 1 Closure, which will be located within the north/northwesterly portion of the main Landfill footprint and will proceed toward the south, proceeding along the northern and western sidelines, to finished elevations of approximately 134. This initial sequence will bring the six (6.0) acre area indicated on the plan titled *Final Closure Construction Sequence Plan, Phase I Landfill Closure Construction* to final subgrade elevations. At the initiation of the Phase 1 grading period, the perimeter of this section of the Landfill will be prepared for closure. As shown on the attached drawing *Site Preparation Grading Plan*, this includes the relocation of waste from within ten feet of the adjacent bordering vegetated wetlands and around the perimeter. This will allow for the construction of the northern access road and sedimentation pond, denoted as Sedimentation Basin No. 2 on the Drawings, to take place outside the final capped limits of the Landfill. During the construction of the perimeter site preparation work, approved materials will be transported to the site and stockpiled within the inner area of the Phase 1 Closure Area. As sections of the perimeter preparation are completed the stockpiled material will be relocated to the interior of the perimeter berms and incorporated into the Landfill. The capacity of Phase 1 is approximately 400,000 cubic yards of approved material.

The second phase (Phase 2), as indicated on the plan titled *Final Closure Construction Sequence Plan, Phase II Landfill Closure Construction* will shape and grade approximately eight (8.0) acres in the southwesterly portion of the main Landfill to final subgrade elevations. Shaping and grading in this section will be preceded by the site preparation work shown on the *Site Preparation Grading Plan*, which includes the removal of waste from within ten feet of the wetlands and the construction of a berm along the south perimeter that will form the outside containment of Sedimentation / Detention Basin No. 1. The capacity of the Phase 2 Closure Area is approximately 343,000 cubic yards of approved material.

The third phase (Phase 3) of this CAD, as indicated on the plan titled *Final Closure Construction Sequence Plan, Phase III Landfill Closure Construction* will be completed with the shaping and grading of two final areas. The first part of the Phase 3 Closure Area includes the shaping and grading of the easterly side of the main Landfill and will bring the remaining seven (7) acres to final subgrade elevations. The shaping and grading of this area will be preceded by the remaining Site Preparation work associated with the main Landfill Area, which includes the removal of waste and the completion of the southerly perimeter berm that will form the outside containment of Sedimentation / Detention Basin No. 1. Site preparation work that will precede Phase 3 landfilling will also include waste consolidation activities and landfill access road construction on the easterly side of the main Landfill area. The capacity for this part of the Phase 3 Closure is approximately 158,000 cubic yards of approved material.

The second part of the Phase 3 Closure will shape and grade the two (2) acre isolated area located to the south of the Algonquin gas pipeline easement. The shaping and grading of the isolated landfill area will also be preceded by site preparation work which includes waste consolidation activities, the construction of a perimeter containment berm and the construction of Sedimentation

/ Detention Basin No. 3. The capacity for the isolated landfill area is approximately 25,000 cubic yards.

As shown on the drawings, the proposed shaping and grading of the Landfill will bring the site to a maximum final elevation of about 134 feet. This represents a total volume of shaping and grading material of approximately 926,000 cubic yards. The shaping and grading operation is proposed to be conducted over a period of approximately three years. This corresponds to an average annual rate of about 310,000 cubic yards, which at an in place density of 3,000 pounds per cubic yard (approximately 110 pounds per cubic foot) represents about 465,000 tons per year. The facility will operate six days per week, excluding holidays (300 days per year), which will result in an average of about 1,030 cubic yards per day or 1,550 tons per day of soils being delivered to the site. The soils will be delivered in thirty cubic yard (30 cy) trucks. Typically a 30 cy truck will carry 32 tons of soils. Based on these assumptions, the estimated truck traffic generated by the proposed Landfill closure operation will be an average of 50 trucks per day.

2.3 Final Cover System

The purpose of Final Closure Construction is to control stormwater runoff so as to reduce erosion and sedimentation, to manage landfill gases and to isolate landfill materials from the environment and vectors. The final cover system will accomplish each of these objectives by incorporating a designed network of run-off/run-on controls, a passive gas venting system and a cover system comprised of geomembrane and earthen materials that will effectively isolate the underlying Landfill area.

The final cover system will be comprised of the components described below:

- Excavation and relocation of limited areas of existing waste, including the restoration of wetlands that may be disturbed by this work.
- The importation, placement and compaction of approved materials to bring the Landfill to design subgrade elevations.
- A suitably prepared landfill surface beneath the final cover system.
- A geomembrane subgrade/gas venting layer consisting of 6 inches of sand with a minimum saturated hydraulic conductivity of 1.0×10^{-3} centimeters per second (cm/sec).
- A low permeability layer consisting of a 40 mil HDPE textured geomembrane cap.
- A drainage layer consisting of 12 inches of sand with a minimum saturated hydraulic conductivity 1.0×10^{-2} cm/sec.
- Establish a vegetative support layer consisting of at least twelve inches (12") of soil with a minimum hydraulic conductivity of 1.2×10^{-4} cm/sec. and a minimum organic content of 5%. The vegetative and capable of supporting a healthy vegetative growth.

2.4 Stormwater Management System

In addition to the components listed above, the final cover system for the Closure Construction will have several stormwater run-off/run-on control features designed to maintain the integrity of the

final cover and prevent ponding of water on the areas of the final cover. The stormwater control system will consist of the following components.

- Earthen diversion berms will be built into the final cover of the sideslopes to divert run-off to side slope let-down channels. These berms reduce the distance that overland run-off has to travel, thereby, reducing the volume of overland flow and erosion of the final cover.
- Side slope stone-lined let-down channels are used to convey slope run-off from the diversion berms to the stormwater basins at the toe of the slope.
- Stone-lined drainage channel is lined with a rip-rap surface and constructed along the inside edge of the Landfill access road on the easterly side of the Landfill. The channel will convey run-off from the easterly sideslope and access road to a stormwater collection area with a sediment sump where it will discharge from the Landfill through a culvert.
- Stormwater basins will capture sediment and control peak discharge rates, prior to discharge to surface waters.
- Sub-drains constructed of perforated pipe will be installed above the geomembrane cap at the toe of the sideslopes, as well as at intermediate slope locations associated with the earthen diversion berms. Sub-drains will divert drainage water that has percolated through the topsoil layer and into the drainage layer and discharge it to the perimeter swales. This will minimize the build-up of water within the drainage layer that could destabilize the sand drainage and vegetative support layer soils.

The locations of each of these stormwater management features, along with details and typical section views are presented in PART E - DRAWINGS of this submission.

The proposed final cover drainage layer was designed to provide sufficient capacity to manage all the water that enters the drainage layer and to ensure that it complies with regulatory design standards. The evaluation was performed using the USEPA HELP Model to determine hydraulic conductivity requirements for the drainage layer.

The following data was used in the design:

- The final cover drainage layer is to be 12 inches thick and comprised of permeable sand having a minimum hydraulic conductivity of 1.0×10^{-2} cm/sec.
- The vegetative support layer is to be comprised of a minimum of 12" of a soil with a minimum organic content of 5%, having a hydraulic conductivity of approximately 1.2×10^{-4} cm/sec.
- Sub-drains installed at the toe of the landfill sideslopes, as well as at intermediate locations, will be used to discharge infiltrated water and minimize pore pressure in the drainage layer. Sideslope subdrains will have a maximum separation distance of ninety (90) feet and the plateau area subdrains will have a maximum separation distance of ninety (90) feet.

