TOWN OF BOURNE, MA
DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

SINGLE SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT

INTEGRATED SOLID WASTE MANAGEMENT FACILITY

201 MACARTHUR BOULEVARD BOURNE, MA 02532

EOEA# 11333

NOVEMBER 13, 2020


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AERIAL PHOTOGRAPHY TAKEN ON DECEMBER 24, 2019

Town of Bourne, MA
Department of Integrated Solid Waste Management
Single Supplemental Environmental Impact Report

Integrated Solid Waste Management Facility
201 MacArthur Boulevard
Bourne, MA 02532

EOEA # 11333

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DISTRIBUTION LIST

The distribution list consists of a merger of previous distribution lists from the original EIR and a subsequent SSEIR and NPCs as well as the certified abutters list and those that have requested copies of submittals during those processes. Note that as allowed by MEPA, at a minimum, the recipients will receive a cover letter and/or an e-mail with instructions on how to download the SSEIR submittal from the Town's website. Hardcopies will be available upon request.

The time span involved is over a period of twenty-two years and every effort has been made to update contacts at state and local agencies, companies (including those taken over by acquisition), organizations, individuals and the local legislative delegation. In some cases, no new information could be obtained after a mailing came back as "return to sender." However, when there was doubt about including a recipient that may be out of date or duplicative, we have erred on the side of inclusion and a copy was sent.

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SECTION 1.0 INTRODUCTION

(1) In February 2020, the Town of Bourne, Department of Integrated Solid Waste Management (ISWM) submitted an Expanded Notice of Project Change (ENPC) relative to the Bourne Integrated Solid Waste Management Facility located at 201 MacArthur Boulevard, (Route 28) Bourne, MA 02532. After consultation with MEPA staff, it was the intention of ISWM that the ENPC act as, in effect, an Expanded Environmental Notification Form (EENF) for the buildout of the ISWM site. The ENPC provided substantial details about the existing facility and the proposed Full Buildout development of the site. The overall site development plan had previously been submitted in a November 2017 ENPC and in a Single Supplemental Environmental Impact Report (SSEIR) dated May 2018, which committed ISWM to expound on the details of the further development of the site.

(2) The 2020 ENPC provided an updated site development buildout plan for the overall site including a conceptual design for the proposed development of Phase 7, Phase 8 and Phase 9 landfill expansions and relocation of the Large Handling Facility that includes a C&D Transfer Station, a Residential Recycling Center and a Single Stream Recyclables Transfer Station, which will result in the full utilization of the site's acreage, including land that has been acquired since 2001, which now totals approximately 111 acres. It also provided a broad overview of the various solid waste handling operations that are conducted at the site.

(3) In response to the submittal of the ENPC, the Secretary issued a Certificate for the ENPC on April 24, 2020, that requires the preparation of a SSEIR in lieu of Draft and Final Environmental Impact Reports. This Certificate provided a Scope for the SSEIR which is the subject of this submittal. A copy of the Certificate is included in Attachment 1 along with copies of comment letters that were received during the comment period for the ENPC and an indexed tabulation of the substantive comments along with references to the location of the responses in this SSEIR by section and paragraph number.

(4) This SSEIR has been prepared in compliance with Section 11.07 of the Massachusetts Environmental Policy Act (MEPA) regulations and provides the comprehensive information requested in the Scope section of the Certificate for the ENPC and addresses the issues that were presented in the comment letters.

SECTION 2.0 PROJECT DESCRIPTION

As noted, the purpose of the submittal of the ENPC was to define what is intended to be the final, full buildout of the site's solid waste management facilities and operations, as currently envisioned. Therefore, a description of the full buildout components, to the extent that they are now envisioned are the targeted focus of this SSEIR.

2.1 BACKGROUND

(1) The Town of Bourne, Department of Integrated Solid Waste Management (ISWM) operates as an enterprise fund for the Town of Bourne. It was created in 1998 and oversees all planning, permitting, construction and operation of the solid waste management facilities located at 201 MacArthur Boulevard, including all ancillary structures and equipment.

(2) Currently, the facility has several operations including:

- a modern double-lined landfill, with leak detection, that accepts predominantly municipal waste combustor ash from Covanta SEMASS located in Rochester, MA
- a landfill gas collection system and flare for thermal destruction of landfill gas generated at the Bourne Landfill
- a leachate load-out system for off-site management of landfill leachate generated at the Bourne Landfill
- a residential recycling center that accepts materials from neighboring communities
- a construction and demolition debris transfer station
- a single stream recyclables transfer station, open to commercial haulers
- a compost site, including yard waste and brush
- an area for asphalt, brick and concrete recycling

(3) Bourne has invested significant resources to modernize the entire facility which began operations in 1967 and has fulfilled the intent as described in the original FEIR to build a multi-faceted facility that would serve a regional need. Attachment 2 contains aerial photographs from 1999 and 2019 that demonstrate the dramatic changes that have been made. This mission will continue even after the last phase of the landfill is constructed and closed as there will be handling and transfer operations on site.

(4) Since 1998, ISWM has been operated as an Enterprise Fund, separate from the Town of Bourne's General Fund which is funded primarily by the real estate tax

levy. The ISWM Enterprise Fund, which is regulated by the MA Department of Revenue (DOR), primarily derives revenue from gate receipts for its various operations, however, the landfill operation comprises the vast majority of revenue. All operations, debt service, insurance and closure and post-closure accounts are paid by the Enterprise Fund. In addition, as approved by DOR, ISWM Department pays for the curbside collection and management of municipal solid waste (MSW) and single-stream recyclables generated by Bourne residents that would otherwise have been paid for out of the Town General Fund. ISWM also pays a per ton fee, known as the Host Community Fee, directly to the General Fund for each ton it manages at the site. The amount of the Host Community Fee is adjusted each year in accordance with the Boston Consumer Price Index. In total, the ISWM Enterprise Fund provides approximately $4,000,000 per year in value to the taxpayers of Bourne and as a result, ISWM's operations, and in particular the Landfill, have become an integral part of the annual budget to operate the Town.

(5) The previous ENPC, submitted in November 2017, was related primarily to the development of the Phase 6 Landfill. After receiving approval from the MEPA office and the Cape Cod Commission (CCC), the Town submitted to Massachusetts Department of Environmental Protection (DEP) an application for an Authorization to Construct (ATC) Phase 6, which was approved. The DEP subsequently approved the Town's application for an Authorization-to-Operate (ATO) on January 17, 2020. Phase 6 was the next step in a sequence of landfilling that started with Phase 1, followed by Phase 2, Phase 3, Phase 2A/3A (valley fill), Phase 4 and Phase 5. Phase 6 is the last phase in a progressive filling plan first discussed in the 1998 EIR, which completed the horizontal expansion of landfill operations on the original 74-acre site.

(6) Since the development of the original EIR, the Town purchased two parcels that have facilitated maximum development of the landfill phases as discussed. In 2001, a 25-acre parcel immediately abutting the Landfill to the south was purchased. See Figure 1 – Locus Plan and Figure 2 – Existing Conditions Site Plan in Attachment 3. This site was site-assigned by the Bourne Board of Health (BOH) for solid waste handling and transfer operations and has allowed for the development of solid waste handling facilities and most recently, relocation of temporary offices. It was also the subject of an Advisory Opinion by the Secretary that indicated that a new EIR was not needed in order to develop this parcel for solid waste handling and transfer operations, but rather it should be viewed as an extension of the original EIR. Additionally, the Town purchased approximately twelve acres to the south of the 25-acre parcel in 2016. Subject to permitting, this area will allow for potential relocation of solid waste handling operations and construction of permanent offices so that Phase 7 and Phase 8 landfill expansions can be fully developed on the 25-acre site.

(7) The overall impact of these acquisitions is that the areas utilized for landfilling can be maximized while at the same time providing area for other solid waste handling facilities such as a C&D transfer station, single-stream recyclables transfer station, a residential recycling center (Large Handling Facility (LHF)) and ISWM offices. The full development of the site requires several steps. These

include: completing this MEPA process; receiving Development of Regional Impact (DRI) approval from the CCC; receiving BOH approval for major modifications to the existing site assignment, modifying the 25-acre handling operations site assignment to allow for landfilling and modifying the existing landfill site assignment to allow for the Phase 9 operations in that area, and receiving BOH approval for a new site assignment to allow for the proposed LHF on the 12-acre parcel and obtaining ATCs and ATOs from MA DEP for each component. See Figure 3, Schematic Site Buildout Plan in Attachment 3.

(8) The plans for the development of Phases 7, 8, 9 and the large handling facility have not significantly changed since the submittal of the ENPC in February 2020. The following sections will reiterate the plans for these facilities and operations as previously discussed and identify potential impacts.

2.2 RESPONSE TO MEPA SCOPE OF E.N.P.C. CERTIFICATE

The following narrative addresses the Scope in the order presented in the Secretary's April 24, 2020 Certificate to the ENPC. A copy of the Certificate is included in Attachment 1, along with the comment letters that were submitted to MEPA. The issues expressed in those comment letters, which are addressed in this SSEIR, have been assigned indexes, which are identified on the comment letter copies. Those indexes are listed on the Response To Comments table, also included in Attachment 1, which references individual comments and identifies response locations in this document by Section and paragraph number.

2.2.1 Project Description and Permitting

(1) The following Project Description is consistent with the description included in the ENPC, with minimal changes that respond to the comments that were received on it. In 2016, the Town acquired approximately twelve acres of undeveloped land, abutting the residential recycling center at the extreme southern boundary of the site. This acquisition has enabled the Town to contemplate a site development plan whereby offices, maintenance and handling facilities would be relocated to that new parcel. By doing this, Phase 7 and Phase 8 could be developed on the 25-acre parcel thereby extending the life of the landfill operations. Currently the 25-parcel is site-assigned only for solid waste handling and is the location of the C&D transfer station, single stream recyclables transfer station, the residential recycling center and other facilities. In order to expand the Landfill into this area, the site assignment will need a major modification from the Bourne Board of Health. In addition, MA DEP commented in the ENPC that the Phase 9 vertical expansion requires a major modification to the Site Assignment. The site assignment process is contemplated to be undertaken in late 2020 after the MEPA process has been completed. Attachment 3 contains plans for the site master plan that show the phasing options for the landfill and a conceptual layout of relocated infrastructure on the 12-acre parcel. See Figures 4, 5, 6, and 7 in Attachment 3 for the site development plans.

(2) Furthermore, the a new site assignment will need to be obtained to allow solid waste handling operations on the 12-acre parcel where the LHF will be relocated. Prior to developing this parcel, the Town must mitigate Eastern Box Turtle habitat, a

species of Special Concern as designated by the Massachusetts Division of Fisheries and Wildlife (MA DFW) and its Natural Heritage and Endangered Species Program (NHESP) which will review plans prior to any removal of habitat. Attachment 4 contains a fact sheet on the Eastern Box Turtle. The Town is working in close coordination with NHESP to submit a Conservation and Management Permit that will address the affected areas on the 12-acre parcel and the 25-acre parcel as well. Phase 7, Phase 8, Phase 9 and surrounding areas outside of the delineated habitat line are exempt from further Massachusetts Endangered Species Act (MESA) review. A letter confirming this determination by NHESP is included in Attachment 4. Delineation of the habitat line is shown on the plans in Attachment 3.

(3) As previously discussed, in addition to the Phase 7 and Phase 8 horizontal expansions, the Town is proposing a vertical expansion, designated as Phase 9. The Town has developed plans for the maximum long-term site development master plan so that the Bourne community and regulators will understand the full potential of the Bourne Landfill to service the region with an active landfill. On August 12, 2019, these plans were shared in a public meeting that received wide-spread media coverage, in order to provide time for community response to the plan. A video recording of the meeting is on the ISWM website. After receiving positive feedback from the community, the Bourne Board of Selectmen voted on November 5, 2019, to pursue a full build-out site development plan which contemplates a 40-foot vertical expansion over the entire footprint of the currently permitted landfill. Attachment 5 contains a copy of the Certificate of Vote which records the vote by the Board supporting this course of development.

(4) Phase 9 will increase the maximum height of the Landfill from elevation 185’ mean sea level (MSL) to elevation 225’ MSL over previously lined and filled areas of the Landfill including Phases 2, 2A/3A, 3, 4, 5 and 6. By increasing the height of the Landfill over already constructed phases, in currently site-assigned areas and filling this area in conjunction with Phase 6, the Town can utilize the time that this capacity will provide to develop a detailed plan for how and when to relocate structures that will be replaced by Phase 7 and Phase 8, thereby maximizing the useful lifespan of the existing large handling facility assets which represent significant capital investments by the Town.

(5) Some of the technical issues associated with Phase 9 that will have to be resolved and approved by MA DEP include modifications to components of the existing landfill gas collection system that are within the Phase 9 overfill footprint. Additionally, Phase 9 will be constructed above portions of the landfill that will receive a long-term intermediate cover system versus a permanent cover system that will be constructed on outside slopes that have reached final design capacity. This will avoid capping an area that will then be disturbed again within a few years to accommodate new capacity. This approach has been previously utilized along the southern slope of Phase 3, Stage 3 which is now being incorporated into the currently operational Phase 6 landfill. A similar approach will be proposed for each successive southern slope as the phases move southward into Phase 7 and Phase 8. Once the final southern slope is reached, a final cover system will be constructed. ISWM has discussed this with MA DEP in-depth, recognizing that all environmental impacts must be addressed prior to final approval.

(6) The addition of a vertical expansion to elevation 225’ MSL for Phase 9 will also

have an effect on the overall landfill as expansions move southward by allowing for more capacity in Phase 7 and Phase 8 than had been previously contemplated because those phases will be constructed in a manner to match the elevation of Phase 9. The total volumes for Phase 7 and Phase 8 will be 3,920,000 cubic yards which could provide up to fourteen years of capacity.

(7) The Phase 9 vertical expansion alone will provide approximately 1,255,000 cubic yards of additional airspace which could extend the life of the landfill up to four and a half years. As noted earlier, by permitting and operating Phase 9 as the next area of landfill development after Phase 6, the Town will have additional time to create a schedule for the required permitting, financing and relocation of existing operations and site preparation for Phases 7 and 8, including excavating nearly 500,000 cubic yards of virgin soils.

(8) The combination of Phase 7, Phase 8 and Phase 9 will ensure that ISWM can continue to provide vitally needed landfill capacity to the region into the late 2030s or early 2040s, depending on which alternative operating scenario occurs, as described below. Attachment 6 includes a table summarizing the volumes for all current and future phases as contemplated under this master plan. Attachment 3 includes detailed plans showing the landfill phases as well as a conceptual layout for the relocated LHF on the 12-acre parcel. See Figures 4, 5, 6, and 7 in Attachment 3 for the site development plans.

(9) In addition to working with local government and elected leaders, ISWM will continue its close working relationship with the Southeast Regional office of MA DEP to ensure that the design of the new expansions, as well as the closure of completed phases, are engineered to the highest standards and meet or exceed all regulations. ISWM regularly seeks to meet with MA DEP, at least on an annual basis, to update the Department on its short term and long term plans. ISWM anticipates that there may be a series of meetings with MA DEP on the proposed site expansion applications, so as to best assure that all of the Department's questions and concerns are adequately addressed. ISWM and MA DEP Southeast Regional Office (SERO) Solid Waste Section personnel had a conference call on July 8, 2020, that focused on responses that are included in this SSEIR. Further discussions are anticipated.

(10) In accordance with previous discussions with MA DEP, there will be two separate site assignment applications, one for Major Modification of an Existing Site Assignment (BWP SW 38) and one for a new site assignment (BWP SW 01). The major modification to the site assignment for the Phase 7, Phase 8 and Phase 9 landfills will be included in one application. The LHF will be the subject of the second application for a new site assignment. Following receipt of MA DEP's positive Site Suitability Reports, the Bourne Board of Health will conduct public hearings in accordance with the requirements of the Site Assignment Regulations at 310 CMR 16.00.

(11) The projects will also require a Development of Regional Impact (DRI) Modification from the Cape Cod Commission (CCC). It is anticipated that there will be a single DRI application that will include all components of the project and

that it will be presented to the CCC at a single hearing for approval. ISWM has been in regular communication with CCC regarding this and previously proposed site development projects. The CCC staff has provided guidance to ISWM regarding the preparation of the DRI, which ISWM will rely on. *See Section 5.0, Cape Cod Commission Draft Development of Regional Impact* for a preliminary discussion of the proposed DRI Modification. The final, full DRI application will be submitted after the MEPA process is completed and will include updates from that process as needed.

(12) Separate ATC and ATO applications for each of the Phases 7, 8, 9 and the LHF projects will be submitted to the Southeast Regional Office of DEP and will comply with all design standards and regulations for solid waste handling facilities, including leachate collection, landfill gas management and stormwater management. Since the FEIR Certificate was issued in 1999, the Town has conducted extensive hydrogeological investigations and modeling, including particle tracking, for areas downgradient of the ISWM facility, in full cooperation with and to the satisfaction of MA DEP and the CCC, which required expanded groundwater monitoring for several years as part of its DRI approval process. An updated summary of groundwater quality and hydrogeologic conditions is presented in Sections 2.2.2, 2.2.8 and 3.0, below.

(13) In the face of dwindling disposal capacity in Massachusetts, the vulnerability of the day-to-day disposal network to even minor, temporary interruption at any of the operating facilities, becomes extremely problematic. Most disposal and some transfer facilities are currently operating at or near permitted capacity on a daily basis. When unanticipated upsets in capacity occur, haulers find themselves with nowhere to tip and the system backs up creating an emergency situation. Future situations that may precipitate the need for immediate emergency operating capacity include catastrophic failure at one of the regional solid waste management facilities resulting in a prolonged capacity shortfall or simple mechanical failure that can be rectified in a week, or even transportation systems such as rail and truck infrastructure. Another credible cause for the need of emergency landfill capacity is a natural or man-made disaster that creates a significant amount of waste material that is only suitably disposed by landfilling. Unlike waste-to-energy and rail transfer facilities, landfills have the ability to provide additional capacity almost immediately by temporarily extending operating hours and increasing daily tonnage limits.

(14) Under future emergency conditions on Cape Cod, it is anticipated that the Bourne Landfill will be asked to play a leading role in providing responses that will ensure that the public health and the environment are protected. Such an occasion occurred in 2007 when Bourne was asked to accept all of the MSW from Cape Cod municipalities after a fire disrupted operations at the SEMASS facility, which services Cape Cod communities.

(15) ISWM is requesting that, as part of the scope to be approved by the Secretary, MEPA waive its review process for such emergencies, including submittal of any

Notices of Project Change (NPC), defer to MA DEP for any technical oversight and pre-approve expanded operations as proposed below. While MEPA, at 301 CMR 11.13 Emergency Action, regulates filing requirements for after-the-fact emergency actions to imminent threats, ISWM is requesting pre-approval from MEPA to limit appropriate approvals for emergency operations from the applicable regulatory agencies. It is the intent of the Town to reduce emergency reaction time by making arrangements with other local permitting agencies such as MA DEP, the Bourne Board of Health and the Cape Cod Commission, to include similar waivers or pre-approvals in their review processes, for a limited time based on the past performance of ISWM and the updated capabilities it now has.

(16) It is proposed by the Town that in the event of an emergency, upon verbal or electronic notification only, ISWM be presumptively approved to operate any or all of its facilities 24 hours per day, with a total inbound tonnage not to exceed 1,500 tons in any 24-hour period, for a maximum of five (5) consecutive days, or 120 hours.

2.2.2 Solid Waste

(1) As noted above, upon completion of the MEPA process, a Major Modification of Existing Site Assignment (BWP SW 38) application and a New Site Assignment (BWP SW 01) application will be prepared. The first application will be for the landfill facilities, which is to revise the existing site assignment on the 25-acre parcel from a limitation to solid waste handling, to allow for landfilling as Phases 7 and 8. In addition, MA DEP has determined that a major modification is required for Phase 9. The ENPC included an extensive discussion of how the proposed facilities meet the Site Suitability Criteria, included in 310 CMR 16.40. That discussion is included and expounded upon, in response to comments received on the ENPC, in Section 3.0. ISWM does not intend to request any waivers from the Site Suitability Criteria.

(2) The existing landfill operations include leachate collection and storage facilities, landfill gas collection and treatment systems and an environmental monitoring system that is sampled and evaluated for impacts to groundwater and soil gas conditions in the vicinity of the Landfill. (See Figure 8 in Attachment 3 for a plan of the existing environmental monitoring system.) These systems will be expanded and maintained for the proposed expansions to the facilities. The leachate collection and storage systems include double composite liner system with primary and secondary leachate collection and monitoring capacity. The double composite liner system consists of 12 inches of low permeable soil, upon which multiple layers of geosynthetic liner materials are installed. These include primary and secondary geosynthetic clay liners (GCL) and 60-mil HDPE geomembranes, with an interstitial leak detection/drainage layer material that drains to a secondary sump and allows for the measurement of leachate that might leak through the primary liner system. On top of the primary geomembrane is a leachate collection system consisting of a network of pipes and 18-inches of drainage sand which allows for the collection and discharge of leachate to the primary leachate sump. There are pumps installed in both the

primary and secondary leachate sumps, which pump the collected leachate through a force main to one of two leachate storage tanks. The stored leachate is transferred to tanker trucks and hauled to licensed wastewater treatment plants for treatment and disposal. The leachate collection system will be expanded to Phase 7 by extending the existing Phase 6 leachate collection system. It is anticipated that Phase 8 will be designed and constructed with its own collection system and leachate sump. Phase 9 will be developed by removing any final or intermediate cover systems onto which it will be built, so that leachate will flow vertically into the existing landfill phases and collection system. See Figures 4, 5, 6, and 7 in Attachment 3 for the site development plans.

(3) The current landfill facilities include an existing, extensive gas collection and treatment system. These will be extended and modified as needed to expand the capacity for the collection of landfill gas. The system for the management of gas generated within the Landfill includes vertical extraction wells and horizontal gas collectors. There is an extensive network of piping to collect generated landfill gases and convey them to a flare station for treatment. The existing flare station is located to the northeast of the Phase 2 Landfill area and prevents the occurrence of odors and the off-site migration of landfill gas. The landfill gas collection system will be expanded by modifying the existing header system, by relocating portions of it to the perimeter sideslopes to prevent them from otherwise being buried by the Phase 9 vertical expansion. Existing gas extraction wells located within the proposed footprint of Phase 9 will be modified by converting the wells to having remote wellheads, also along the perimeter sideslopes. The Phase 7 and 8, as well as the Phase 9 overfill waste will have new extraction wells installed and operated in the same manner as the existing extraction wells. The existing flare treatment system was replaced a few years ago and is adequately sized for either alternative scenario for the proposed expansion.

(4) Potential impact from the landfill to the environment has been monitored for several decades by a groundwater and soil gas monitoring program. The monitoring program has consisted of quarterly sampling that began in the 1990s. This program has contributed to the development and approval of a Comprehensive Site Assessment for the site. The scope of the current monitoring program was established in MA DEP's approval of the CSA in 2017. ISWM anticipates that MA DEP approvals for Phases 7 and 8 will include the placement of additional groundwater and gas monitoring wells along their perimeter. See Figure 8, Existing Environmental Monitoring Systems in Attachment 3, which shows the existing and proposed monitoring system. In addition, ISWM acknowledges its responsibility to make notification to MA DEP regarding any identified release of oil or hazardous materials in accordance with Massachusetts Contingency Plan (MCP) requirements and to further modify its environmental monitoring program to characterize any potential release. ISWM will fully conform with MA DEP Asbestos Regulations (310 CMR 7.15) when demolishing any of its buildings during the site development work.

(5) Phase 9 will be a vertical expansion of landfilling over existing double composite lined landfill phases. Some of the phase areas have final cap installations that

will require the removal of those cap components, including geomembrane barriers. Other areas upon which Phase 9 will be developed (Phase 4, Stage 2 and Phase 5) are currently not capped, because they have just recently stopped operating, having reached their current approved final subgrades. The other portion of the Phase 9 overfill area will be constructed over the future plateau area of the active Phase 6 Landfill, when those approved grades are achieved. A slope stability analysis is being conducted , that will determine the effects that Phase 9 will have on settlement of the underlying, existing landfill areas. With the approval of Phase 9 (including the completion of MEPA review, site assignment modification and ATC/ATO approval) ISWM plans to develop Phase 9 in stages. The first stage will be to fill the area that is over the Phase 5 Landfill. This will allow the final closure of the northwest corner of the landfill, which includes the currently uncapped Phase 5 sideslopes. The second stage would be to fill over the currently uncapped Phase 4, Stage 2 plateau and the completed Phase 6 plateau. This sequence will allow the postponement of removal of the existing final cap over the remainder of the Phase 9 footprint and will allow for the progressive modification to the existing gas collection system that underlays the Phase 9 Landfill. The completion of the Phase 9 overfill will require sequentially removing stages of the existing final caps of the Phase 2, Phase 2A/3A, Phase 3 and Phase 4, Stage 1 landfills. The sequential cap removal work will be done so as to minimize the area of open landfill surface at any one time. See Figure 4 in Attachment 3 for a plan that shows the anticipated sequential development of the Phase 9 Landfill.

(6) There are areas, as described above, that will remain uncovered for several years before the Phase 9 filling occurs on them. In order to mitigate any impacts from occurring because of this, there will be an intermediate cover layer installed over these areas upon achieving the currently approved subgrades. The intermediate cover will be an application of soil materials meeting the requirements of 310 CMR 19.130(15)(d) Intermediate Cover. Because of the possible long-term exposure of the intermediate cover material until Phase 9 is constructed, the cover soils material will be applied across the subgrade surface, so as to form an intermediate cover that is at least twelve inches (12") thick. Should the intermediate cover materials fail, whereby odors are produced or excessive leachate is generated and cover repairs do not prove to be adequate, a temporary, sacrificial, geosynthetic cap may be installed.

(7) The described project is the “Preferred Alternative” which is the continued landfilling of ash at approximately 80% and MSW at approximately 20% of the daily waste stream into Phases 7, 8 and 9, as well as the relocation of the existing solid waste handling operations. Alternatives to this are the “Do Nothing” alternative, which is the completion of the Phase 6 landfill to its limits, with no further landfilling occurring on-site. Another alternative is to build out the site, as proposed, but to stop accepting ash and only accept MSW for disposal. The difference between this, the “MSW Alternative” and the Preferred Alternative is that there will be much less tonnage of waste that can be disposed because ash is much denser than MSW. This in turn will lead to a shortened landfill life, if (in both alternatives) the maximum daily capacity is achieved throughout the life of the facility. ISWM and Covanta, the owner of the SEMASS facility, are in active

negotiations to extend the contract for ash disposal.

(8) If the MSW Alternative were to occur and the facility were to operate at daily capacity, another impact would be that more truck traffic would occur delivering waste to the facility, which is the operational scenario that existed at the facility prior to accepting ash. ISWM's traffic consultant, TEPP, LLC, has evaluated the facility's traffic conditions for several years and has concluded that infrastructure improvements have enhanced traffic safety and operations so as to provide for a capacity of at least 1,500 tons per day. TEPP has provided a Traffic Assessment memorandum, which is included in Attachment 13. As was shown in the ENPC and included in Attachment 6, if the facility runs at daily capacity through its life, the Landfill will operate until approximately September 2041 under the Preferred Alternative, while the MSW Alternative will only operate until approximately January 2036.

(9) A number of plans are presented in Attachment 3 which support and demonstrate the proposed development of the site. Included in these plans are *Figure 9, Land Use Plan* and *Figure 10, Water Resources Plan*, which are required in the Site Assignment Application. Also included are plans that show the limits of site assignment and waste handling, the conceptual site plans for the proposed landfill expansion and relocation of the large handling facility which demonstrate compliance with <u>310 CMR 16.10(4)(h) Size of Facility.</u>

(10) The Town is continuing its efforts to develop a project to treat leachate on-site to avoid trucking leachate off-site to a wastewater treatment facility. The Town will continue to ensure that it has an array of off-site disposal options that are as close to the facility as possible. This includes participating in discussions with towns on the Upper Cape and with the MA Air National Guard which operates the wastewater treatment facility on JBCC and potentially expanding its capacity and capabilities, including treatment of leachate. Considering that the facility is within ten miles of the Landfill, this would represent a significant reduction in emissions from transportation to more distant treatment facilities as well as a savings in capital through cost sharing.

2.2.3 Land Alteration/Stormwater

(1) The development of the site will involve the expansion of impervious area beyond what was discussed in the original FEIR. This increase in impervious area was presented in the May 2018 SSEIR. The expansion of new impervious area on the 25-acre parcel will be for the landfill expansion and will be the portion of that parcel that is not currently paved or covered by a building. This area consists of approximately 10.28 acres. The expansion of new impervious area on the 12-acre parcel, which is currently undeveloped, will be for pavement, buildings and infrastructure to support the LHF. The conceptual design of new impervious area is approximately 5.58 acres. The total new impervious area exceeds the ten-acre threshold and therefore this SSEIR is required. The final site design will attempt to minimize impervious area, by reducing pavement area. With the heavy equipment and truck usage of the site, pervious pavement will not be practical in many areas. However, pervious pavement may be considered

for passenger vehicle parking areas. The drawing titled *Figure 3, Site Modification Plan* in Attachment 3 includes a delineation of the areas that are currently pervious surfaces that conceptually will become impervious.

(2) The ISWM facility has a long-established Stormwater Management Plan (SMP), which has evolved as the site has been developed. The current stormwater management facilities consist of a series of engineered runoff water quality diversion berms, let-down channels, perimeter swales, culverts and sedimentation/retention basins. The site is divided into three drainage basins. Generally, the northern two thirds of the western side of the site, which includes the site's access road and the northern and western sides of the Landfill, drain to Stormwater Basin No. 1 as tributary flows to a drainage swale along the western toe of the landfill. The eastern side of the landfill and southern third of the site, which contains the existing LHF, drains to Stormwater Basin No.2. The landfill sideslopes in this drainage basin drain through water quality and stone lined swales which discharges into a drainage interceptor pipe that conveys the flow south along the eastern toe of the existing and future landfill sideslopes to Stormwater Basin No. 2. The interceptor is designed to collect flow at critical phase points at the toe of the eastern sideslope of the future Phases 6, 7 and 8 landfills. The existing LHF has a drainage system consisting of catch basins, culverts and overland flow areas, that discharge to Stormwater Basin No. 2. All site runoff from developed areas of the site drains to either of these two basins, which are large enough to contain flow volumes greater than the 100-year storm event. Each basin completely discharges to groundwater, with no discharges to "waters of the United States". Runoff from the 12-acre parcel infiltrates the surface, within that area.