The HELP Model analysis of the final cover indicates that the drainage layer has sufficient capacity to manage infiltration, without it impacting and destabilizing the vegetation support layer. (The depth of water on top of the geomembrane is not greater than the depth of the sand layer during peak day conditions.) Results of the HELP Model analysis are provided in Appendix B-2.

3.0 WASTE RELOCATION, WETLANDS RESTORATION & PERIMETER BERM

3.1 General

Certain limited areas of existing buried waste, along the perimeter of the Landfill area to be capped, or which may be identified during closure construction work, will be excavated and relocated into the interior portion of the Landfill as shown on the Drawings. These waste materials will be excavated to the natural ground surface and consolidated into the main portion of the Landfill so that they may be properly covered, initially with intermediate cover materials and subsequently incorporated into the site wide final closure construction work. The waste relocation work will remove waste from the delineated wetlands and within a minimum of ten feet from the wetlands boundary, in order to provide an adequate buffer space between the wetlands and landfilling work. Additionally waste will be removed for the perimeter access road and sedimentation pond areas. In areas where waste excavation will result in the need to backfill the areas, on-site, non-landfill related soils of adequate physical characteristics will be used. Where wetlands have been excavated, they will be remediated and replaced, as described below and shown on the drawings.

After waste excavation, relocation and wetlands restoration in any particular phase of landfill closure construction, an earthen perimeter containment berm will be constructed around the Landfill to establish the limit of grading and shaping materials associated with closure activities and to control stormwater runoff during intermediate stages of landfill closure.

3.2 Delineation of the Limit of Waste

BEC and its consultant SITEC Environmental, completed the delineation of wetlands throughout the entire property. The wetland delineation line has been surveyed and plotted on the drawings. BEC, on behalf of Mary Robinson, filed a Request for Determination of Applicability (RDA) with the Dartmouth Conservation Commission requesting approval to conduct the limit of waste test pit excavations and to obtain concurrence from the Commission on the accuracy of the wetland delineation. The Dartmouth Environmental Affairs Officer, Michael O'Reilly, visited the site on two occasions to view the wetlands flagging. The Commission issued a Negative Determination that allowed for the test pit investigations and also approved the limits of on-site wetlands and associated resource areas.

BEC completed an extensive topographic survey of the property and the area of the existing Landfill. There were several historical drawings that showed the reported extent of the Landfill which were prepared by the EPA as well as several consultants that worked on the Landfill property. These drawings were used to identify the general extent of the landfilling operations. To better define the Landfill and its boundaries, BEC and SITEC conducted an extensive test pitting program on the Landfill property to define the boundary of the waste. BEC excavated forty-four (44) test pits around the Site to determine the location of buried waste at the site and its limits. SITEC had a field engineer on site at all times to verify the test pit location as well as depth and materials identified in the test pit. This test pit program and field survey has been used to prepare the drawings included in this Corrective Action Design (Closure Plan) submittal.

3.3 Waste Location, Excavation and Relocation

Prior to performing waste excavation activities, erosion controls will be installed on down-gradient sides of the work area as shown on the Erosion Control Plan enclosed in PART E – DRAWINGS. Erosion controls will consist of haybales and siltation fencing. It is anticipated that the waste excavation activities will be conducted using a track-mounted excavator that will load the waste into dump trucks. Excavation and waste removal will be performed until the natural ground surface is encountered. Waste relocation activities will be conducted under the supervision of a qualified environmental Field Technician experienced in solid waste management issues, health and safety protocols and hazardous materials identification and response actions. Removal of waste located in wetland resource areas or their buffer zones shall be conducted in compliance with federal, state, and local requirements.

Excavated waste materials will be loaded into dump trucks and transported to the Landfill's operations area, where grading and shaping materials are to be placed at locations described herein. The material will be placed to provide appropriate grading of this area. The excavated materials will be placed directly into the area of the Landfill that is to be graded, spread, and thoroughly compacted by the bulldozer or waste compactor performing the landfill grading activities. All waste materials consolidated into the Landfill will be covered with approved daily cover materials at the end of each day's operations. Similarly, there will be no waste material left exposed within the excavation area. This area will be made secure at the end of each day by grading to eliminate steep slopes or embankments and with the application of cover material to prevent unsafe conditions.

Waste excavation activities will be conducted under the supervision of an Environmental Field Technician experienced in the identification and handling of hazardous materials and DEP listed waste ban items. During the excavation process, the Environmental Field Technician will examine (visually and with instrumentation) the excavated materials for the presence of restricted materials. Should suspect hazardous materials be identified, excavation within its vicinity will be suspended until proper investigation can be performed in accordance with the Hazardous Materials Management Plan (HMMP) included as Appendix B-3. Refer to the HMMP for a listing of suspect hazardous materials as well as other site conditions requiring the implementation of the HMMP.

The nature of the materials encountered will be carefully examined and a determination will be made as to whether handling by on-site personnel (with Level D Personnel protective equipment) is feasible without risk to the environment or personal health and safety. This determination will be made by the Project Coordinator in consultation with the Environmental Consultant (if necessary – refer to HMMP in Appendix B-3). Should it be determined that the material can be managed by on-site personnel, the material will be placed within a secure area or roll-off container for collection by a licensed hazardous waste management company, for proper disposal. Should the materials require special handling, the area where the material was encountered will be secured and appropriate notifications will be made. Refer to the HMMP for detailed descriptions of the notification and response actions to be implemented.

A complete listing of emergency response contacts with phone numbers has been developed and will be reviewed with all on-site workers prior to the start-up of this waste excavation project.

Additionally, site workers will also receive training on the site-specific Health And Safety Plan (HASP) included as Appendix B-4 of this CAD. This HASP identifies the potential hazards that may be encountered during this project along with the measures to be implemented for protection. The copy of the HASP will be maintained at the office trailer at the site entrance. An Emergency Response Contact Sheet with phone numbers and directions to the nearest hospital will be posted within the trailer adjacent to the telephone. Heavy equipment operators will have two-way radios at all times during the work to respond to emergency situations.

3.4 Confirmatory Soil Sampling and Analysis Plan

Following the excavation and relocation of waste from the perimeter buffer area and prior to backfilling the excavation, BEC will conduct a confirmatory sampling and analysis of the residual soils that remain in the excavation area, in order to confirm that no unacceptable levels of contamination remain in the excavated areas.

Residual soils will be characterized by laboratory analysis of composite samples that are collected in a manner that provides a representative sample of the remaining soils materials. Each soil sample sent for analysis will represent no more than 500 cubic yards of excavated and relocated material. Sampling will be conducted in accordance with Section 3.1 of the *Massachusetts Department of Environmental Protection's Standard References for Monitoring Wells (Standard References).* The method used will be selected in the field based upon conditions at that time and approved by the Project Coordinator in consultation with the Environmental Consultant (if necessary – refer to HMMP in Appendix B-3).