(3) Under proposed build-out conditions, control of stormwater runoff along the western side of the Landfill will continue to be managed by existing facilities that discharge to Stormwater Basin No. 1, located in the northwest corner of the property. The tributary area to Stormwater Basin No. 1 will slightly increase with the buildout of Phase 7 and 8 and the development of Phase 9 will reallocate some tributary areas between the two drainage basins, but flow volumes to Stormwater Basin No. 1 will not change significantly.

(4) Future development of Phase 7 and 8 will result in the abandonment of Stormwater Basin No. 2, the extension of the drainage interceptor to the south and the construction of a new sedimentation basin (Stormwater Basin No. 3) on the currently undeveloped 12-acre parcel, located immediately to the south of the 25-acre parcel. A separate infiltration field will be constructed for the relocated LHF, that will have an overflow to Stormwater Basin No. 3.

(5) In its February 17, 2000 Development of Regional Impact (DRI), the Cape Cod Commission (CCC) evaluated the compliance of the facility to the CCC's then Regional Policy Plan standards for water resources and determined, that as conditioned, the Application for the Bourne Landfill was approved. Since that time, site development has provided an approved, continuous, environmental

monitoring plan for groundwater quality and improved structural stormwater management facilities. In addition, the May 2006 Massachusetts Estuaries Project Report on nitrogen loading threshold modeling for the Phinney's Harbor area in Bourne, noted that "the Landfill is contributing negligible nitrogen to the Phinney's Harbor System." It also noted that the flow path of nitrogen enriched groundwater was from the historic septage lagoons, and that groundwater from the former lagoon area flows toward the Cape Cod Canal. These lagoons have been out of service for over twenty years and groundwater monitoring has shown a consistent improvement in groundwater quality downgradient from the former lagoon's locations.

(6) A Stormwater Management Plan (SMP), that takes into account the proposed full site buildout is included in Attachment 7. The SMP includes Drainage Area sketches for the existing and proposed stormwater management facilities and stormwater modeling calculations for design 25-year and 100-year storm events. The SMP also addresses the conformance of the proposed facilities to the MA DEP Stormwater Management Standards and the CCC Minimum Performance Standards, including construction sequencing with interim or temporary erosion control and structures, as well as water quality criteria such as total suspended solids (TSS) and nitrogen loadings.

2.2.4 Rare Species

(1) The project includes previously disturbed land (the 25-acre parcel and the 74-acre existing landfill area) and undisturbed land (12-acre parcel), that does not contain a habitat of rare species, vernal pools, priority sites of rare species or exemplary natural communities, and therefore, no alteration of designated significant habitat or taking of an endangered or threatened species will occur. However, the 12-acre parcel in its entirety, and small portions of 25-acre parcel, do contain Eastern Box Turtle habitat, a species of Special Concern. This habitat is delineated on plans in Attachment 3. Any taking of this land will require mitigation in close coordination with NHESP. Attachment 4 includes a fact sheet on the Eastern Box Turtle as well as a letter from NHESP which confirms that Phase 7, Phase 8, Phase 9, and areas outside of the delineated habitat and are exempt from further MESA review.

(2) The Town will work closely with NHESP on its plans to develop the 12-acre parcel it recently acquired. This particular parcel contains virgin *Priority Habitat* for the Eastern Box Turtle and will likely result in a Take. As such, the Town will apply for a Conservation and Management Permit for any development of that site. The Town has researched parcels in the nearby area that would provide suitable mitigation and could be placed under permanent protection. This research has yielded two candidate parcels and, working with its consulting team, the Town is preparing an assessment of the parcels for NHESP review to ensure that they are suitable. Based on a positive determination, ISWM will proceed with plans to gain ownership of the candidate parcels that are compliant with all aspects of MESA. Horsley Witten Group (HW) has completed the field

reconnaissance on the 12-acre parcel as outlined in the Wildlife and Plant Technical Bulletin (Cape Cod Commission (CCC) 2018 Regional Policy Plan (RPP)), and is in the process of preparing the Natural Resources Inventory (NRI) to support the Town's Development of Regional Impact (DRI) application with the CCC. HW will work cooperatively with the Town to ensure that the goals and objectives for wildlife habitat and open space preservation are addressed for the project.

(3) Documentation gathered during these site visits and at the proposed mitigation parcels will serve to support the DRI as well as the anticipated Conservation and Management Plan (CMP) for review and approval by the MA Natural Heritage and Endangered Species Program (NHESP) under the Massachusetts Endangered Species Act or MESA.

2.2.5 Climate Change and Greenhouse Gas (GHG) Emissions Analysis

Under the Massachusetts Environmental Policy Act (MEPA), M.G.L. c. 30, ss. 61-621 and its implementing regulations at 301 CMR 11.00, project proponents are required to study the environmental consequences of projects, and take all feasible measures to avoid, minimize and mitigate Damage to the Environment. During 2007, the state agency responsible for implementing MEPA (the "MEPA Unit"), broadened the definition of "Damage to the Environment" to include greenhouse gas (GHG) emissions from certain projects already subject to MEPA review. For those projects subject to the MEPA GHG Policy, a quantitative analysis is required to assess project alternatives and to establish the mitigation measures of GHG emissions of the proposed alternative to a baseline scenario. The initial MEPA GHG Policy and Protocol was drafted by the MEPA Unit during 2007 and has since been revised.

2.2.5.1 Adaption and Resiliency

As a coastal community the Town of Bourne takes climate change seriously and is therefore taking into account how it will adapt and be resilient to predicted climate changes. This includes reviewing how plans for the future development of the landfill could be affected and also how it could play a role in serving the community as climate changes occur. To aid in this assessment, the Town consulted resilientMA.org which contains a report entitled, Massachusetts Climate Change Projections - Statewide and for Major Drainage Basins Temperature, Precipitation, and Sea Level Rise Projections, prepared by the Northeast Climate Adaptation Science Center at the University of Massachusetts Amherst and published by the MA Executive Office of Energy and Environmental Affairs which has provided support for these projections to enable municipalities, industry, organizations, state government and others to utilize a standard, peer-reviewed set of climate change projections that show how the climate is likely to change in Massachusetts through the end of this century.

The Town has reviewed the prediction for sea level change noted in the report on page 16 that describes changes for Woods Hole, MA which is close to Buzzards Bay and the Landfill. The "Extreme", or maximum physically plausible case, sea level rise scenario for as far into the future as the year 2100, predicts a maximum rise of 10.3 feet above current sea level. While this level is unlikely, nevertheless, the designs for the expansion of the Bourne Landfill and associated waste management and handling facilities would not be directly affected by this change as the facility is located on one of the highest points on Cape Cod and has elevations ranging from approximately 144 feet MSL to 90 feet MSL along the perimeter of the facility. The maximum predicted sea level rise is well below this level.

In addition to sea level rise, the Town considered the predictive modeling regarding increases in precipitation as shown on page 40 and page 47 of the same document during the designing of its stormwater management systems that manage stormwater on-site without discharging off-site. The model shows for the Buzzards Bay basin, by the end of the century in the 2090s, the maximum increase in annual precipitation is to be between 0.3 and 6.8 inches from the observed baseline amount of 47.8 inches per year. The model also shows predictions in the 2090s for the Cape Cod Basin, which is to the north of the facility, ranging from a decrease of 0.8 inches to an increase of 5.5 inches from the observed baseline amount of 44.9 inches per year. The systems at the ISWM facility are capable of handling this projected increase with available capacity and proposed drainage basins above the 100-year storm event.

In terms of both sea level rise and increase in precipitation, the ISWM facility is well positioned to adapt to any predicted climate change impacts. This is critical not only to ensure that the structures on the site, including the Landfill are not negatively impacted, but also because the facilities located at the site are likely to play a vital local and regional role in responding to incidents associated with climate change that create water damage. Floods and storms generate tremendous amounts of debris and materials that are only suitably managed by landfills because of their bulky and mixed nature. Recent flooding along the Gulf Coast of the U.S. highlights the integral role landfills play in responding to such crises and the recovery efforts. Were it not for the landfill capacity in these areas, it is likely the economic, public health and transportation impacts would have been significantly greater.

To further prepare, ISWM has taken steps to make its operations more resilient which include:

- ISWM has a backup generator for on-site power in the event of storms.

- The ISWM facility has data backup storage off-site at Town Hall and furthermore, the technology staff has ensured that storage at Town Hall is also backed-up at an off-site location.

- ISMW reviews its operations, supply chains and staffing to assess areas for improvement to be ready to respond to increased storm events in coordination with the Town Administrator, Town first responders, the LEP Committee and other Town staff. Coordination will also include working with the County that maintains a regional emergency response staff and state staff at appropriate agencies.

- ISWM has proposed emergency response pre-approvals for expanded operations on a limited basis to allow for rapid deployment during surges in need.

As noted in the ENPC Certificate, the Town of Bourne is a participant in the Municipal Vulnerability Preparedness (MVP) program. To gain feedback from the community about what risks are posed to Bourne by climate change, the Town held a two-day workshop in 2019 open to the public that was led by a core of Town employees including: Samuel Haines, Conservation Agent, Town Lead, Jennifer Copeland, Assistant Town Planner, Timothy Lydon, Assistant Town Engineer and Charles Noyes, Emergency Management Director.

A report summarizing the overall findings of the workshop and in particular, the top hazards found on page 8 is maintained on the Town website at: https://www.townofbourne.com/conservation/news/municipal-vulnerability-workshop-draft-report. As previously noted the ISWM facilities are ideally positioned both physically and operationally to address many of the top hazards which include storms, flooding and sea level rise and therefore is part of a prudent climate change adaptation and resiliency plan.

2.2.5.2 GHG Background

The Town previously submitted a GHG analysis as part of the Phase 6 landfill expansion project in 2018 and most recently in February 2020 as part of an Expanded Notice of Project Change which focused on the Phase 7, Phase 8 and Phase 9 vertical and horizontal landfill expansions. Below is an update to the 2020 submittal. The GHG emissions for these phases include methane and carbon dioxide that are formed through the natural biological decomposition of solid waste.

The ISWM Department has aggressively pursued options to reduce impacts of its landfill operations as a matter of practice and has already done mitigation to reduce emissions of greenhouse gases as outlined below. This is followed by an analysis of the projected emissions of two baseline scenarios. Supporting figures and calculations are contained in Attachment 8.

2.2.5.3 Existing GHG Mitigation

1. Utilization of a utility flare that destroys methane that would otherwise be emitted to the atmosphere. The installed flare at the landfill is sized to manage up to 2,000 standard cubic feet per minute (SCFM) with a margin of 25-percent additional capacity over the projected maximum quantity of landfill gas (LFG) to be generated at the Landfill which is approximately 1,600 SCFM if capacity were consumed entirely by MSW. Currently the facility generates approximately 600 SCFM while it is accepting mostly municipal waste combustor ash.

   In the final Air Quality Plan Approval issued by MA DEP, the MA DEP determined the utility flare to be the “top-case” for Best Available Control Technology (BACT) for control of landfill gas and its subsequent emissions of NOx, CO and VOCs (Air Quality Plan Approval, Application SE-12-011, March 18, 2013). ISWM compared the utility flare to an enclosed flare, and determined that given the context in which it is used, the utility flare has several key operational advantages over an enclosed flare:

- The utility flare is more reliable than an enclosed flare because it is less complex and easier to operate and maintain, as well as less susceptible to shutdowns due to sudden fluctuations in LFG flow rates.

- The utility flare can operate over a wider range of flow rates because of a higher turndown ratio than enclosed flares. The turndown ratio for the utility flare is 20:1 (100 SCFM to 2,000 SCFM) as compared to 4:1 (500 SCFM to 2,000 SCFM) for a typical enclosed flare. The capability of a utility flare to combust LFG over a wide variety of flow rates is especially important for Bourne Landfill operations because the utility flare may serve as a primary control device or a back-up or supplementary control device in the event that a beneficial use (e.g. LFGTE, leachate evaporation and control, heat recovery boiler, animal crematory) is installed.

- The utility flare has the capability to continue operating when large changes in LFG flow occur and an enclosed flare does not. Therefore, the utility flare can serve both as a primary control device and is compatible as a back-up or supplementary control device. An enclosed flare would likely only be able to serve as a primary control device, and therefore is not considered further.

2. Landfill phases are capped regularly as final design grades are filled to capacity.

3. Horizontal and vertical landfill gas collection systems and wells are installed regularly to capture approximately 95% of all gas generated at the landfill. Emissions are so low that the Environmental Protection Agency (EPA) has allowed Bourne to stop reporting them. ISWM reports greenhouse gas emission to DEP via the Greenhouse Gas Emission Reporting Program.

4. Current operations consume approximately 86% of the permitted annual tonnage with inert municipal waste combustor ash vs. MSW.

5. Truck traffic was significantly reduced after switching to ash because the denser ash material resulted in fewer truck loads per day, for the same capacity.

6. Providing a local option for ash from Covanta SEMASS and local soils projects reduces hauling to other more remote locations. As landfill capacity, including that which is predominantly for municipal waste combustor ash or so-called “monofills”, continues to shrink, options for disposal are increasingly at distant landfills including options in NH, NY, VA and OH which would significantly increase the carbon footprint associated with transportation whether by rail haul or long-haul trucking.

7. The Bourne facility provides a viable site for renewable energy projects with the necessary infrastructure, permits and political and community support. For example, the Town invested a substantial amount of capital to develop an anaerobic digester project with Harvest Power, Inc., however the project failed through no fault of the Town.

8. The Town pursued and has a current permit for an on-site landfill gas-to-energy power plant and/or leachate evaporation unit.

9. Heavy machinery on-site is relatively new and has the latest Tier 4 emissions reduction devices.

10. ISWM provides transfer stations for single-stream recyclables for Bourne, Falmouth and local businesses thereby creating efficiencies in transportation and reducing emissions. This is also true for waste that is transferred through its construction and demolition (C&D) debris transfer station. Both provide a regional benefit to Cape Cod customers.

2.2.5.4 Landfill Expansion Scenarios

(1) The Town of Bourne owns and operates the Bourne Landfill for the disposal of solid waste. The Landfill is permitted to accept up to 219,000 tons of solid waste per year which can include municipal solid waste (MSW), which is biodegradable waste from residential and commercial sources, municipal combustor ash, which is inert and will not generate GHG, and other inert residuals wastes such as contaminated soils. The Town has operated the lined Landfill as a large regional disposal facility for residential and commercial waste since 1999. Prior to the construction of the first lined phase, the Town operated an unlined Landfill, beginning in 1967, which operated at much lower capacity to accept residential and commercial solid waste predominantly from the Town.

(2) Through 2014, the Landfill had accepted residential and commercial solid waste that was largely organic with an increasing percentage comprising ash. However, after significant discussion and planning in the community and with elected officials, the Town made a strategic decision to move from accepting largely biodegradable solid waste from commercial and municipal generators in the region, to accepting non-biodegradable ash material generated by the Covanta SEMASS (SEMASS) municipal waste combustor located in Rochester, MA. Specifically, the Town entered a 10-year contract with SEMASS that culminates at the end of 2021. The agreement requires SEMASS to deliver and the Town to accept for disposal at the Bourne Landfill, up to 189,000 tons per year of non-biodegradable ash residue beginning in 2015 after a ramp up period. During this ten-year contract term, the remaining 30,000 tons per year of the 219,000 tons of permitted solid waste disposal capacity is reserved for residential MSW from Bourne and from the Town of Falmouth also with a ten-year term, soils and other difficult to manage wastes. This decision by the Town of Bourne has the impact

of significantly reducing the baseline emissions below a projected baseline that would have occurred if the Town had stayed its course of providing a large regional disposal facility for residential and commercial waste that was largely organic.