Each soil sample submitted for analysis will be a composite of at least five locations within the residuals soil area being characterized. The sampling locations will be selected and the surface of the remaining soils will be scraped to reveal material under the surface. A clean plastic or steel bucket will then be filled from each area using a hand trowel. A known volume of soil will be obtained from each bucket, emptied onto a mixing surface or into a separate clean bucket, and thoroughly mixed before being placed in sample jars. The exception will be volatile organic compounds (VOCs) or volatile petroleum hydrocarbons (VPH) samples which will be collected by a single grab sample and will not be agitated in a way that could cause volatilization. Saturated soils excavated below the groundwater table will be dewatered to the maximum extent practicable.

Each collected sample will have a completed sample label securely attached. In addition, the sample identification number will be marked on the container lid with a permanent marker so that the sample can be properly identified if the label is separated from the sample. The chain-of-custody program will be followed as outlined in Section 6.4-1 of the *Standard References*. Field data sheets, chain-of-custody forms and labels will be completed by field personnel at the time the samples are collected. Forms must be signed by the sampler and each person the samples are transferred to. Chain-of-custody forms will be provided by the analytical laboratory.

The confirmatory Soil Sampling and Analysis Plan is to be conducted to ensure that residual soils will meet the criteria of the Massachusetts Contingency Plan (MCP) of the applicable Method 1 Soil Category pursuant to 310 CMR 40.0975.

In order to determine whether soils will meet the applicable Method 1 Soil Category criteria, the soils will be analyzed for the following analytes.

- Volatile Petroleum Hydrocarbons - MA-VPH Method
- Extractable Petroleum Hydrocarbons - MA-EPH Method
- Poly-chlorinated Biphynels (PCBs) by EPA Method 8082
- 8 RCRA Metals

Results of the Soil Sampling and Analysis Plan shall be periodically reported to MassDEP. At a minimum a report of the findings of the confirmatory soil sampling activities will be made to MassDEP at the completion of waste excavation and relocation for each phase of site preparation work.

3.5 Odor Monitoring Plan

BEC has established an Odor Monitoring Plan as part of the Landfill Gas Response Plan, which is included in Appendix B-5 of this Engineering Report. BEC will be responsible for the implementation of this Odor Monitoring Program, which is summarized below:

- Monitoring wind speed and direction throughout the day.
- Conducting odor surveillance along the down-wind property line and within the surrounding area at a minimum of two times daily or with changes in wind direction or wind speed. Surveillance locations shall include Old Fall River Road, Energy Road and Hixville Road.
- Recording all surveillance data and implementing measures necessary to abate odor episodes should they occur. These abatement measures may include neutralizing agent application, operational changes such as reducing the size of the active excavation area or the temporary suspension of waste excavation and consolidation activities until conditions are more conducive. The Project Coordinator will maintain a written log of all surveillance activities. These records will be readily available for reference and review to determine if trends have developed and to ensure that appropriate follow-up actions have been implemented.
- Work will be conducted in accordance with MassDEP odor policies.

3.6 Waste Excavation Area Restoration

Upon completing each day's excavation activities, approved daily cover materials will be placed over all exposed waste areas. The daily cover material will be placed, graded and compacted so as to form a stable surface, resistant to erosion. Excavation areas into natural soils will be stabilized to resist erosion. As indicated on the Drawings, the excavated areas will be brought to grade/subgrade of the Landfill's perimeter facilities and will be located outside of the construction of the final cap. The area of remaining waste will be brought to design grades using approved materials and will be fully capped by the proposed design.

As shown on the Drawings, disturbed upland areas will be covered with the specified twelve inches (12") of vegetation support soils and will be seeded, consistent with the landfill sideslope cover. Wetland areas disturbed during the removal of solid waste and sediments will be restored to their

approximate original grade so as to preserve the hydrological functions, including flood protection and groundwater recharge. As shown on *Drawing R-1, Wetlands Replication Areas Plan*, granular fill will be used as backfill up to six inches below the final grade if greater depths of sediment excavation are required. Final grades will be achieved using six inches of topsoil or peat with a minimum of 10% organic matter. Once the final grades are established, the disturbed areas will be planted with highbush blueberry and wintrberry or other suitable wetland plant specied listed int eh Wetlands Protection Act. Also, the disturbed areas will receive an application of OBL Wetland Seed Mix ERNMX-151 or a similar mix. Utilization of this mix will result in a diverse plant community. The restored areas will be re-seeded as necessary to ensure that the area is fully stabilized and supporting vegetative growth. Disturbed wetland areas shall be restored according to MassDEP wetland restoration guidelines and the Superseding Order of Conditions that was issued by MassDEP on December 2, 2013, which is included in Appendix B-1

3.7 Perimeter Berm Construction

After waste excavation is completed in any particular construction phase, site preparation activities shall include the formation of an earthen perimeter containment berm to control stormwater runoff, the construction of a stormwater detention basin at the northwesterly corner of the landfill, and landfill surface grading and preparation activities. Construction sequence drawings that detail the phased construction of site preparation activities are enclosed in PART E – DRAWINGS.

The earthen containment berm is to be constructed of soils that may be excavated as part of landfill surface preparation activities or of soils that are transported to the site from off-site sources. The soils should be compactable to form a dense berm that will establish the actual limits of grading and shaping material placement and that will prevent the uncontrolled discharge of stormwater runoff from the disturbed landfill surface. The perimeter berm is to be formed at a minimum distance of ten feet (10') upgradient of the delineated and approved wetlands line and shall slope continuously to the northwesterly corner of the site where Stormwater Basin No. 2 is to be constructed.

4.0 LANDFILL GRADING MATERIALS ACCEPTANCE PLAN

4.1 Landfill Grading Material Types

MassDEP's *"Guidelines for Determining Closure Activities at Inactive Unlined Landfill Sites"* provides that a variety of materials can safely be used to (1) achieve proper grade for closure, (2) provide an adequate foundation layer for final cover materials, and (3) help defray the cost of landfill closure. The criteria established for the types of materials to be used for these closure activities are presented below:

1. Use of materials during closure shall not significantly add to the actual or potential public health, safety environmental concerns of the unlined inactive landfill site. Materials used during closure shall:
    a) be non-putrescible and not contain contaminants that are likely to leach in the landfill environment;

b) not significantly increase the concentration of contaminants in leachate or quantities of leachate released at the site;
c) not significantly increase the toxicity or quantities of landfill gas released; and,
d) not significantly increase nuisance conditions, such as noise, dust or odor, at the site.

2. Closure materials shall have, but not be limited to, the following characteristics:
   a) be granular and composed predominately of inorganic (mineral) materials to minimize settlement due to decomposition, gas generation, etc.;
   b) be easy to spread, compact to high density and not readily decompose over time;
   c) be well graded;
   d) a maximum size where no more that 10% of the material, by weight, exceeds 6 inches (nominal) in size with a maximum size of 12 inches an any dimension.
   e) have a gradation where 90% of the material is 6 inches (nominal) or less in size.

3. To reduce settlement issues and gas and leachate generation concerns, the organic content (determined by a loss of ignition test) of materials brought to the site during closure shall either be:
   a) less than 35% (by weight) on a material specific basis; or
   b) less than 35% of the combined weight of all materials brought to the site during closure, excluding the weight of final cover materials used for the cap.

4. All materials greater than 35% organic content shall be mixed with other materials to meet 3.b above, either prior to or during the actual placement of that material. An appropriate method to verify the organic content of materials brought to the site shall be a requirement for use of those materials.

MassDEP Final Guidance provides:

1. The following types of materials shall be used for closure activities. All other materials shall require specific DEP approval.
   a) clean soil;
   b) street sweepings;
   c) contaminated soil as defined by DEP Policy 97-001;
   d) approved grading and shaping materials, such as C&D fines and coal ash;
   e) dewatered catch basin cleanings from separate storm sewers;
   f) dewatered dredge spoils (see DEP Policy 94-007); and
   g) residuals from solid waste processing facilities or recycling operations.

2. The type and/or source of all materials used for closure activities shall be approved by the Department prior to use at the Landfill. Testing of materials (chemical, physical, etc.) may be required to determine whether it is suitable for the proposed closure application.

3. Unprocessed MSW, C&D or any other unprocessed wastes are not suitable for use during inactive unlined landfill closures.

4.2 Material Acceptance, Screening, Tracking and Placement

All providers of grading material will be required to sign an agreement prior to utilizing the facility. In doing so, these providers will be certifying that the material they deliver to the facility are consistent witht the acceptable shaping and grading material profile and they conform to the physical properties and/or chemical characteristics that may be reported on accompanying documentation or described when requesting approval to use the facility. In signing the agreement, the providers are also agreeing to comply with the regulations of the facility including the use of approved vehicle routes when going to and from the site. The facility will coordinate routes with trucking companies delivering materials to the Site.

4.2.1 Soils Handling Procedure

Upon arriving at the site all vehicles will be weighed on the truck scale at the site entrance. At that time, the scale attendant will record all pertinent information about the transporter and the materials delivered. This information will include the following:

- Date and Time of the delivery;
- Transporter information including company, phone number, driver's name, truck number or license plate and truck type;
- Gross vehicle weight; and tare weight when exiting the site;
- Material type and origin.
- Confirmation that the transporter is in possession of a Bill of Lading (BOL) or a Materials Shipping Record (MSR) documenting that materials have been tested and do not exceed contaminant limits set forth in DEP's Policy # COMM-97-001, *Reuse and Disposal of Contaminated Soil at Massachusetts Landfills.*

The driver will also be required to sign the information record attesting to the accuracy of the reported load content and to the fact that it does not contain hazardous waste or hazardous substances such as asbestos containing materials.

The scale attendant will visually check the contents of the load, if it is feasible to do so at that time, prior to directing the driver to proceed to the current working area on the Landfill. Should the attendant determine that unacceptable materials are observed or that the contents of the vehicle are not consistent with the declared material type, the vehicle will be rejected and not allowed to proceed. In the event of this occurrence, a discrepancy report will be prepared citing the nature of the problem and the action taken to prevent future occurrences. These actions include notifying the transportation company by phone or in writing of the discrepancy to facility policy and warning that a subsequent violation will result in suspension of facility privileges. These actions will also include the notification of appropriate authorities such as the Police Department, Fire Department and MassDEP, as appropriate.

Authorized vehicles will proceed to the active grading area following posted signs and directional arrows. Upon arriving at the active area, the driver will be directed by the spotter to the appropriate material placement area. The contents of the vehicle will be thoroughly inspected by the equipment

operators as it is being discharged. Should unacceptable materials be observed during the unloading process, they will be reloaded onto the transporter's vehicle for subsequent removal from the facility. If it is not possible to segregate the prohibited materials from the rest of the load, the entire load will be rejected and placed back on the truck for removal. In either case, a Waste Load Discrepancy Report will be completed and the previously mentioned follow-up actions will be performed in order to prevent future occurrences. This acceptance protocol is applicable to all materials accepted at this facility for grading and shaping of the Landfill's surface.

Once the inspection of the material is complete, the load will be spread in shallow lifts and compacted. Bulldozers and/or compactors specifically designed for these operations will conduct this grading and compaction. Compaction will be conducted by multiple passes of the heavy equipment until the material is consolidated into a stable mass with minimal voids. These operations will continue until the final grades presented on the Closure Plans are attained. These placement operations are intended to begin within the Final Closure Construction Area, as indicated on the Drawings in PART E - DRAWINGS of this CAD.

4.2.2 C&D Fines and Residuals Handling Procedure

BEC is proposing to conduct the grading and shaping operations of the Landfill by including fines and residuals from Construction & Demolition (C&D) processing operations. The use of this additional materials source stream will help BEC complete the Landfill closure process in a timely manner. The C&D fines and residuals will be blended with other approved materials, primarily soils. BEC is proposing to mix the materials at a ratio of two parts soil to one part C&D materials (2:1), by volume. This ratio does not include additional soils that will be used for cover material. The 2:1 ratio has proven, by field testing and assessment, to provide a conservative protocol for mitigating the potential for producing odors. Odors can occur when the sulfates in gypsum, a component of wallboards, react in the environment so as to produce odorous hydrogen sulfide gas.

BEC is going to control the acceptance of C&D fines and residuals by establishing agreements with C&D processors who produce these materials and need to dispose them. These agreements will require the processors to demonstrate that they have established and that they conduct a Gypsum Removal Plan. The purpose of a Gypsum Removal Plan is to reduce, to the extent practicable, the amount of gypsum in the C&D materials, in order to reduce potential odor generation. In addition the agreements will require the processors to composite sample and analyze the fines and residuals for sulfate content, on a monthly basis. BEC will use the analytical results to comparatively track the general quantity of sulfates that are incorporated into the landfill.

The fines and residual materials produced by processing operations will be delivered to the site in roll off or other closed containers, unmixed with other materials. The roll-off containers will cross the scales and their weights will be recorded. A separate log for these materials will be maintained for record and reporting purposes. These volume records, along with the sulfate analysis reporting will provide a mechanism to track the volume of sulfates that are deposited into the Landfill. These materials will then be delivered to the Landfill in an area specifically designated for the handling and filling of C&D materials

The blending of the soils with fines/residuals will occur as the materials are placed into the Landfill. The blending will be performed by using heavy equipment. Either of two methods may be used to measure the materials to the established ratio. The first method will be to create a mixing pile from separate stockpiles of fines/residuals and soils. The ratio will be achieved by creating the mixing pile by taking the established ratio of front end loader bucket loads from each of the piles. (e.g. one bucket full of fines/residuals to two bucket fulls of soil to achieve a 2:1 ratio.) BEC may initially try to blend the mix pile materials by feeding them through a trommel device that does not have a screen, but rather a solid body. This will provide a thorough blending of the materials with a single step that will allow a near continuous operation, without having to work in batches. As an alternative to the trommel, a batch mixing process can be used that will initially consist of turning the pile with the front end loader, spreading the pile out and then harrowing the pile to achieve a blend of materials.