(3) The Town therefore is weighing its options beginning in January 2022 after the conclusion of the current contract period with SEMASS. In the first scenario, the Town would extend the contract with approximately the same amount MSW consuming the remaining available annual tonnage and the resultant low gas generation or 189,000 tons per year of ash and 30,000 tons per year of biodegradable waste. In the second scenario, the Town would utilize its 219,000 tons per year of capacity entirely for MSW. Of course, the Town could allocate its tonnage in various combinations of ash and MSW depending on market conditions, but for the purposes of analysis it is presenting what could be considered bookends with regard to gas generation potential. Scenario 1 would generate the least amount of gas going forward and Scenario 2 would generate the maximum gas as all the waste would be biodegradable.

(4) The estimated cumulative CO2e in tons for Scenario 1 is 390,706 and 815,844 tons for Scenario 2, as show in Attachment 8. It is important to note that these filling scenarios were previously discussed in the Phase 6 SSEIR and that the annual rate has not changed. This rate was reviewed and is being discussed again as part of this submittal because by definition, landfills are a consumable structure that must be expanded in order to continue operations which is the subject of this submittal, however the annual rate is the same. Further, having local capacity does in and of itself mitigate anthropogenic emissions associated with utilizing fossil fuels to transport waste increasingly farther away, such as Ohio, as in-state capacity drastically reduces. Additionally, the emissions from the waste itself, whether deposited in Massachusetts or in another state, would still be generated as the emissions are intrinsically linked to the waste.

(5) A scenario that envisions accepting only ash was not considered as it is more likely that at a minimum, the Town would continue to dispose of its own MSW in the landfill and potentially one other municipal customer. Eliminating the alternative of only ash provides a more realistic projection of gas generation at the facility

(6) Figure 1 and Figure 2 found in Attachment 8, along with the respective calculations, show GHG projections as CO2 equivalents, for Scenario 1, represented by the orange line, and Scenario 2, represented by the blue line, over the life of the full build-out of the landfill, both horizontally and vertically.

(7) As included in both scenarios, the landfill operations have incorporated very aggressive measures to capture, collect and destroy landfill gas thereby optimizing the LFG collection system to attain 95-percent collection of LFG produced in either scenario, versus the default value assumed by EPA of 75-percent collection. These measures include:

- Continued expansion of the LFG collection system into new areas of waste disposal. The expansion of the LFG collection system includes installation of horizontal collectors into active areas of waste disposal primarily to collect LFG as it first starts to be generated. Horizontal collectors are typically installed every 30-feet in waste depth and are placed approximately 300 feet apart. When areas of the Landfill reach their final grade, vertical wells are installed.

- Continued inspection, monitoring, repair and replacement of vertical wells to maintain the full performance of the LFG collection system.

- LFG collection system monitoring and adjustment to maintain a balanced operational system. Bourne dedicates a technician to monitor each extraction point of the LFG collection system. Using a handheld instrument, the technician measures LFG composition, static pressure, temperature and flow at each point and based on these readings makes an adjustment to flow to extract an optimal level of LFG from the extraction point to maintain the LFG collection system in balance. The technician performs a full LFG collection system balancing once every two weeks.

- Installing new equipment on a regular basis, such as the recent installation of a new flare that also included new redundant flare blowers specifically engineered with special components and coatings to handle LFG. Each blower can collect all the LFG from the LFG collection system and combust it in the new flare. The flare blowers can be switched from one to the other and the flare restarted quickly. Operation of the blowers are alternated periodically to ensure that both blowers are functional and can perform when called upon.

2.2.5.5 Attempted GHG Mitigation Measures

The Town has assessed the feasibility of several projects and pursued the development of those environmental projects that were likely to be technically and economically feasible. These projects included the following:

<u>LFG conversion to pipeline natural gas</u>
National Grid approached the Town to conduct a feasibility assessment to treat LFG generated from the Landfill to remove all components and contaminates other than methane so that the methane could be injected into a nearby natural gas pipeline. National Grid conducted the study over a period of 6 months and determined that the project was not feasible to pursue. The feedback that the Town received from National Grid was that the LFG had too high concentrations of oxygen, nitrogen and contaminants and too low a quantity of methane to make a commercially viable project both technically and economically feasible. No impact on reduction to GHGs was provided, however, the reduction would have been approximately the quantity of methane that would be injected into the

pipeline from such a project. The Town will monitor this technology as it continues to develop as well as government incentive programs that provide financial support for renewable gas sources. The combination of cheaper technology and new revenue streams may provide an opportunity in the future.

Microturbines fueled by LFG

Through a Mass Technology Collaborative (MTC) grant, the feasibility of using microturbines fueled by LFG to serve the electric loads of the vacuum blower and flare station was assessed and the study found that the microturbines were not technically feasible due to limitations on their output/turndown capability that preclude operation at the anticipated load levels. Furthermore, the study found that microturbines would not be economically feasible to install due to the high capital cost and high operating costs for the fuel conditioning systems that microturbines require when using landfill gas as fuel. The study also assessed microturbines to serve all the Facility loads at the site, which would require the Town to modify the on-site electrical distribution system such that all Facility loads on the site are served by one master meter at the primary voltage level (23.5 kV). To do so, the Town would need to (a) purchase transformers, cables and other equipment owned by Eversource on-site; and (b) install a new meter and associated equipment at the new service entrance to the site. Even if the site is converted to master-metering, it is not feasible to meet electric site loads by installing any of the microturbines studied to utilize landfill gas to provide electricity behind the meter. It would not be technically feasible to install microturbines due to limitations on their output turndown capability that preclude operation at the anticipated load levels. The study recommended that the Town proceed to pursue development of a facility to utilize the LFG to generate electricity for on-site use and to export excess electricity for sale. Depending on ISWM's internal assessment of its capabilities and potential benefits and costs, the Town may pursue such development either (a) through a facility to be owned and managed by ISWM; or (b) through a facility to be owned and developed by a third party that provides benefits to ISWM in exchange for the development rights. Such a facility might feasibly involve multiple microturbines served by a common fuel conditioning system as described herein, or might involve an alternative approach utilizing reciprocating internal combustion engines or other equipment.

LFG-to-energy facility

Following the recommendation of the preceding feasibility study, the Town applied for and obtained MDEP Air Permits for a LFG-to-energy facility using internal combustion engine-generator sets to generate up to 4.5 megawatts and recover heat to evaporate up to 18 Million gallons of Landfill leachate. LFG-to-energy facility would require up to 1,785 scfm of LFG at 50-percent methane content to operate at capacity. The production of electricity by the LFG-to-energy facility would result in 19,400 tons of CO_2 indirect reductions annually using a CO_2 marginal emission rate factor of 1,036 pounds of CO_2 per MWhr, which emission rate factor is established in "ISO New England 2015 Air Emissions Report". The indirect reduction of CO_2 emissions is the quantity of CO_2

emissions avoided from the reduced use of the marginal mix of power plant sources in ISO New England. The evaporation of leachate by recovered heat from the LFG-to-energy facility would result in 155 tons per year of CO2 emissions reductions from avoiding trucking of leachate. The Town conducted a procurement to obtain proposals for use of the LFG over a 25-year period at a designated site adjacent to the Landfill. However, no proposals were received to develop a stand-alone LFG-to-energy facility.

After the procurement process, the Town made the strategic decision to pursue disposal of primarily ash residue, which changed the projected LFG generation rates so that a 4.5 MW LFG-to-energy facility could not be supported by the projected LFG quantities. Although a much smaller LFG-to-energy facility (e.g. 1.8 to 2.7 MW) may be supported by the projected LFG quantities, the combination of lower prices in both the power market and renewable energy certificates market under the Massachusetts Renewable Energy Portfolio Standards (RPS) and the inability to obtain long-term power purchase agreements has made development of new smaller LFG-to-energy facility very uncertain and difficult to develop economically

<u>Anaerobic digestion of organic materials and biogas-to-energy</u>
After the Town's procurement process that requested proposals for use of LFG and/or waste management options at the ISWM facility, the Town selected a combined proposal and negotiated and signed a site lease agreement with Harvest Power to develop a private anaerobic digestion (AD) facility to digest up to 342 tons per day of organic material, such as food waste and biosolids, to produce biogas. The proposal included mixing the biogas generated by the AD facility with the LFG generated by the Landfill to obtain up to 2,400 scfm of gas at 50-percent methane content to fuel a LFG/biogas-to-energy facility to generate up to 6.4 MW of electric power.

The production of electricity by the LFG/biogas-to-energy facility would result in 27,589 tons of CO2 indirect reductions annually using a CO2 marginal emission rate factor of 1,036 pounds of CO2 per MWhr, which is the emission rate factor established in "ISO New England 2015 Air Emissions Report". The indirect reduction of CO2 emissions is the quantity of CO2 emissions avoided from the reduced use of the marginal mix of power plant sources in ISO New England. The evaporation of leachate from recovered heat from the LFG/biogas-to-energy facility would result in 74 tons per year of CO2 emissions reductions from avoiding trucking of leachate. The anaerobic digestion of organic material results in reduction of GHGs but no protocols to our knowledge are in place to quantify these GHG reductions.

Harvest Power spent several years developing the proposed project, but terminated the development because (1) the failure to obtain a long-term power purchase agreement; and (2) the added costs, uncertainty, and risks posed by DEP insistence on biogas treatment and post-combustion controls on emissions from the LFG/biogas-to-energy facility. The increased cost resulted in Harvest

Power proposing a very high cost per kWh for its power to Eversource when it sought renewable energy proposals for biogas projects. This cost caused Eversource to reject Harvest Power's proposal with no option to negotiate. Without the ability to obtain a long-term power purchase agreement (PPA), project financing was untenable and therefore Harvest Power terminated the lease with the Town.

Unfortunately, the Harvest Power Project was originally going to be the Proposed Mitigation case beyond the base case scenarios. Both the Town and Harvest Power invested substantial amounts of resources in time and money to move this project forward and were greatly disappointed the project did not go forward. For its part ISWM invested approximately $400,000 in legal, procurement and consulting costs to secure a lease arrangement. DEP also awarded the Town a grant of $350,000 to build supporting infrastructure that later had to be rescinded. Nevertheless, the work ISWM has done has set a template for future development projects and will save considerable time and money should another project come forward. ISWM will continue to study available technologies, companies and opportunities that may arise. Indeed, ISWM has already been approached by vendors interested in our facility and is carefully considering options for the future.

2.2.5.6 Other GHG Mitigation

The Town is in the process of assessing the feasibility and/or developing additional environmental projects that could have a potential reduction in greenhouse gas emissions at the site.

- <u>Recovering thermal energy.</u> Heat from the flare was utilized to heat water which is piped into a 6,500-gallon liquid storage tank used to store sodium hydroxide, which is a reagent used to remove hydrogen sulfide from the landfill gas. The heat was required to maintain temperature above freezing and to heat small pump and valve chambers. The quantity of methane displaced from recovery of waste heat was estimated at 140 tons per year. This recovery heat has been discontinued because H2S levels in the LFG have dropped below levels requiring removal and therefore the chemicals in the wet scrubber system are no longer needed. However, the system is maintained and can be restarted should H2S rise to the 200 PPM level which would require treatment.

- <u>LFG-to-energy facility.</u> Reconsideration of developing the LFG-to-energy facility will be made subject to increased LFG quantities that may result if the facility were to return to disposal of 219,000 tons per year of residential and commercial waste (MSW) that is largely organic.

- <u>LFG Blower Power.</u> With a new flare system, ISWM purchased and installed in 2015 two new LFG blowers, each driven with a 40 HP motor. The motors are belt-driven with rotary sheaves selected to minimize energy consumption at desired flow rates. The Town performs on-going maintenance, replacing bearings and belts as necessary to reduce motor load. The piping to convey LFG within the blower and flare system was oversized resulting in low pressure drops and energy consumption across the new flare system. ISWM makes routine adjustments to the landfill gas collection system and blower inlet throttle valve position to optimize the flow of landfill gas and reduce electricity consumption of the blowers. ISWM considered purchasing variable frequency drives (VFDs) for these new blowers but decided against the VFDs for two reasons. First, the LFG flow rates are very constant over extended periods of time (e.g. months), and therefore the VFD does not provide improved efficiency typically provided in variable motor speed applications. Second, while ISWM did acquire a VFD on the old blower configuration after an energy audit from the Cape Light Compact, it did experience significant reliability problems that resulted in numerous unplanned outages of the LFG collection and flaring system, especially as adjustments to the wellfield were made. Based on this experience, ISWM designed the new LFG blower and flare system with reliability in mind. This priority reduces the overall impact of fugitive landfill gas emissions to the environment and increases the destruction of methane which is a major greenhouse gas. Additionally, given the lack of variation in LFG flow, there is little, if any, change in motor load between the throttle adjusted belt driven blowers that exist and VFD driven blowers. Note that the consumption of electricity by the blowers was 23 kW or 31 HP on an annual average basis or 75% of rated capacity. This resulted in approximately 75 tons of CO2e of indirect emissions annually, using a CO2 average emission rate factor of 747 pounds per MWhr (200.78 MWhr per year * 747 lb. CO2e/MWhr / 2000 lb./ton) from the ISO New England 2015 Air Emissions Report.

- Photovoltaic (PV) Solar. The Town has the potential to install and operate up to 6.9 MW of PV solar over the final closed plateau of the landfill, on the roof of an existing maintenance garage and on the roofs of potential new offices, transfer stations and maintenance facilities that are proposed to be developed at the southern end of the facility, as shown on Figure 11 – Solar Array Plan in Attachment 3. With a capacity factor of 13%, a PV solar array of 6.9 MW would result in approximately 4,100 tons of CO2e indirect reductions annually using the CO2 marginal emission rate factor of 1,036. The total contribution from the capped landfill area is less than discussed in previous submittals because the current application envisions a final elevation of 225’ for the capped landfill versus an elevation of 185’ which reduces the plateau area upon which panels can be installed on level grade. However, additional PV solar arrays may be installed along finished side-slopes as has been done at the closed landfill along Route 24 in Randolph. Installation of PV solar arrays on sloped surfaces is a relatively new development and the Town will investigate the feasibility of applying it to the Bourne Landfill at the appropriate time. While solar projects at landfills have become very common in Massachusetts in recent years, these projects are usually developed on closed landfills that have been inactive for decades. The landfill operated by ISWM is still active and even though sections have been closed for a number of years, a careful evaluation of traffic patterns and topography must be conducted prior to any installation. This was stressed in the MA Department of Energy Resources document entitled *The Guide to Developing Solar Photovoltaics at Massachusetts Landfills*, which noted on page 8, *"As part of any feasibility assessment, the host municipality will need to inspect the landfill to evaluate a number of potential issues that may impact site development, including storm water, landfill gas, and settlement."* ISWM will work with its consulting engineering team to determine when and where a potential area will become available for development. However, given the relatively recent deposition of waste and its composition, it may take at least five years or even longer for an area to become suitably stable. ISWM will look at this carefully along with various procurement options and business models to determine the earliest time that at least a portion of the facility could be utilized for a solar array which will be expanded over time. Nevertheless, the long-term ISWM facility is a good candidate for solar once it is fully capped and closed. In the shorter term ISWM will evaluate options for the installation of solar arrays on rooftops, especially as it begins design of an anticipated new office/garage complex at the southern end of the property

- On-site leachate treatment. The Town is continuing its efforts to develop a project to treat leachate on-site to avoid trucking leachate off-site to a wastewater treatment facility. The Town is evaluating a recent proposal to utilize LFG to evaporate a portion of the leachate. The remaining volume of leachate might then be treated on-site, with a specialized system, to meet relevant discharge standards. However, the Town must continue to ensure that it has an array of off-site disposal options that are as close to the facility as possible. This includes participating in discussions by towns on the Upper Cape with the MA Air National Guard to take over operation of the wastewater treatment facility on Joint Base Cape Cod and potentially expand its capacity and capabilities, including treatment of leachate. Considering that the facility is within ten miles of the landfill, this would represent a significant reduction in emissions from transportation to more distant treatment facilities as well as a savings in capital through cost sharing.

- Animal crematory. The Town is contemplating hosting an animal crematory that would use the LFG as a fuel. Such an application would displace the use of natural gas from other sources.

- Additional thermal recovery from LFG combustion. The Town is considering assessing the financial feasibility to recover thermal energy from combustion of LFG to heat the existing permanent structures on site. ISWM intends to keep a storage/maintenance garage near the existing leachate tank along the eastern boundary approximately 1,500 feet from the flare at which a heating system might be installed. While this facility alone might prove to be too costly, ISWM, as part its site master plan, will construct permanent administrative and maintenance facilities at the extreme southern end of the facility on a 12-acre parcel that was recently acquired. The site does not have a natural gas line, and oil heat would not be a preferred option. Therefore, with the inclusion of these capital assets and their energy needs in mind over decades, the feasibility may improve considerably versus considering just the existing maintenance facility in isolation.

The Town will evaluate the use LFG to recover its heat value in the form of hot water or steam for building heating, cooling or other purposes. The ISWM facility has an existing maintenance garage and future plans to construct a new permanent office/maintenance garage complex, and in the longer term, new transfer stations, that could be ideal locations to utilize heat generated from the LFG. The landfill gas can be used to heat the buildings by combusting the landfill gas in a gas fired boiler. The required equipment to be installed would include:

- gas piping from the existing blower/utility flare station to a gas-fired boiler at the buildings
- gas compression, cooling and condensate removal
- a gas-fired boiler to generate either hot water or steam
- a distribution system for heating the buildings using the hot water or steam

The quantity of heat that can be recovered is as follows:

- At current landfill gas flow rates of 600 scfm corrected to 50% methane content or 18.2 MMBtu/hour, a gas fired boiler sized for this heat input could recover 12.7 MMBtu/hour of useful thermal energy at a heat recovery efficiency of 70%.

- At 83% of the projected peak landfill gas flow rates of 1,584 scfm corrected to 50% methane, 1,270 scfm corrected to 50% methane content or 38.6 MMBtu/hour would result for a 10-year period rising up to and declining from the peak. A gas fired boiler sized for a heat input of 38.6 MMBtu could recover 27.0 MMBtu/hour of useful thermal energy at a heat recovery efficiency of 70%.

Both these quantities of thermal heat are substantially more than sufficient to heat the building space contemplated to be built by ISWM. A square foot for a commercial building or office space in Massachusetts takes approximately 55 Btus/sq. foot. Therefore, the current flow rate of LFG can heat approximately 225,000 square feet of building and the projected increase can heat approximately 470,000 square feet of building. The building space for the office/garage complex is anticipated to be approximately 59,000 square feet, which is substantially below the potential quantities of useful thermal energy that can be extracted from LFG. The extra thermal energy can therefore be used for other purposes, including:

- Evaporative cooling for air conditioning of the building spaces
- Heating water for hot water supply for truck wash
- Radiant heating for outdoor roads, receiving areas, roof, and sidewalks
- Heating of transfer station space

- Heat other outdoor areas (generators)
- Heating leachate treatment equipment
- Evaporation of some portion of leachate

ISWM will consider these other uses for thermal energy from LFG when considering options to utilize landfill gas as a resource, especially during the design process of future buildings.

- Vertical axis wind turbines. As with solar technology, advances are made every year, and this applies to wind turbines as well. There may be a potential for interspersing small scale turbines amongst a solar array to take advantage of steady winds from Buzzards Bay that blow across the top the landfill. However, as with solar arrays, settlement and stability issues will need to be carefully evaluated.

- CNG for trucks. Increasingly, landfill gas is being compressed and utilized in garbage collection vehicles around the nation. ISWM will carefully monitor these developments and evaluate if Bourne is a candidate for investing the necessary infrastructure and fleet conversion for such a project, especially if diesel fuel prices increase and if credits are available for use of renewable fuels.

- Regional composting. Planning entities have shared a strong interest on the Cape to have a local food waste composting site. ISWM has been approached by a firm that has partnered with a technology company that has a covered windrow system that utilizes forced air blowers to accelerate decomposition of organic matter. The cover would also contain odors. Such a regional approach would reduce CO2 emissions by creating a saleable high-quality compost. ISWM is part of a regional group of solid waste professionals and municipal officials on the Cape that are exploring such options. Additionally, as the site master plan options become clearer and space becomes available, ISWM may contemplate issuing a request for proposals.

- Platform for technology development. As has been noted, ISWM has excellent potential for hosting developing technologies. ISWM staff constantly monitors industry development and looks at how potential vendors may fit into a site master plan and be suitable for this region. Additionally, as companies continue to approach ISWM, ISWM will carefully review all options based on its experience with Harvest Power.

- New office/garage complex and other structures. As previously discussed, the Town has an opportunity to evaluate how energy is utilized at its administrative and maintenance facilities that are planned for the southern end of the site. This includes installing a solar array on roofs and potentially using thermal energy from the combustion of LFG. In addition, the Town will work with the design team to consider electrification of space and water heating, a high-performance building envelope and interior and exterior LED lighting.

2.2.6 Construction and Site Operations

(1) During construction of any facility at ISWM and during normal operations by Department staff, best management practices are employed to reduce emissions impacts. The measures that are undertaken include:

- compliance with MA DEP regulations regarding air pollution control
- designating areas for storage of equipment and supplies
- ensuring that contractors keep all work areas neat and free from unsecured supplies such as gasoline, diesel fuel and other petroleum products
- dust control measures such as regular road sweeping and watering as needed
- requirement of a site-specific Health and Safety Plan by all contractors
- installation of stormwater control structures to manage all stormwater on-site
- requirement of a site-specific Erosion Control Plan by all contractors
- requirement to follow anti-idling requirements
- use of ultra-low sulfur diesel fuel (ULSD)
- use of and purchase of equipment with current low-emission engine types or other control mechanisms, including Tier 4 standards for engines (file maintained on-site)
- coordination of on-site disposal and diversion of waste with the Town management to comply with waste bans and encourage recycling and diversion
- Inclusion of language in bid documents for construction projects that vendors must meet the standards as shown above.

(2) With regard to the “MassDEP’s Clean Air Construction Initiative” as referenced in the ENPC Certificate, our research has indicated that this initiative is no longer in effect according to DEP. After some further research, the Braintree Electric Light Department’s (BELD) 2007 Air Plan Approval noted that, “on November 10, 1998 the Clean Air Construction Initiative was announced in Massachusetts to reduce air emissions generated by heavy-duty construction equipment used in the Central Artery/Tunnel Project. The Clean Air Construction Initiative was sponsored by the Massachusetts Turnpike Authority, the Central Artery/Tunnel Project, EPA-Region I New England, Massachusetts Executive Office of Environmental Affairs, Massachusetts Department of Environmental Protection, Manufacturers of Emissions Control Association and NESCAUM.” Now that the Central Artery/Tunnel Project is completed this no longer applies, however, while this is the case, the steps described above meet the intent of the initiative at the time to reduce emissions. The majority of ISWM’s equipment complies with EPA Tier 4 emissions limits. A few pieces of equipment that do not comply are scheduled to be replaced with compliant equipment within a few years. ISWM maintains a list of their applicable engines and their characteristics.

(3) In all of the contracts that ISWM puts out for public bid there are requirements for the contractor to submit various plans and to conform to a series of site maintenance operations, that enforce the best management practices listed above. Relative, typical specifications included in each bid are presented in Attachment 9 – Construction Best Management Specifications. Also see the draft Section 61 findings in Section 4.0 of this SSEIR for the application of BMPs.

(4) With regard to the preparation of a Stormwater Pollution Prevention Plan (SWPPP) the Town notes that it is not required to file for a National Pollution Discharge Elimination System (NPDES) Construction General Permit (CGP) because all stormwater is contained on-site by sedimentation basins as described above and as shown on the site plans and is managed through infiltration into the ground with no surface water discharges. Therefore, by definition, a NPDES CGP is not required nor are a Multi-Sector General Permit (MSGP), a Dewatering General Permit or a Remediation General Permit required. Representatives from MA DEP specializing in these permits were contacted and have confirmed that this is the case. Attachment 9 also contains a flow chart from EPA which explains the decision-making process.

(5) The ISWM facility is not located in area that could reasonably be expected to discharge oil to navigable waters or adjoining shorelines and therefore does not need a Spill Prevention Control and Countermeasure (SPCC) plan. However it does maintain best management practices which include:

- Keep all work areas neat and well organized.
- Sweep or pick-up all trash and debris daily or as needed.
- Recycle or dispose of all wastes properly and promptly.
- Do not handle, use, pour, dispose or transfer materials outdoors near storm drain inlets or drainage ditches.
- Do not try to handle a container alone if it is awkward or requires over-exertion. Get help or use powered equipment.
- Use tarps or containers to contain any wastes or spills.
- Use only dry clean-up methods to clean up spills.
- Clean-up all spills or releases promptly.
- Instruct contractors to manage all of their materials in a safe manner while on site and report incidents to site management.
- Properly store and handle chemical materials.
- Remove fluids from vehicles, parts, and cores in one centralized location and over an impervious surface.
- Plug all hoses after draining.
- Use drip pans, funnels, mechanical pumps, and hoses when removing and transferring fluids.
- Drain parts and cores on a drain table before moving them to a storage area.
- Place fluids in leak tight, non-breakable, labeled storage containers, or tanks immediately after draining. Keep the containers and tanks tightly closed, except when adding or removing fluids.
- Provide secondary containment, as required.
- Regularly inspect fluid containers and tanks for leaks, rust, dents, or other deterioration.
- Keep facility equipment, such as crushers, forklifts, hydraulic lifts, company vehicles, and fluid transfer equipment in good condition and free of leaks.

- Maintain spill response materials including absorbents, specialized pads and containment barriers.
- Train staff.

2.2.7 Mitigation Measures/Section 61 Findings

In accordance with M.G.L. c. 30, Section 61 and 301 CMR 11.12(5), any State Agency that takes Action on a project for which the Secretary required an EIR shall determine whether the project is likely, directly or indirectly, to cause Damage to the Environment and shall make a finding describing the Damage to the Environment and confirming that all feasible measures have been taken to avoid or minimize the Damage to the Environment. Draft Section 61 Findings are presented in Section 4.0 of this SSEIR.

2.2.8 Water Resources

2.2.8.1 Geology

(1) Precambrian igneous and metamorphic rocks underlie this portion of Cape Cod at depths that range from approximately 100 to over 400 feet below sea level. Glaciation during the Wisconsin Stage of the Pleistocene Epoch (the Ice Age two million years to eight thousand years before present) deposited thick layers of sediment to achieve these depths. Glacial ice overtopped Cape Cod in three separate lobes, the Buzzards Bay, Cape Cod Bay and South Channel Moraines, which are identified by undulating hilly, sandy till morainal deposits.

(2) The Bourne Landfill is situated primarily on the Buzzards Bay outwash deposit. These layered (stratified) outwash sediments of primarily well-sorted sand and gravel were deposited by glacial meltwater streams flowing from the hills of the Buzzards Bay Moraine. In some cases, these meltwater streams flowed around and over blocks of ice which upon melting formed kettle depressions or ponds, sometime with fine sediment bottoms.

(3) At the Bourne Landfill the upper 20 to 40 feet of unconsolidated deposits are typically comprised of coarse to fine sand, and coarse to fine gravel with cobbles and a trace to no silt and become finer with depth. Occasional lenses of silt and clay may be encountered, but typically typical soils at the site are highly permeable and drain very well. The natural surface topography at the site slopes gently toward the interior of the property eliminating surface water flow from the site.

2.2.8.2 Hydrogeology

(1) The groundwater flow system on Cape Cod consists of six distinct aquifers bounded by salt water. The Bourne Landfill is located over the western edge of the largest of these aquifers in aerial extent and volume, known as the Sagamore Lens. Approximately 40 to 47 inches of precipitation fall annually on Cape Cod, with nearly half recharging the groundwater lenses. Groundwater in the center of

the Sagamore Lens reaches elevations of approximately 70 feet MSL in Sandwich beneath Joint Base Cape Cod (JBCC) and flows radially outward in all directions from this peak.

(2) Near the Bourne Landfill, the groundwater flow direction is to the west-northwest toward Buzzards Bay, as shown on Figure 13, Groundwater Contour Plan in Attachment 3, which represents measurements taken in 1998. This round of groundwater measurements, which used eleven monitoring wells, is the most conclusive map of groundwater flow at the site because there were a number of measuring points within the footprint of the Landfill that were subsequently and properly abandoned and are now beneath the Landfill. This round of water levels is not only the most precise measurements available for groundwater flow, but also represents the maximum groundwater levels recorded to date for the site.

(3) Figure 13 generally agrees with the much larger and regional groundwater flow maps developed over the past several decades using thousands of measuring points developed to analyze groundwater flow originating at JBCC, by the United States Army Corps of Engineers (USACE), which are currently being used to track and remediate groundwater contamination radiating from the center of the Sagamore Lens. A portion of this regional map is shown on Figure 14, USACE Groundwater Flow and Contaminant Plume included in Attachment 3, which indicates the same groundwater flow trajectory that is shown on Figure 13. In addition, the MADEP MEP project *Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Phinneys Harbor, Eel Pond and Back River System, Bourne, Massachusetts* indicates that groundwater flows to the west-northwest.

(4) Based on Figure 13, the average hydraulic gradient across the site is 0.003 feet per foot. This value generally agrees with the regional USACE flow model. Using the average hydraulic gradient across the site of 0.003 ft/ft and the average hydraulic conductivity calculated during numerous previous studies, which is 258 ft/day, the average linear groundwater flow velocity at the site is approximately 2.2 ft/day, indicating in one year the groundwater would be expected to flow approximately 800 feet.

(5) Vertical hydraulic gradients measured at well couplets change depending upon the season, the amount of precipitation and site runoff controls and for the most part are minimal in relation to horizontal groundwater flow.

(6) The Cape Cod Commission (CCC) has been taking monthly measurements from USGS network wells throughout Barnstable County for thirty years to track regional fluctuations in the water table. Since 2018, CCC staff have measured the groundwater level in well MW-20S at the Bourne Landfill as part of this regional monitoring effort. These measurements indicate that in the higher elevations of the Landfill site the depth to groundwater is well over 100 feet with a seasonal fluctuation of approximately 2 feet.

(7) The closest surface water body to the Facility is Donnelly Pond located approximately 500 feet to the east. Since groundwater flow is to the west and surface water does not flow from the Facility, it can be concluded that Donnelly Pond is not and will not be impacted by the expansion of the Facility.

2.2.8.3 Water Supplies

(1) No existing or potential public drinking water wells exist downgradient from the Facility. No Zone II areas or Interim Wellhead Protection Area (IWPA) are located downgradient from the Facility. The nearest Town of Bourne Zone I and Zone II areas to the Landfill are shown on Figure 15 – MA DEP Water Resource Map. As can be noted the nearest well is the relatively new well 4036000-08G. No private drinking water supply wells are located within 500 feet of the Facility. The Town is not aware of any private drinking water wells located downgradient from the Facility. The presence of any such downgradient drinking water supply well would be illegal, in accordance with a Bourne Board of Health regulation. (See Attachment 10). This in effect, and by law, renders all areas downgradient of the Landfill to be within the area of a “non-potentially productive aquifer”. Therefore, expansion of the Facility will pose no risk to public drinking water supplies.