Another method of proportioning the materials will be to spread measured layers of the materials at the established ratio. (e.g. a two foot thick layer of soil covered by a one foot layer of fines/residuals, to achieve a 2:1 ratio.) The layered soils and fines/residuals will again be blended by either feeding the measured materials through a trommel or by turning the pile with the front end loader, spreading the pile out and then harrowing the pile to achieve a blend of materials. The blended materials will then be placed into the Landfill and thoroughly compacted. BEC will maintain a stockpile of soil on the Landfill's footprint to ensure enough soil is available for daily use in the blending process.

4.3 Construction Period Impact Controls

4.3.1 Dust Control

The Facility will implement measures necessary to prevent impacts associated with wind blown dust generated from the placement of grading and shaping materials as well as landfill capping materials. The Facility will conduct routine evaluations of dust control program by performing inspections within the adjacent areas along Old Fall River Road, Hixville Road and Energy Road.

The dust control measures to be implemented during grading and shaping and closure construction include:

- Maintaining all internal access roads in good condition with stable surface materials that resist the propagation of dust,
- The application of calcium chloride to access roads to prevent dust conditions;
- The use of a water truck on the project so that access roads can be sprinkled to prevent dust conditions; the water truck will also be equipped with a hose attachment so that grading and shaping materials can be sprinkled as they are being unloaded, spread and compacted;
- Dispatching of a street sweeper to the paved areas within the site and along the adjacent streets to prevent off-site dust;
- Coordinating the locations at which grading and shaping material placement occurs so that more remote areas can be worked during periods of higher wind.

4.3.2 Litter Control

Due to the nature of the materials to be accepted at this site for grading and shaping, wind blown litter is not anticipated to be a significant issue. The Facility will, however, dispatch personnel as needed to patrol adjacent streets and properties for fugitive litter. The Project Coordinator will be responsible for determining if cleanup actions are needed and for assigning personnel.

4.3.3 Noise Control

The Facility will implement measures to minimize noise impacts during the project. The measures include:

- Maintaining internal access roads in good condition to reduce truck body noise;
- Minimizing truck and heavy equipment idling in proximity to the adjacent property areas;
- Maintaining strict adherence to the approved hours of operation;
- Communicating frequently with all site employees reminding them to be aware of noise issues at the facility and their possible detrimental impacts to the adjacent areas.

4.3.4 Odor Control

The Facility will implement measures necessary for the control of odors during the placement of grading and shaping materials, during the waste excavation and consolidation activities and during final cap construction. These measures include, but are not necessarily limited to the following:

- The temporary suspension of waste excavation activities during periods of excessively hot weather or other weather conditions when odor episodes are identified to be occurring;
- The liberal application of odor neutralizing agents during the waste excavation activities and during the unloading of grading and shaping materials;
- The rapid covering of particularly odiferous loads of materials either excavated from on-site or delivered to the facility for grading and shaping. These materials will be covered with non-odorous materials.

4.3.5 Traffic Mitigation Plan

The Facility will implement a Traffic Mitigation Plan that will reduce impacts to the vicinity, resulting from truck traffic generated by the closure activities of the Landfill. Because there should be no peak demands on the facility, the average and peak hour trip rate for the facility will be about 14 truck trips per hour for an average eight hour day. Even if unmitigated, this increase is not significant, especially when taken into context that this is a temporary traffic generation source, which will cease upon final closure of the Landfill.

The Facility will coordinate routes and schedules with trucking companies delivering materials to the site, particularly on large soil jobs, to balance truck route trip rates. Traffic delivering closure materials to the Landfill can be controlled by prior notice to the entities that are shipping the materials to the Facility. Each source of materials that are shipped to the Facility requires prior

approval by BEC. In that approval the operators will be assign the traffic route to the Facility. A majority of the trucks delivering materials to the Facility will be directly controlled by BEC. Others will be contracted or will be independent users of the site who will be directed by BEC, under penalty of suspension or termination of the privilege to use the site, on the routing, the speed, noise generation and other driving practices that may impact neighborhood traffic and abutters on the travel route.

BEC will post signs at the site entrance and other locations, directing the truck drivers to obey all posted speed limits, not to use "Jake Brakes", always use the wheel wash station when leaving the site and to keep to the assigned travel route. Drivers will be advised that BEC has a zero tolerance policy toward violations of its posted rules. BEC will investigate any valid complaints from residents and, if they are justified, will suspend or terminate the offender's privilege to use the Facility.

The Figure titled Truck Traffic Routing, included in PART E Drawings, indicates the primary truck route for accessing the site. Trucks will be directed to use Massachusetts Route 140 (Rt. 140). The trucks will exit Rt. 140 at Exit 4 in New Bedford. North bound trucks will take a right at the bottom of the exit ramp onto Kings Highway and then take a right onto Mount Pleasant Street. South bound trucks on Rt. 140 will take a right directly onto Mount Pleasant Street. The trucks will then merge and travel west on New Plainville Road for approximately two miles where New Plainville Road intersects with Old Plainville Road. Trucks will then travel west on Old Plainville Road for approximately 0.25 miles where Old Plainville Road becomes Old Fall River Road at the Dartmouth Town Line. Trucks will then travel west on Old Fall River Road for approximately two miles, crossing Faunce Corner Road, and will then turn left onto the Site. While the above described route will be the primary haul route to the Facility, emergency alternative routes with very good access exist, notably Exit 11 (Reed Road) and Exit 12 (Faunce Corner Road) off of Interstate 195. These emergency alternative routes will only be allowed for use if the primary route is detoured or otherwise obstructed. Trucks using these emergency alternative routes, without BEC approval, will be treated as having violated the Facility's Traffic Mitigation Plan and the privilege to use the Facility will be suspended or terminated.

5.0 LANDFILL GAS MANAGEMENT SYSTEM

The management of gas generated within the Old Fall River Road Landfill will be provided by the installation of passive landfill gas vents. The layout of the Landfill's gas system and installation details are presented on the drawings included in PART E - DRAWINGS of this submission. The components of the gas system are described below.

The proposed system is a passive type of gas vent system, by which removal of the gas from the Landfill is caused by the internal pressure of the gases within the Landfill. If an active collection and treatment system is ever determined to be required, the proposed gas vent system could be manifolded to a vacuum blower and treated at a single location. The determination of the need for an active gas collection and treatment system will be determined by the Comprehensive Site Assessment, and if needed the Corrective Action Alternative Analysis, requirements of the regulations.

Gas Vent Wells

The radius of influence exerted by a passive landfill gas vent is the lateral distance from which the gas generated will be drawn into the well as a result of pressure exerted by the gas within the Landfill. To efficiently and effectively collect gases generated within the Landfill several vents, appropriately located, shall be installed. An estimated radius of influence of one hundred horizontal feet (100') was utilized for the design of the gas management system. The radii of influence for the gas vents overlap to provide adequate venting capability over the Landfill's area.

The passive landfill gas vents have been designed to be constructed with a minimum diameter of three feet (3'). To construct each vent, a 3' minimum diameter excavation shall be made at a total depth of five feet (5') below the final closure system subgrade at the locations shown on the enclosed drawing in PART E – DRAWINGS. Once the excavation is completed, the gas vent piping will be installed and will consist of the following:

- A four-inch diameter vertical perforated PVC vent screen pipe, provided with a bottom end cap, joined to a four-inch solid PVC riser pipe to be installed to the bottom of the excavation;
- Minimum two-inch washed stone placed around the vent screens (vertical and horizontal) ensuring that a minimum diameter of 3' of washed stone is placed around all piping. Stone shall be installed to a minimum of one-foot above the top of the vertical vent screen.