(2) The Bourne Landfill is located over the Cape Cod Sole Source Aquifer, as designated by the EPA. However, it has been established above that there are no existing or potential public or private drinking water supplies downgradient from the Facility.

(3) The Bourne Water District (BWD) is supplied by ten different sources, seven are BWD gravel packed well sites and three are gravel packed well sites that are part of the Upper Cape Regional Water Supply Cooperative. Four of BWD well sites are in the Monument Beach area of the Town Forest and two wells are in the Cataumet area. The Bourne water supply includes the newly established well 4036000-08G which is located on JBCC. This well was developed as part of the USACE project to identify water supplies on JBCC known as the Upper Cape Water Supply Project in 2001. This well was carefully sited along with three others to thread Zone II areas between JBCC contaminant plumes. In addition, the Town was connected by a metering station at Connery Avenue to the other wells of the Upper Cape Water Supply Cooperative which have a total permitted yield of 3 million gallons per day (MGD). These water supply wells are referenced in the *Bourne Water District’s Water Quality Report for 2019*, which is included in Attachment 10.

(4) This cooperative allows BWD to obtain water along with other cooperative members (Sandwich Water District, Falmouth, Mashpee and JBCC) to withdraw any needed supplemental water from the legislatively established Upper Cape Water Supply Reserve. While currently permitted at 3 MGD the three Reserve wells are capable of producing 6 MGD. If ever needed the Cooperative has the ability of establishing additional water sources within the Reserve. Based on

land use in all Cooperative member jurisdictions and environmental impacts to sensitive environmental areas, along with the relatively low cost for the Cooperative to develop future water supply sources, it is anticipated that any such need on the Upper Cape will be from the Reserve. All portions of the Reserve are up-gradient from the Landfill.

(5) While the area downgradient of the Bourne Landfill is indicated by mapping to be a Potentially Productive Aquifer public or private water supplies in the area could not be permitted and are illegal because of current land use and potential impacts from water withdrawal, as well as the aforementioned Bourne Board of Health regulation. The Board of Health regulation in and of itself renders the area to be a Non-Potentially Productive Aquifer, since no water supply wells can be developed in this area.

(6) As discussed above the water supplies developed on JBCC where threaded between containment plumes. As shown on Figure 14 the main plume contains RDX ($(O_2NNCH_2)_3$, and various amounts of perchlorate, both explosive compounds, which originate from the Impact area and is partially heading in the direction of the Landfill. While this plume is being remediated it is unlikely that a public water supply would be allowed in its path until remediation is complete, in the next century. In addition, any new public water supply in the area has the potential of altering the groundwater flow, which could impede clean-up efforts.

(7) Figure 15 shows modeled particle tracks originating from the Landfill area based on groundwater flow and accounting for other aquifer characteristics discussed above. These modeled particle tracks account for advection and dispersion and indicate the area that groundwater beneath the Landfill travels. Figure 15 also shows that land use immediately downgradient of the Bourne Landfill includes two other landfills, which in themselves would prohibit the siting of a public water supply.

(8) The Brookside mixed-use development is located immediately to the west of the site. Brookside consists of 300 condominium units, a wastewater treatment plant, an 18-hole golf course and open spaces. The old Bourne Municipal Landfill is also located within the Brookside development. The old landfill was closed in the mid 1960's and contained municipal solid waste, ash, sewage and wood waste. According to studies conducted in 1986, trace concentrations of lead and synthetic organic pesticides (dichlorodiphenyltrichloroethane or DDT and associated compounds) were present in the waste.

(9) Further to the north of the Brookside Landfill and also in the line of particle tracks is the Nightingale Stump Dump, which was opened in 1971 to dump wood waste, supposedly for the construction of a campground. According to MA DEP records this landfill is unlined and did not complete proper closure.

(10) Based on MA DEP mapping the housing density and possibly more important the septic system density within the particle track is too high to allow a public

water supply. This density also results in parcel size and use limiting a site that would meet the Zone I (400 foot radius or eleven acres) requirements.

(11) The closest downgradient surface water body is Mill Pond, located approximately 3,000 feet (0.6 miles) hydraulically downgradient from the Facility. An active cranberry bog and wooded swamp are located directly south of Mill Pond. Locally, the wetlands area located south of the cranberry bogs is known as “Head of the Springs” because of the groundwater discharge as springs to this low-lying area. Therefore, the water in Mill Pond is from groundwater. Mill Pond drains to the Back River.

(12) The Back River estuary and headwater wetlands are an Area of Critical Environmental Concern (ACEC). The Back River estuarine system includes upstream freshwater wetlands within the drainage basin. A public water supply in this area would potentially diminish groundwater discharge and potentially change the salinity in the ACEC. This has the potential on impacting plant and animal species, making it unlikely to be able to permit a public supply well under current regulations. The potential impact to a water supply as you approach the estuary is the potential for saltwater intrusion to the well screen.

SECTION 3.0 DRAFT SITE SUITABILITY CRITERIA

As discussed previously, there will be an application for Major Modifications of the Existing Site Assignment for the Bourne ISWM Facility and a New Site Assignment for the LHF. The modification of the existing Handling Facility Site Assignment to allow the Phase 7 and Phase 8 landfill operations on the 25-acre parcel and the modification of the existing landfill Site Assignment to allow the Phase 9 vertical expansion will be the first application. The second application will be to allow the relocation and operation of the LHF onto a portion of the 12-acre parcel. The Facility-Specific Site Suitability Criteria and General Site Suitability Criteria that are applicable to these modifications are presented below (in italics) as they appear in, or are paraphrases of, the regulations at 310 CMR 16.40 (3)(a) Criteria for Landfill Facilities, 310 CMR 16.40 (3)(d) Criteria for Solid Waste Handling Facilities and 310 CMR 16.40 (4) General Site Suitability Criteria, respectively, or on the BWP SW 38 Application Form. In addition, the applicability of the provisions of 310 CMR 16.22 Modifications to and Rescissions and Suspensions of Site Assignment to this Application are discussed, as this section may limit the evaluation of criteria to only those that are affected by the modification, as determined by MA DEP. Please note that despite the Phase 9 vertical expansion being fully within the area that is currently site assigned for landfill operations, MA DEP has determined that a modification to the existing site assignment is required for the Phase 9 vertical expansion and in its comment letter on the ENPC (See Attachment 1) has identified limited criteria that need to be evaluated for the modification to the Site Assignment, as it applies to Phase 9. Those criteria are limited to General Criteria and are identified in the discussion of those criteria.

M.G.L. c. 111, § 150A½, MA DEP regulations, codified at 310 CMR 16.00, establish the criteria that MA DEP uses in determining whether a site is suitable for a site assignment under M.G.L. c. 111, § 150A for a Solid Waste Management Facility. Local boards of health are required to use these criteria to make a determination whether to grant or deny a Site Assignment. A local board of health shall assign a place requested by an applicant as a site for a new or modified facility unless the board makes a finding, based on the siting criteria established by M.G.L. c. 111, § 150A½, that the siting thereof would constitute a danger to the public health or safety or the environment. 310 CMR 16.40 (3)(a) Criteria for Landfill Facilities, 310 CMR 16.40 (3)(d) Criteria for Solid Waste Handling Facilities and 310 CMR 16.40 (4) General Site Suitability Criteria are described and evaluated below in terms of the proposed modification of the existing Solid Waste Handling Site Assignment to a proposed Landfill Site Assignment on the 25-acre parcel and the New Site Assignment for the proposed relocation of the existing Solid Waste Handling Site Assignment on to a portion of the adjacent 12-acre parcel at the ISWM facility which does not have an existing site assignment. Figure 12, Proposed Site Assignment Modifications in Attachment 3 delineates the modifications to areas of the site.

3.1 FACILITY-SPECIFIC SITE SUITABILITY CRITERIA

The Facility-Specific Site Suitability Criteria that are applicable to the proposed modification of the solid waste handling facility site assignment of the 25-acre parcel to a landfill facility site assignment are presented below (in italics) as they appear in or are paraphrases of the regulations. Each criterion is addressed with respect to the proposed project.

3.1.1 310 CMR 16.40(3)(a) Criteria for Landfill Facilities

No site shall be determined to be suitable or be assigned as a solid waste landfill facility where:

1. *Any area of waste deposition would be within the Zone II of a public water supply well;*

   The Bourne Landfill is not within a Zone II of an existing public water supply well. The nearest Zone II is approximately 0.4 miles to the south of the 25-acre parcel. Refer to Figure 10, Water Resources Plan in Attachment 3. The site meets this criterion.

2. *Any area of waste deposition would be within the Interim Wellhead Protection Area (IWPA) of an existing public water supply provided that the proponent may conduct a preliminary Zone II study, approved of by the Department, to determine if the facility would be beyond the Zone II of the public water supply well in question;*

   The Bourne Landfill is not within an IWPA of an existing public water supply. Refer to Figure 10, Water Resources Plan in Attachment 3. The site meets this criterion.

3. *Any area of waste deposition would be within a Zone II or Interim Wellhead Protection Area (IWPA) of a proposed drinking water source area, provided that the documentation necessary to obtain a source approval has been submitted prior to the earlier of either the site assignment application, or if the MEPA process does apply, the Secretary's Certificate on the Environmental Notification Form or Notice of Project Change, or where applicable, the Secretary's Certificate on the EIR or Final EIR;*

   The Bourne Landfill is not within an IWPA or a Zone II of a proposed drinking water source area. The site meets this criterion.

4. *Any area of waste deposition would be within 15,000 feet upgradient of the existing public water source well or proposed drinking water source area for which a Zone II has not been calculated; the proponent may conduct a preliminary Zone II study, approved of by the Department, to determine if the facility would be beyond the Zone II of the public water supply well or proposed drinking water source area in question;*

The nearest public drinking water supply well is about 0.83 miles south and cross-gradient (not downgradient) to the 25-acre parcel. Refer to Figure 10, Water Resources Plan in Attachment 3. The Facility is therefore not upgradient of an existing public water supply well. The site is not in a proposed drinking water source area as the Bourne Board of Health has issued a regulation that prohibits (makes illegal) the installation of any public or private water supply wells downgradient of the Landfill. The site meets this criterion.

5. *It is determined by the Department that a discharge from the facility would pose a danger to an existing or proposed drinking water source area;*

The nearest public drinking water supply well is about 0.83 miles south and cross-gradient (not downgradient) to the 25-acre parcel. The Facility is not upgradient of an existing or potential public water supply. The Facility is not located within a "Current Drinking Water Source Area". While the Landfill and the downgradient area are within the medium yield, sole source Cape Cod aquifer, areas downgradient have been designated as Non Potential Drinking Water Source Areas on MA DEP resource maps (Figure 15) and the Bourne Water District has stated in a letter included in *Attachment 10 – Water Resources Correspondence* that it does not have, nor will it seek to locate future drinking water sources downgradient of the Landfill. Additionally, the Bourne Board of Health has issued a regulation that prohibits the installation of any public or private water supply wells downgradient of the Landfill, making it illegal to construct a water supply well, thus the entire area is a non-Potentially Productive Aquifer. A letter from the Bourne Board of Health, confirming this bylaw is also included in Attachment 10. All previously identified downgradient water supply wells have been replaced with connections to the public water supply system. The site meets this criterion.

6. *Any area of waste deposition would be over the recharge area of a Sole Source Aquifer, unless all of the following criteria are met:*

   a. *There are no existing public water supplies or proposed drinking water source areas downgradient of the site;*

   There are no existing or proposed public drinking water supply wells downgradient of the Bourne landfill. The Facility is not upgradient of an existing or potential public water supply. The Bourne Board of Health has made it illegal to install water supply wells downgradient of the Landfill. The site meets this criterion.

   b. *There are no existing or potential private water supplies downgradient of the site; however, the applicant may have the option of providing an alternative public water supply to replace all the existing or potential downgradient private groundwater supplies; and*

   The Bourne Water District has stated in a letter that it does not have existing, nor will it seek to locate future drinking water sources downgradient of the Landfill. Additionally, the Bourne Board of Health has issued a regulation that makes it illegal to install any public or private water supply wells downgradient of the Landfill. All previously identified water supply wells have been replaced with connections to the public water supply system. Consequently, there are no existing or potential private water supplies downgradient of the site. See *Attachment 10 – Water Resources Correspondence.* The site meets this criterion.

c. *There exists a sufficient existing public water supply or proposed drinking water source area to meet the municipality's projected needs;*

The Bourne Water District (BWD) is the water supply for the portion of Bourne that is on the Cape side of the Cape Cod Canal. The BWD is not responsible for providing sufficient water supplies to other parts of the municipality. BWD is supplied by ten different sources, seven are BWD gravel packed well sites and three are gravel packed well sites that are part of the Upper Cape Regional Water Supply Cooperative. Four of BWD well sites are in the Monument Beach area of the Town Forest and two wells are in the Cataumet area. The Bourne water supply includes the newly established well 4036000-08G which is located on JBCC. This well was developed as part of the USACE project to identify water supplies on JBCC known as the Upper Cape Water Supply Project in 2001. This well was carefully sited along with three others to thread Zone II areas between JBCC contaminant plumes. In addition, the Town was connected by a metering station at Connery Avenue to the other wells of the Upper Cape Water Supply Cooperative which have a total permitted yield of 3 million gallons per day (MGD).

This cooperative allows BWD to obtain water along with other cooperative members (Sandwich Water District, Falmouth, Mashpee and JBCC) to withdraw any needed supplemental water from the legislatively established Upper Cape Water Supply Reserve. While currently permitted at 3 MGD the three Reserve wells are capable of producing 6 MGD. If ever needed the Cooperative has the ability of establishing additional water sources within the Reserve. Based on land use in all Cooperative member jurisdictions and environmental impacts to sensitive environmental areas, along with the relatively low cost for the Cooperative to develop future water supply sources, it is anticipated that any such need on the Upper Cape will be from the Reserve. All portions of the Reserve are up-gradient from the Landfill. The site meets this criterion.

7. *Any area of waste deposition is within the zone of contribution of an existing public water supply or proposed drinking water source area, or the recharge area of a surface drinking water supply, pursuant to a municipal ordinance or by-law enacted in accordance with M.G.L. c. 40A, § 9;*

All existing and proposed areas of waste deposition at the Bourne Landfill are not within the zone of contribution of an existing public water supply or proposed drinking water source area, or the recharge area of a surface drinking water supply. The nearest public drinking water supply well is about 0.83 miles south and cross-gradient (not downgradient) to the 25-acre parcel. The Facility is not upgradient of an existing or potential public water supply. The Facility is not located within a "Current Drinking Water Source Area", but the Facility is located within a "Potential Drinking Water Source Area" due to the mapped presence of a Potentially Productive Aquifer. A majority of the areas hydraulically downgradient of the Facility are located over the mapped Potentially Productive Aquifer. However, portions of aquifer beneath the highway corridor associated with MacArthur Boulevard and some areas immediately west of MacArthur Boulevard have been classified as non-potential drinking water source areas" in accordance with the Massachusetts Contingency Plan ("MCP"). The Bourne Water District has stated in a letter included in Attachment 10 that it does not have, nor will it seek to locate future drinking water sources downgradient of the Landfill. Additionally, the Bourne Board of Health has issued a regulation, as confirmed in a letter also included in Attachment 10, that prohibits the installation of any public or private water supply wells downgradient of the Landfill. All previously identified water supply wells have been replaced with connections to the public water supply system. The site meets this criterion.