The top of the four-inch diameter solid PVC riser will extend approximately 3' above the final cover of the Landfill's surface and will terminate in a "candy cane" outlet, with an insect screen.

Landfill Gas Response Plan

BEC's consultant, SITEC has prepared a *Landfill Gas Response Plan* as part of this CAD application as required by MassDEP for approval of the final closure construction of the Landfill. The Landfill Gas Response Plan is being submitted by BEC as part of the CAD in order to allow the reuse of processed C&D fines and residual material (fines/residuals) for a portion of the grading and shaping fill, as part of the Old Fall River Road Landfill Closure project. This Plan has been developed in accordance with MassDEP's September 2007, *Control of Odorous Gas at Massachusetts Landfills* policy and is attached as Appendix B-5.

6.0 STORMWATER MANAGEMENT PLAN

Existing Conditions

As shown on the enclosed drawings, the limit of existing waste associated with the former Old Fall River Road Landfill as determined through a test pit plan conducted in September 2012, consists of two separate areas. The larger of the two areas is located on the northerly side of the Algonquin Gas pipeline easement and is approximately 22.5 acres in area. The second area is an isolated landfilled area on the southerly side of the Algonquin Gas pipeline easement and is approximately 2.5 acres in area. Both landfill areas are uncapped and significant portions of these areas are situated within the 100-foot buffer zone associated with adjacent Bordering Vegetated Wetland (BVW).

Under existing conditions, stormwater runoff from both landfilled areas generally flows, untreated, in a westerly direction toward the surrounding BVW. The existing landfill surface consists of a pasture / grassland with a fair stand of vegetation.

Proposed Conditions

BEC has prepared a Stormwater Management Plan (Plan) that is intended to provide a comprehensive means to properly control stormwater runoff generated across the site. The Plan is intended to provide a stormwater system that will control both the quantity and quality of runoff that is discharged from the site to the environment to mitigate potential impacts from that discharge. An analysis has been performed for three (3) scenarios during the operational closure period in order to evaluate the ability of the earthen perimeter berm to contain the runoff from the 100-year rainfall event. As demonstrated by the drainage calculations enclosed in *PART B, Appendix B-6 – Stormwater Management System and Drainage Report*, the earthen berm has the capability of fully containing stormwater runoff from the Landfill for all major rainfall events. Minor grading will be required within the landfill to create storage capacity. The proposed grading and perimeter berm locations are shown on the enclosed Site Preparation Plan and Final Closure Construction Sequence Plan in PART E – DRAWINGS.

In addition, drainage calculations have been prepared to analyze stormwater runoff generated from all storm events for the final Landfill post-closure conditions. The proposed post-closure conditions, as presented in this CAD are represented by the anticipated build out of the site by landfilling approved materials to attain proposed final elevations. This will be achieved by filling the area of the consolidated Landfill to a maximum slope of 3:1 and a minimum slope of five percent (5%) on the upper plateau area, to reach a maximum elevation of 134 feet. The filled area will be capped and be constructed with plateau and sideslope drainage controls for diverting run off to the control facilities constructed under the CAD. These conditions are generally presented on the drawing titled *Final Design Grading Plan* included in PART E- DRAWINGS of this CAD. A report enclosed in *PART B, Appendix B-6 – Stormwater Management System and Drainage Report*, summarizes the proposed stormwater management system proposed for the final closure of the Old Fall River Road Landfill and the system's applicability to the MassDEP stormwater management standards, including required water quality volume to be treated by the facilities and the mitigation of peak runoff flows from existing conditions to proposed post-closure conditions. In addition, drainage calculations for existing conditions and post-closure conditions are enclosed in PART B, Appendix B-6.

7.0 THE SUBGRADE LAYER AND SUBGRADE PREPARATIONS

After the Landfill has reached its approved subgrade elevations, it will require minor grading and shaping prior to placing the cap. Grading will be established across the Landfill area that will be capped, based on the approved plans and existing survey baseline information. Where appropriate, organic soils and other unsuitable materials will be removed and stockpiled for use as vegetative support soils. Upon completion of grading activities, the Landfill surface and the subgrade soils will be thoroughly compacted as required in Section 02200 - Earthwork included in PART D – TECHNICAL SPECIFICATIONS of this CAD. Should there be insufficient quantities of soil to

establish a uniform subgrade layer, additional soils materials will be brought in and applied to deficient areas. These subgrade materials may be soils conforming to *DEP's Policy # COMM-97-001, Reuse and Disposal of Contaminated Soil at Massachusetts Landfills*. These soils shall comply with the requirements of reuse levels for unlined landfills, as stated in that Policy. The passive landfill gas vents shown on the PART E - DRAWINGS will be installed prior to the completion of subgrade preparation.

8.0 THE LANDFILL GAS VENTING LAYER

The Landfill gas venting layer will consist of a sand material with a minimum permeability of 1 x 10^{-3} cm/sec. This layer will be placed to a uniform 6" thickness over the entire area to be capped for the purpose of providing a medium within which landfill gas will migrate to the passive ventilation system. This layer should prevent isolation or pockets of gas from building up and damaging the geomembrane cap. Frequency testing requirements for both permeability and grain-size are specified in the CQA Plan which is attached as PART C of this CAD. The gas venting layer will be "connected" so the accumulating gases flow to the gas vents for emission of built up gases to the atmosphere.

9.0 LOW PERMEABILITY LAYER

The final cap design includes the installation of a 40 mil textured High Density Polyethylene (HDPE) geomembrane as the low permeability layer. Technical Specifications for the geomembrane material and its installation are included in PART D of this CAD. The geomembrane shall be installed over the prepared landfill surface to the limits shown on the Drawings that are included in PART E. The geomembrane shall be firmly secured into an anchor trench that will be excavated around the perimeter of the Landfill closure area. The anchor trenches shall be backfilled and compacted with suitable soil material to fully secure the geomembrane sheets and the extrusion welds will be fully tested in accordance with the specifications.

The geomembrane material will be subject to extensive source testing by a third party testing laboratory as well as in-the-field destructive and non-destructive seam testing as detailed within the PART C - CONSTRUCTION QUALITY ASSURANCE PLAN and PART D - TECHNICAL SPECIFICATIONS of this CAD. Geomembrane installation and testing will be supervised and coordinated by the Certifying Engineer.

10.0 DRAINAGE LAYER

10.1 Drainage Layer Description

The final cover drainage layer will be comprised of a permeable layer of sand installed directly on the surface of the low permeability layer geomembrane. The purpose of the drainage layer is to:

- prevent excessive accumulation of water above the low permeability layer;
- provide a high permeability pathway through which drainage water which infiltrates through the vegetative support layer may flow; and

- function, in association with the vegetative layer, as a protective layer over the low permeability layer.

Accordingly, the materials used within the drainage layer will be high permeability sands.