8. *Any area of waste deposition would be within the Zone A or Zone B of a surface drinking water supply;*

   The Bourne Landfill site is not within a Zone A or Zone B of a surface drinking water supply. The site meets this criterion.

9. *Any area of waste deposition would be less than 400 feet upgradient, as defined by groundwater flow or surface water drainage, of a perennial water course that drains to a surface drinking water supply which is within one mile of the waste deposition area;*

   The Landfill is not located less than 400 feet upgradient, as defined by groundwater flow or surface water drainage, of a perennial water course that drains to a surface drinking water supply which is within one mile of the waste deposition area. The site meets this criterion.

10. *Any area of waste deposition would be within a Potentially Productive Aquifer unless:*

    a. *The proponent demonstrates to the Department's satisfaction, based on hydrogeological studies, that the designation of the area as a potentially productive aquifer is incorrect;*

    Because the Facility is located on Cape Cod, the site is defined in the Massachusetts Contingency Plan (MCP) as being located in a Potentially Productive Aquifer. As further defined in the MCP the Facility is not located within a "Current Drinking Water Source Area", but the Facility is by this definition, located within a "Potential Drinking Water Source Area" due to the presence of the Potentially Productive Aquifer. Portions of the aquifer downgradient from the site beneath the highway corridor associated with MacArthur Boulevard and some areas immediately west of MacArthur Boulevard have been classified as "Non-Potential Drinking Water Source Areas" in accordance with the MCP. Other contamination sources downgradient of the site, and in particular Phases 7 and 8, are two closed and unlined landfills (Brookside Landfill and Nightingale Stump Landfill). In addition, hydrogeologic studies conducted for the Facility (Mahoney and Douglas, April 11, 2003 and October 8, 2003) determined by particle tracking analysis supplied by the USGS, that groundwater flows from the site in a generally west-northwest direction to tributaries of Buzzards Bay and the Cape Cod Canal, both salt or brackish waters. Water supply wells within the downgradient areas of the particle tracking plumes have the potential of pulling in brackish water, which could contaminate the wells. The results of the particle tracking analysis results are shown on Figure 15, MA DEP Water Resouces Map, which is included in Attachment 3 and in Attachment 10. As a result of these hydrogeologic studies the Bourne Water District has determined that the areas downgradient of the Landfill are, for their purposes, "Non-Potential Drinking Water Source Areas" and that they will not seek to locate future drinking water sources in these areas. The Bourne Water District has stated this in a letter included in Attachment 10 that it does not have, nor will it seek to locate future drinking water sources downgradient of the Landfill. Additionally, as a result of the hydrogeologic studies the Bourne Board of Health has issued a regulation, as confirmed in a letter also included in Attachment 10, that prohibits the installation of any public or private water supply wells downgradient of the Landfill. All previously identified water supply wells have been replaced with connections to the public water supply system.

Actions taken as a result of hydrogeologic studies, have included the establishment of local by-laws and policies that prohibit and make illegal the construction of private or public water supply wells, which is characteristic of a Non-Potential Drinking Water Source Area. Therefore, despite the Facility being on Cape Cod, within the mapped limits of a Potentially Productive Aquifer, the designation of the area as a Potentially Productive Aquifer is incorrect and the site is in fact a Non-Potentially Productive Aquifer. The site meets this criterion.

b. *The proponent demonstrates to the Department's satisfaction, based on hydrogeological studies, that the aquifer cannot now, nor in the reasonably foreseeable future, be used as a public water supply due to existing contamination of the aquifer; or*

Because the Facility is located on Cape Cod, the site is defined in the Massachusetts Contingency Plan (MCP) as being located in a Potentially

Productive Aquifer. As further defined in the MCP the Facility is not located within a "Current Drinking Water Source Area", but the Facility is by this definition, located within a "Potential Drinking Water Source Area" due to the presence of the Potentially Productive Aquifer. Portions of the aquifer downgradient from the site beneath the highway corridor associated with MacArthur Boulevard and some areas immediately west of MacArthur Boulevard have been classified as "Non-Potential Drinking Water Source Areas" in accordance with the MCP. Other contamination sources downgradient of the site, and in particular downgradient of Phases 7 and 8, are two closed and unlined landfills (Brookside Landfill and Nightingale Stump Landfill). In addition, hydrogeologic studies conducted for the Facility (Mahoney and Douglas, April 11, 2003 and October 8, 2003) determined by particle tracking analysis supplied by the USGS, that groundwater flows from the site in a generally west-northwest direction to tributaries of Buzzards Bay and the Cape Cod Canal, both salt or brackish waters. Water supply wells within the downgradient areas of the particle tracking plumes have the potential of pulling in brackish water, which could contaminate the wells. The results of the particle tracking analysis results are shown on Figure 15, MA DEP Water Resources Map, which is included in Attachment 3 and in Attachment 10. In addition to these downgradient contamination sources, hydrogeologic studies conducted on the JBCC site have determined that there is an existing plume of contamination that will eventually migrate through the Landfill to downgradient sites, making groundwater in this area unusable as a drinking water source. See Figure 14, USACE Groundwater Flow and Contamination Plume, which is in Attachment 3. As a result of these hydrogeologic studies the Bourne Water District has determined that the areas downgradient of the Landfill are, for their purposes, "Non-Potential Drinking Water Source Areas" and that they will not seek to locate future drinking water sources in these areas. The Bourne Water District has stated this in a letter included in Attachment 10 that it does not have, nor will it seek to locate future drinking water sources downgradient of the Landfill. Additionally, as a result of the hydrogeologic studies the Bourne Board of Health has issued a regulation, as confirmed in a letter also included in Attachment 10, that prohibits the installation of any public or private water supply wells downgradient of the Landfill. All previously identified water supply wells have been replaced with connections to the public water supply system.

Based on hydrogeological studies, the aquifer downgradient of the Facility cannot now, nor in the reasonably foreseeable future, be used as a public water supply due to existing contamination of the aquifer. The site meets this criterion.

c. *The area has been excluded as a “Non-Potential Drinking Water Source Area” pursuant to 310 CMR 40.0932, or as otherwise defined at 310 CMR 40.0006: The Massachusetts Contingency Plan.*

Portions of aquifer beneath the highway corridor associated with MacArthur Boulevard and some areas immediately west of MacArthur Boulevard have been classified as "Non-Potential Drinking Water Source Areas" in accordance with the Massachusetts Contingency Plan ("MCP"). In addition, there are two closed, unlined landfills and the potential for the presence or the promotion of brackish water that should characterize the area as a "Non-Potential Drinking Water Source Areas". See the responses above. The site meets this criterion.

11. *Any area of waste deposition would be within 1000 feet upgradient, and where not upgradient, within 500 feet, of a private water supply well existing or established as a potential supply at the time of submittal of the application; provided, however, the applicant may show a valid option to purchase the restricted area, including the well and a guarantee not to use the well as a drinking supply, the exercise of which shall be a condition of any site assignment;*

The Bourne Landfill area is currently served by the Bourne Water District for drinking water. There are no known private drinking water supply wells within 1,000 feet of the Bourne Landfill site. Additionally, there are no known potential private water supplies, as defined in 310 CMR 16.02, within 500 feet of the Bourne Landfill site. The Bourne Water District has stated in a letter included in Attachment 10 that it does not have, nor will it seek to locate future drinking water sources downgradient of the Landfill. Additionally, the Bourne Board of Health has issued a regulation, as confirmed in a letter also included in Attachment 10, that prohibits the installation of any public or private water supply wells downgradient of the Landfill. All previously identified water supply wells have been replaced with connections to the public water supply system. The site meets this criterion.

12. *The maximum high groundwater table is within four feet of the ground surface in areas where waste deposition is to occur or, where a liner is designed to the satisfaction of the Department, within four feet of the bottom of the lower-most liner;*

Near the Bourne Landfill, the groundwater flow direction is to the west-northwest toward Buzzards Bay, as shown on Figure 13, Groundwater Contour Plan in Attachment 3, which represents measurements taken in 1998. This round of groundwater measurements, which used eleven monitoring wells, is the most conclusive map of groundwater flow at the site because there were a number of measuring points within the footprint of the Landfill that were subsequently and properly abandoned and are now beneath the Landfill. This round of water levels is not only the most precise measurements available for groundwater flow, but also represents the maximum groundwater levels recorded to date for the site. The design elevation of the bottom of the low permeable soil at the leachate sump is the point to which the design groundwater separation distance of four feet is to be established. The anticipated design for the Phase 7 and Phase 8 Landfills will be that leachate from Phase 7 will drain to the currently active

Phase 6 leachate sump, which was designed and approved to meet the minimum separation requirements, as part of the Phase 6 ATC approval process. A separate leachate collection and sump system will be designed for the Phase 8 Landfill, which will also meet that criteria. The site meets this criterion.

13. *The outermost limits of waste deposition or leachate containment structures would be within a resource area protected by the Wetlands Protection Act, M.G.L. c. 131, § 40, including the 100 year floodplain;*

The limits of the waste deposition area or leachate containment structures are not within any resource areas protected by the Wetlands Protection Act, M.G.L. c. 131, § 40, including the 100 year floodplain. The site meets this criterion.

14. *Any area of waste deposition or the leachate containment structures would be less than 400 feet to a lake, or 200 feet to a Riverfront Area as defined in 310 CMR 10.00, that is not a drinking water supply;*

The area of waste deposition or the leachate containment structures will not be less than 400 feet to a lake, or 200 feet to a Riverfront Area as defined in 310 CMR 10.00, that is not a drinking water supply. The site meets this criterion.

15. *Any area of waste deposition would be within 1000 feet of an occupied residential dwelling, health care facility, prison, elementary school, middle school or high school or children's pre-school, licensed day care center, senior center or youth center, excluding equipment storage or maintenance structures; provided, however, that the applicant may show a valid option to purchase the restricted area, the exercise of which shall be a condition of any site assignment; or*

There are no occupied residential dwellings, health care facilities, prisons, elementary schools, middle schools or high schools or children's pre-schools, licensed day care centers, senior centers or youth centers within 1,000 feet of the proposed waste deposition area. The limit of waste has been designed to maintain a minimum distance of 1,000 feet from a store with an upstairs apartment that is part of the Bay View Campground. This structure meets the definition of an "occupied residential dwelling". Within the 1,000 foot radius of the waste deposition area are campsites. These are used seasonally and occupied by tents, campers and trailers, which do not meet the definition of an "occupied residential dwellings". See Figure 9, Land Use Site Plan included in Attachment 3. The site meets this criterion.

16. *Waste deposition on the site would result in a threat of an adverse impact to groundwater through the discharge of leachate, unless it is demonstrated to the satisfaction of the Department that a groundwater protection system will be incorporated to prevent such threat.*

A groundwater protection system will be incorporated into the design of the Landfill that will be a double composite liner with interstitial leak detection, which will meet or exceed MA DEP requirements for a groundwater protection system, as stipulated at 310 CMR 19.110. The site meets this criterion.

3.1.2 310 CMR 16.40(3)(d) Criteria For Handling Facilities

The Facility-Specific Site Suitability Criteria that are applicable to the the new site assignment that would allow for a handling facility on portions of the 12-acre parcel to the south of the 25-acre parcel are presented below (in italics) as they appear in, or are paraphrases of the regulations at 310 CMR 16.40 (3)(d) or on the BWP SW38 Application Form.

No site shall be determined to be suitable or be assigned as a solid waste facility where:

1. *The waste handling area would be within the Zone I of a public water supply.*

   The proposed solid waste handling area at the Bourne facility is not within Zone I of a public water supply. The site meets this criterion.

2. *The waste handling area would be within the Interim Wellhead Protection Area (IWPA) or a Zone II of an existing public water supply well within a proposed drinking water source area, provided that the documentation necessary to obtain a source approval has been submitted prior to the earlier of either the site assignment application, or if the MEPA process does apply, the Secretary's Certificate on the Environmental Notification Form or Notice of Project Change, or where applicable, the Secretary's Certificate on the EIR or Final EIR, unless restrictions are imposed to minimize the risk of an adverse impact to the groundwater; and either*

   a. *The proponent can demonstrate to the satisfaction of the Department that the facility cannot reasonably be sited outside of the IWPA or Zone II; or*

   b. *There would be a net environmental benefit to the groundwater by siting the facility within the Zone II or the IWPA where the site has been previously used for solid waste management activities.*

   The proposed solid waste handling area at the Bourne facility is not within an IWPA or a Zone II of an existing public water supply. The nearest Zone II is approximately 0.30 miles to the south of the 12-acre parcel. The site meets this criterion.

3. *The waste handling area would be within the Zone A of a surface drinking water supply.*

   The proposed solid waste handling area at the Bourne facility is not within the Zone A of a surface drinking water supply. The site meets this criterion.

4. *The waste handling area would be within 500 feet upgradient, and where not*

upgradient, within 250 feet, of an existing or potential private water supply well existing or established as a Potential Private Water Supply at the time of submittal of the application, provided however, the applicant may show a valid option to purchase the restricted area including the well and a guarantee not to use the well as a drinking water source, the exercise of which shall be a condition of any site assignment.

There are no existing or potential private drinking water supply wells within 500 feet of the proposed solid waste handling area at the Bourne facility. The site meets this criterion.

5. *The waste handling area of (a) a transfer station that proposes to receive less than or equal to 50 tons per day of solid waste and utilizes a fully enclosed storage system such as a compactor unit ....(b) any other transfer station or any handling facility is 500 feet from: (i) an occupied residential dwelling; or(ii) a prison, health care facility, elementary school, middle school or high school, children's preschool, licensed day care center, or senior center or youth center, excluding equipment storage or maintenance structures.*

   b.i. There are no occupied residential dwellings within 500 feet of the proposed solid waste handling area at the Bourne facility. The site meets this criterion.

   b.ii. There are no prisons, health care facilities, elementary schools, middle schools or high schools, children's preschools, licensed day care centers, or senior centers or youth centers within 500 feet of the area proposed to be used for waste handling at the Bourne facility. See Figure 9, Land Use Site Plan included in Attachment 3. The site meets this criterion.

6. *A waste handling area would be within the Riverfront Area as defined at 310 CMR 10.00.*

   The proposed solid waste handling area at the Bourne facility is not within a Riverfront Area. The site meets this criterion.

7. *The maximum high groundwater table is within two feet of the ground surface in areas where waste handling is to occur unless it can be demonstrated that a two foot separation can be designed and operated to the satisfaction of the Department.*

   The maximum groundwater table varies across the property from an elevation of approximately 49 feet along its eastern edge to 42 feet adjacent to MacArthur Boulevard along the facility's western edge. See Figure 13, Groundwater Contour Plan in Attachment 3. The approximate surface elevation of the proposed waste handling area is in the range of 100 feet. Based upon this information, there is a vertical separation distance between groundwater and proposed or potential waste handling areas of at least 50 feet, which far exceeds the minimum 2 feet separation distance required for handling facilities. The site meets this criterion.