10.2 Design Criteria for Drainage Layer

The drainage layer has been designed to comply with applicable regulatory design standards (310 CMR 19.112). The general regulatory design standards for the final cover drainage layer are:

- The layer must have sufficient thickness and hydraulic conductivity to drain the immediate and up-gradient areas of the final cover system.
- To protect the geomebrane from damage, the maximum grain size of the sand layer will be less than 3/8 inches.
- The layer must be composed of a soil material that is at least twelve (12) inches thick and has a designed minimum saturated hydraulic conductivity of 1.0×10^{-2} centimeters per second (cm/sec).

10.3 Analysis of Drainage Layer

The proposed final cover drainage layer was evaluated to assure it would provide sufficient capacity to manage water infiltrating through the overlying vegetation support layer. The evaluation included an estimation of the infiltration into the drainage layer. This estimate was made by SITEC using the HELP (Hydrologic Evaluation for Landfill Performance) model, based on weather data for Providence, Rhode Island. Results of the calculations are presented in Appendix B-2.

- The evaluation shows that the drainage layer has sufficient capacity to manage all infiltration provided the following conditions are satisfied:
- The drainage layer is approximately twelve (12) inches thick and its design minimum saturated hydraulic conductivity of 1.0×10^{-2} cm/sec.
- The vegetative support layer is a minimum of 12 inches thick on the side slopes and its saturated hydraulic conductivity is approximately 1.2×10^{-4} cm/sec.

11.0 VEGETATIVE SUPPORT LAYER

11.1 Vegetative Support Layer Description

Areas of the final cap that will not be part of surface access roads will be covered with vegetative support soils and will be seeded to establish a stable grass cover over these areas. The vegetative support layer will be comprised of a loamy soil capable of supporting native vegetation, free of large rocks, debris, stumps and any other unsuitable matter. The purpose of the vegetative support layer is to:

- provide an environment that will sustain a vegetative cover; and

- protect underlying layers of the final cover from the adverse effects of desiccation, extremes of temperature, including frost effects, and erosion.

11.2 Design Criteria for Vegetative Support Layer

The vegetative support layer has been designed to comply with applicable regulatory design standards (310 CMR 19.112). The general regulatory design standard for the vegetative support layer is that it must have a sufficient thickness and composition to support vegetation and to protect underlying layers from desiccation, extreme temperatures and erosion.

11.3 Analysis of Vegetative Support Layer

The vegetative support layer will be twelve (12) inches thick and when placed over the drainage layer will provide a layer of earthen materials 24" thick, above the low-permeability layer. Thus, the potential effects of temperature variations and the potential for erosion to expose the low-permeability layer are minimized.

The soils used to construct the vegetative support layer will be obtained from local sources and will have a minimum organic content of five percent (5%). Lime and/or fertilizers will be added to encourage the growth of vegetation. Since the design of the underlying drainage layer is based on soil hydraulic conductivity, the vegetative support layer will have a saturated hydraulic conductivity of approximately 1.2×10^{-4} centimeters per second.

The Landfill slopes shall be seeded upon completing the placement of the vegetative soil layer using the seed species and application rates stipulated in the specifications. Seeding will be done by either broadcast or hydroseed application methods between April 1 and May 31 or August 15 to October 15 unless otherwise approved.

12.0 CONSTRUCTION PLAN

12.1 General

The Landfill closure project will be phased. Final capping construction activities will be completed as portions of the Landfill areas achieve final closure elevations. This CAD submission details the phased final closure of the entire site. This work will proceed in accordance with the provisions of this plan and MassDEP approvals. MassDEP will be notified in writing prior to commencing closure construction activities. The following section describes the general conduct of the closure construction work and provides measures to be employed to mitigate any possible nuisance conditions that may arise due to site construction activities.

12.2 Sub-grade Preparation

The Final Closure Construction project includes preparing a subgrade for the final cover system and to construct the Landfill's gas venting system. A description of construction control measures which

will be implemented during the subgrade preparation, gas system installation and final cover construction are provided below.

Dust Suppression
While preparing the subgrade for the final cover system, dry materials have the potential to become airborne creating dust. This potential will be controlled by applying water to dry and dusty work areas on an as needed basis. If dust control by the application of water is unsuccessful, the excavation or movement of material will stop so the dust can be controlled, or may be delayed until weather or site conditions are conducive to resuming the work.

Odor Control
The subgrade preparation and gas system work has the potential to generate odors. A sufficient supply of lime or other odor control agents will be maintained at the project site to manage odors, should they occur. If odors develop, the odor control agents will be applied, as necessary, to neutralize odors at the active excavation area. In addition, soil may be used to cover odorous waste. At the end of each work day, exposed waste will be covered to control potential odors.

Erosion Controls
The intermediate cover soils will be maintained prior to the placement of the sub-grade/gas venting layer to minimize erosion. Erosion control methods, including silt fencing and hay bales, have been installed around the entire perimeter of the Landfill. These measures will be maintained throughout the operating and closure construction activities at the site.

Run-off Controls
Run-off control structures will be constructed as part of the subgrade preparation. Swales will direct run-off away from the construction area to the stormwater sedimentation basins. Any sediment captured in the these basins will be removed on an as-needed basis.

12.3 Final Cover Construction

Once the subgrade is prepared, as shown on the design drawings, the construction of the final cover system will begin. This work will include the following elements:

1. Gas wells and vent trenches will be drilled or dug into the Landfill, as specified.

2. A six (6) inch thick sub-grade/gas venting layer, comprised of permeable sands, will be placed over the entire area where the final cover system will be placed.

3. An HDPE geomembrane will be placed on the prepared surface of the subgrade/gas-venting layer. The geomembrane will be deployed from the top of slopes and will be appropriately ballasted with sand bags. The geomembrane will be oriented parallel to the line of the slope. The geomembrane will be secured in an anchor trench at the top of the Landfill and along its perimeter.

4. A drainage layer, at least twelve (12) inch thick, will be placed over the surface of the geomembrane. This material will, typically, be spread from the bottom of the slope, up-hill toward the top of the slope. In limited areas, it may be necessary to work from the top towards the bottom.

5. A vegetation-support layer, at least twelve (12) inch thick of at least 5% organic content soils, will be placed above the drainage layer. This material will, typically, be spread from the bottom of the slope, up-hill toward the top of the slope. Final seeding of the completed slopes will be performed prior to October 15th each year to ensure adequate time for seed germination and establishment of vegetative cover.

6. Earthen diversion berms and stone-lined run-off channels will be constructed on the final cover system. The diversion berms will be constructed of compacted earthen soils used in the vegetation-support layer. The stone-lined channels will be constructed on a channel subgrade above the geomembrane.

The above summary of work is intended to provide a general description of the final cover construction. PART C - CONSTRUCTION QUALITY ASSURANCE PLAN and PART D - TECHNICAL SPECIFICATIONS, which provide more detailed requirements for the construction work, are included as components of this Corrective Action Design submission.

13.0 CLOSURE/POST-CLOSURE ENVIRONMENTAL MONITORING

13.1 Site Monitoring

During the closure and subsequent initial post-closure period, bi-monthly, or every other month, inspections are proposed to be conducted to determine the adequacy and status of erosion controls, settlement of critical areas, site drainage, gas venting, groundwater monitoring wells and vector control. Reports will be forwarded to MassDEP and the Dartmouth Board of Health during the closure and post-closure periods describing any maintenance activity at the Landfill. A copy of an inspection form is included in Appendix B-7. This form will be utilized for the closure period and modified for the post-closure period inspections and any additional comments will be attached to the forms. At some future point in time, presumably by the fifth year after final closure, approval will be requested from MassDEP to conduct inspections on a semi-annual basis.

13.2 Groundwater and Surface Water Monitoring

An Initial Site Assessment and a Comprehensive Site Assessment Scope of Work (ISA/CSA-SOW) has been prepared in accordance with MassDEP Guidance and submitted to MassDEP for approval.

Following MassDEP's approval of the ISA/CSA-SOW Report, the site assessment work will be conducted. Groundwater and surface water will be sampled for four quarters, by techniques consistent with the approved ISA/CSA-SOW and DEP's *Standard References for Monitoring Wells*. Samples will be field screened for pH, temperature, dissolved oxygen and conductivity. In accordance with the Solid Waste Management Regulations at 310 CMR 19.132(1)(h)1-3, samples

will be sent to a laboratory certified by the Commonwealth of Massachusetts for the analysis of the parameters required by the regulations. Soil gas monitoring wells will be field screened in accordance with the approved CSA-SOW.

Initial results from two sampling events of the CSA will be presented in a Draft CSA Report. Comments received from MassDEP and results of the final two rounds of sampling will be incorporated into the Final CSA Report. The Final CSA Report will include a risk characterization of the site and recommendations for the need of any further assessment.

As monitoring continues during the post-closure period, the data may indicate that changes to the monitoring program, either a reduction or an increase, is warranted for either; 1) the number of groundwater wells or surface water locations sampled; 2) the number of parameters analyzed; or 3) the frequency of sampling. Any change in the monitoring program will require the approval of MassDEP. It is anticipated that the Environmental Monitoring Program will be reevaluated after the fifth year of final closure.

During sampling and monitoring activities, groundwater monitoring wells and gas monitoring wells will be inspected to ensure that the seal around the well and the well itself is secure. Wells will be repaired or replaced, as required to conform to the MassDEP's *Standard References for Monitoring Wells* and to provide proper monitoring facilities. Static groundwater elevations and total well depth from each well will be recorded prior to collecting groundwater samples. Groundwater and gas monitoring wells will be maintained as required in accordance with 310 CMR 19.118(2) and 310 CMR 19.133. All sampling and analysis protocols will be consistent with MassDEP requirements.

13.3 Landfill Gas Monitoring

In accordance with MassDEP's approval of the ISA/CSA-SOW, the installation and screening of a soil gas monitoring well system will be conducted, as part of the CSA program. Depending on the results of the soil gas monitoring work, additional gas wells may be installed, if it appears that landfill gas is migrating off site.

Following completion of the CSA work soil gas will continue to be monitored on a quarterly schedule. Design modification of the passive gas venting system may be warranted if the concentration of explosive gases is consistently measured to be greater than 25% of the Lower Explosive Limit (LEL) or methane exceeds 1.25% (equivalent to 25% LEL) at the property line. In addition, an oxygen meter, hydrogen sulfide meter and a photoionization detector will be used to determine the possible presence of other landfill gases or volatile organic compounds (VOCs). The landfill gas venting system and gas monitoring wells will be monitored and maintained during post-closure to determine the gas control system's effectiveness in preventing concentration levels of explosive and malodorous gases and other pollutants which may exceed air quality standards, and in turn cause nuisance conditions or explosive conditions, as outlined in 310 CMR 19.117, 310 CMR 19.118(4) and 310 CMR 19.133.

14.0 CONCEPTUAL POST-CLOSURE USE PLAN

14.1 Alternative Post-Closure Uses

A number of post-closure uses have been considered for the Old Fall River Road Landfill. Categorical uses have included passive recreation, active recreation, solid waste composting and solar power generation. The following is a summary of the potential post-closure uses that have been considered.

Passive Recreational Uses
This use typically includes the establishment of walking trails and park areas for unorganized recreation such as dog walking or frisbee playing. Capital and maintenance costs for this alternative are relatively low. Parking areas would have to be established and mitigation of odors from the gas vents may have to be conducted.

Active Recreational Uses
This use typically includes the development of some organized athletic facility, such as baseball, soccer or football fields or a mountain bicycle (BMX) recreation, training and competition facility. Capital and maintenance costs will be greater than for passive recreational uses. Additional measures will have to be taken to protect the Landfill's cap because of the more intensive use of the site, relative to passive recreational uses. Also more parking will be required than for passive recreational uses and mitigation of odors from the gas vents may still have to be conducted.

Solid Waste Composting Uses
This use would be to develop a leaf composting operation to the top plateau of the Landfill. Capital and maintenance costs for this alternative are relatively low. The area where these activities are conducted would be supplemented with a thicker cap and a wearing surface of processed asphalt, brick or concrete would have to be installed. An access road would also be required to handle potentially more intense traffic use on the landfill than with the recreational use alternatives. Depending on actual conditions at the locations of user and employee exposure, mitigation of odors from the gas vents may have to be conducted.

Solar Panel Power Generation
This use would be the construction of an electric generating solar power panel array, on top of the Landfill. This alternative will be the most expensive because of the potential high cost of site development for the array and capital costs for the array and electrical transmission equipment. However, this alternative offers the potential benefit of renewable electricity generation. With the potential for selling the power to individual off site users or to the local power grid system, this alternative offers the potential means of generating revenue along with reducing power demand from non-renewable sources.

14.2 Proposed Post-Closure Use

The proposed post-closure use for the site is to be determined at a later time. When an appropriate post-closure use has been selected a BWP SW36 Major Post-Closure Use or a BWP SW37 Minor Post-Closure Use will be submitted to MassDEP, for approval.

15.0 CLOSURE/POST-CLOSURE COST ESTIMATES

15.1 Cost Estimates

Old Fall River Road Landfill closure and post-closure cost estimates were developed and included in the approved Conceptual Closure Proposal at Attachment 6. Attachment 6 provides a summary of the costs associated with all closure construction requirements and post-closure maintenance of the Landfill site as well as environmental monitoring and reporting for the 30 year Post-Closure Period.

The funding of these closure/post-closure costs is underwritten by the revenue generated by the acceptance of approved materials, for shaping and grading the Landfill, in accordance with MassDEP's Unlined Landfill Policy.

15.2 Financial Assurance Mechanism

In accordance with 310 CMR 19.051 and paragraphs 55 and 56 of the ACO, BEC will provide MassDEP with documentation that a Financial Assurance Mechanism (FAM) is established for the implementation and completion of the Landfill's closure plan and post-closure maintenance and monitoring in the amount of approximately $5,600,000. The Financial Assurance Mechanism for the post-closure maintenance and monitoring portion will, per paragraph 56 of the ACO, consist of an account to be funded in the amount of $816,450 through a portion of the proceeds from the delivery and use of the approved shaping and grading material.