3.2 310 CMR 16.40(4) GENERAL SITE SUITABILITY CRITERIA

The General Site Suitability Criteria outlined in 310 CMR 16.40(4) apply to all types of solid waste management facilities, and address concerns such as traffic and access to a site, threatened and endangered species, and Areas of Critical Environmental Concern. The General Site Suitability Criteria apply equally to both handling facilities and landfills. Since the 25-acre parcel was demonstrated to meet all of the General Site Suitability Criteria as part of the site assignment process for a handling facility, modification to a landfill site assignment should not affect the results of the previous evaluation of the General Site Suitability Criteria. MA DEP has indicated that it will require the evaluation of only select criteria for the Phase 9 vertical expansion, namely: Traffic and Access to the Site (b), Potential Air Quality Impacts (f), Potential for the Creation of Nuisances (g), Size of Facility (h), Areas Previously Used for Solid Waste Disposal (i), Consideration of Other Sources of Contamination or Pollution (k), and Promotion of Integrated Solid Waste Management. The criteria discussed below includes evaluation of the criteria as it relates to the Phase 7, 8 and 9 expansion as well as the relocation of the handling facility onto a portion of the 12-acre parcel.

The following Site Suitability Criteria shall apply to all types of solid waste management facilities.

a. <u>*Agricultural Lands.*</u> *No site shall be determined to be suitable or would be assigned as a solid waste management facility where:*

1. *The land is classified as Prime, Unique, or of State and Local Importance by the United States Department of Agriculture, Natural Resources Conservation Service; or*

   A *Custom Soil Resource Report for Barnstable County, Massachusetts, Town of Bourne, ISWM Department* was prepared by the United States Department of Agriculture, Natural Resources Conservation Service and is included in Attachment 11. In that report, the included soil map identifies the western portion of the 12-acre parcel and the 25-acre parcel, as well as the state-owned abutting land along the western boundary, to be Soil Group *431B, Barnstable sandy loam, 3 to 8 percent slopes, very stony* and *431C, Barnstable sandy loam, 8 to 15 percent slopes, very stony* with a Farmlands Classification of, "Farmland of statewide importance." The remaining portions of the town-owned parcels are identified as Soil Group *435B, Barnstable loamy coarse sand, 3 to 8 percent, very* stony, with a Farmlands Classification of, "Not prime farmland."

   The 25-acre parcel is currently site-assigned for solid waste handling and has been completely disturbed by historical clearing and gravel mining operations and approved solid waste handling operations. Historical aerial photos shown in Attachment 2 indicate this parcel was substantially disturbed prior to acquisition by the Town and subsequent site assignment of the land and may not have met the agricultural land classifications when ISWM acquired it. Included in Attachment 12 are site specific soil survey reports for each parcel prepared by a Certified Professional Soil Scientist/Soil Classifier from LEC Environmental Consultants. These reports document and delineate the actual soil conditions of the two parcels as they relate to this criterion.

Figure 12, *Proposed Site Assignment Modifications* included in Attachment 3, indicates the specific areas where modifications to the site assignment are, or are not, proposed. The blue area on the figure is that portion of the 25-acre parcel where the existing solid waste handling site assignment is currently proposed to be modified for landfilling and represents the conceptual footprint of the Phase 7 and Phase 8 landfills. The yellow area is that portion of the 12-acre parcel that is not site assigned but is currently proposed to be site assigned for solid waste handling, as defined by the property line and the 100-foot offset from the "Farmland of statewide importance." The green area is that area where no site assignment is currently proposed, which on the 25-acre parcel means the solid waste handling site assignment remains in effect and on the 12-acre parcel the area will remain without a site assignment.

Reportedly, there are proposed modifications to *310 CMR 16.00 Site Assignment Regulations for Solid Waste Facilities* that may revise this criteria's requirements. Should this criteria be modified where there would be no or reduced restrictions on the application of a site assignment that would increase the area where solid waste handling or disposal can be increased, the Town will seek to modify the limits of the site assignment area. The site meets this criterion.

2. *The land is deemed Land Activity Devoted to Agricultural or Horticultural Uses, except where the facility is an agricultural facility; and*

   The Bourne Landfill is not deemed to be *Land Activity Devoted to Agricultural or Horticultural Uses*. The site meets this criterion.

3. *A 100 foot buffer would not be present between the facility and those lands classified at 310 CMR 16.40(4)(a)1 or 2.*

   On the 12-acre parcel and the 25-acre parcel, there will be a 100 foot buffer between the delineated "Farmland of statewide importance" and the areas that are proposed to be site-assigned for landfilling or for solid waste handling. Should the Site Assignment Regulations be modified, as discussed above, ISWM will seek to modify the area impacted by the 100 foot buffer, so as to optimize the facility's design. The site meets this criterion.

b. <u>*Traffic and Access to the Site.*</u> *No site shall be determined to be suitable or be assigned as a solid waste management facility where traffic impacts from the* *facility operation would constitute a danger to the public health, safety, or the environment taking into consideration the following factors: (1) traffic congestion, (2) pedestrian and vehicular safety, (3) road configurations, (4) alternate routes, and (5) vehicle emissions.*

1. Traffic Congestion- Site access, volume and regional impacts of traffic coming and going from the Bourne ISWM were thoroughly analyzed during the EIR/DRI Joint review process with MEPA and CCC. Additionally, traffic impacts were again reviewed in 2003 when ISWM filed a Notice of Project Change (NPC) with MEPA, and a Major Modification with the Cape Cod Commission (CCC), to accept MSW at the landfill. All reviews, including those by the CCC, are complete. Since the proposed project, including the Phase 9 expansion, does not propose to increase the permitted tonnage to the site and thereby not changing the traffic volume that has been previously evaluated and approved, or changing the site access, there will be no change to the existing traffic impacts which have already been well evaluated, therefore the facility's operation will not constitute a danger to the public health, safety, or the environment. An alternative analysis, included in Section 2.2.2(7), identified that the preferred alternative, continuing to accept combustor ash from SEMASS, will produce less traffic than the alternative of accepting only MSW. The difference in traffic volume is not significant and will not affect traffic impacts.

   Attachment 13 provides a Traffic Assessment and plan showing infrastructure improvements. This Traffic Assessment and plan are an update of the original FEIR, as well as what was part of the most recent MEPA ENPC and SSEIR submittal in 2018 and the submittal to the CCC for its Development of Regional Impact (DRI) review. The engineer notes in the Assessment that previous project files dating back to the original EIR era were reviewed again and that it includes a review of recent crash data. The site meets this criterion.

2. Pedestrian and Vehicular Safety- The subject parcels are located south of the existing site assigned 74-acre landfill parcel which is accessed by a deceleration lane on the Route 28 north bound lane. This is the only site access point and it has been thoroughly reviewed for safety concerns. Pedestrians are prohibited along Route 28, therefore potential conflicts with pedestrian traffic will not arise. Furthermore, traffic coming to the site will use major highways and will not be traveling through or near congested urban areas, residential neighborhoods or schools. The site meets this criterion.

3. Road Configurations- As previously noted, access to the site is solely through the deceleration lane located on the Route 28, north bound lane, which has been approved by the Massachusetts Department of Transportation, Highway Division (MA DOT), constructed and has been operational for several years. Internal roads accessing the subject parcels consist of the existing main access road along the western perimeters of the

74-acre and 25-acre parcels and to roads and areas along the eastern side of the site, that are not accessible to the general public, which are used primarily for operations purposes. The existing main access road on the western perimeter will continue to be used as part of the Phase 7, 8 and 9 operations and for access to the residential recycling center area and the C&D Transfer Station. Adjustments and extensions to this network will be constructed once access to the 12-acre parcel is achieved. The site meets this criterion.

4. Alternate Routes- Access to the facility is limited to the Route 28, north bound lane as described above. The site meets this criterion.

5. Vehicle Emissions- ISWM has submitted and received approval of its Cumulative Impact Assessment (CIA) which included analysis of potential emissions from the facility. Since the total permitted tonnage at the site will not change, emissions are not expected to change. ISWM has implemented a Best Management Practice program described previously in Section 2.2.6, in order to reduce diesel emissions from its heavy equipment. ISWM's policy for purchasing all new equipment requires that it meet or exceed all current air emissions standards applicable to heavy equipment operations. See Sections 2.2.5.3 and 2.2.6 for discussion the air emissions policy that ISWM has implemented. The site meets this criterion.

c. *Wildlife and Wildlife Habitat. No site shall be determined to be suitable or be assigned as a solid waste management facility where such siting would:*

1. *have an adverse impact on Endangered, Threatened, or Special Concern species listed by the Natural Heritage and Endangered Species Program of the Division of Fisheries and Wildlife in its data base;*

   As identified by a representative from Natural Heritage and Endangered Species Program (NHESP) and Horsley & Witten, Inc., the 25-acre parcel provides a small area of habitat for the Eastern Box Turtle, a species of Special Concern. These areas are identified in the plans in Attachment 3, along the eastern boundary abutting the Joint Base Cape Cod facility. The Town has committed to maintaining a buffer along this boundary to protect this habitat. This buffer may include boulders, fencing or earthen berms to physically separate this area and protect it from disturbance. As indicated in a letter dated July 17, 2001, which is included in Attachment 4, NHESP agreed that rare species will not be directly impacted so long as this area is maintained as a buffer.

   The entire 12-acre parcel is Eastern Box Turtle Habitat. Any portions that are taken for use by ISWM will have to be mitigated with suitable habitat that is placed under a new conservation restriction at a ratio of 1.5 acres for each acre that is taken. The Town has identified such land and is in the process of acquiring it for this purpose. ISWM is working closely with NHESP staff on this issue and no disturbance of the area will occur until all requirements are met including the preparation of a Conservation and Management Permit (CMP). NHESP has determined in a February 5, 2020 letter that Phase 7, Phase 8, Phase 9 and surrounding areas outside of the delineated habitat line are exempt from further Massachusetts Endangered Species Act (MESA) review. See the NHESP comment letter on the ENPC, included in Attachment 4. The site meets this criterion.

2. *have an adverse impact on an Ecologically Significant Natural Community as documented by the Natural Heritage and Endangered Species Program in its data base; or*

   NHESP has confirmed that there will be no impact on an Ecologically Significant Natural Community. The site meets this criterion.

3. *have an adverse impact on the wildlife habitat of any state Wildlife Management Area.*

   A review of the Mass Wildlife Lands viewer confirms that the ISWM facility is not in a Wildlife Management Area. The site meets this criterion.

d. <u>*Areas of Critical Environmental Concern.*</u> *No site shall be determined to be suitable or be assigned as a solid waste management facility where such siting*:

1. *would be located within an Area of Critical Environmental Concern (ACEC), as designated by the Secretary of the Executive Office of Environmental Affairs; or*

2. *would fail to protect the outstanding resources of an ACEC as identified in the Secretary's designation if the solid waste management facility is to be located outside, but adjacent to the ACEC*.

   The Bourne ISWM facility is not within or adjacent to an ACEC. The nearest ACEC is the Bourne Back River estuarine system. The boundary for the Bourne Back River ACEC is located along the western edge of Route 28, across the highway and within 500 feet of the site. However, the Secretary of the Executive Office of Environmental Affairs' Designation of the ACEC clearly identified that the watershed boundary is not part of the ACEC. The ACEC is limited to identified wetlands resource areas and their 100 foot buffer zones. The site meets this criterion.

e. <u>*Protection of Open Space.*</u> *No site shall be determined to be suitable or be assigned as a solid waste management facility where such siting would have an adverse impact on the physical environment of, or on the use and enjoyment of:*

1. State forests;
2. State or municipal parklands or conservation land or other open space held for natural resource purposes in accordance with Article 97 of the

Massachusetts Constitution;

3. *MDC reservations;*
4. *Lands with conservation, preservation, agricultural, or watershed protection restrictions approved by the Secretary of the Executive Office of Environmental Affairs; or*
5. *Conservation land owned by private non-profit land conservation organizations and open to the public.*

In December, 2004, ISWM staff met with the Environmental Manager and Natural Resources Manager of the Massachusetts Army National Guard's (Guard) Environmental and Readiness Center and the Environmental Officer of the Environmental Management Commission (EMC) to discuss ISWM's application to expand the original 74-acre site assignment to allow solid waste handling operations to be conducted on the 25-acre parcel and to address any concerns.

Together, the Guard and the EMC manage the habitat of Camp Edwards, a 15,000-acre parcel located on the Joint Base Cape Cod (JBCC) adjacent to the Town's parcel, to ensure that military training operations do not have an adverse impact on habitat, species or the groundwater. This is especially critical because this area has been designated as the Upper Cape Water Supply Reserve (Chapter 47 of the Acts of 2002 of the Massachusetts General Court) to recognize and protect the area as a drinking water source for the Upper Cape. To that end, the Guard, through its Groundwater Protection Policy, has chosen to treat this area as if it were a Zone II. In addition, this law created the EMC to oversee implementation of environmental management principles agreed to by the Guard. The EMC reports to three agencies that are part of the EOEA and therefore this land could be considered open space as defined in items 2 and 4 listed above.

The Town wishes to support these efforts by eliminating any potential adverse impacts on the physical environment that its operations could have on the JBCC property. Therefore, ISWM has developed the following best management practices (BMPs) to help protect this land. In addition, ISWM will continue to work with officials overseeing the management of the Upper Cape Water Supply Reserve to make modifications to its operations, as necessary.

<u>Litter</u> - It is possible that wind-blown litter might escape the property while landfill operations are being conducted. To address this concern, ISWM has developed and implements a plan containing the following measures.

- Strategically placed permanent litter fencing.
- Use of temporary moveable litter fences.

- Use of tarps over temporary stockpiles to contain recyclables.
- Restrictions on loading and unloading operations on high wind days.
- Regular litter patrols along Canal View Road adjacent to the entire parcel and on Town property.

Dust - Landfill operations will be conducted on soil or ash surfaces that have the potential for creating dust. Therefore, mitigation of dust generation will be an active component of the Landfill's operation. ISWM will continue to use Town owned street sweepers and water trucks to maintain site roads to control dust. ISWM will also conduct active water applications to open surfaces that may generate dust, with particular attention being paid to the Landfill's access roads where heavy equipment operation is conducted. When a contractor is working on the site, they are contractually bound to control dust, principally by water application. Typical specifications included in each bid are presented in Attachment 9 – Construction Best Management Specifications.

Stormwater/Groundwater - The proposed site assignment modification is to convert solid waste handling operations to landfilling operations on the 25-acre parcel and the new site assignment is to relocate existing handling and administration operations to the 12-acre parcel. The Phase 7 and Phase 8 landfill (cells) will be constructed in accordance with the current MA DEP groundwater protection standards, as stipulated at 310 CMR 19.111. These standards require that at least a double composite liner with leak detection be installed. All liners, except for Phase 1-ABC (no liner) and Phase 2 (single composite liner) have been installed to meet the current design standard. Therefore, the risk of potential releases to groundwater is minimal, as determined by the current MA DEP groundwater protection system standards. All stormwater will be managed on site through the use of diversion berms, swales, culverts, retention basins and infiltration basins. This includes the existing large infiltration/sedimentation basin that is located at the northwest corner of the site and a new large infiltration/sedimentation basin that will be on the 12-acre parcel. Refer to Attachment 7, Stormwater Management Plan for a detailed description of the proposed stormwater control facilities.

Buffer - As noted previously, ISWM will maintain the natural buffer along the eastern boundary of the 25-acre and 12-acre parcels to protect the potential Eastern Box Turtle habitat. As an alternative, ISWM may provide compensating habitat land under the CMP discussed above. ISWM may utilize a variety of techniques to physically separate operations from the area including: earthen berms, fencing, boulders and infiltration basins.

As a result of these activities the site meets this criterion.

f. *Potential Air Quality Impacts.* *No site shall be determined to be suitable or be* *assigned as a solid waste management facility where the anticipated emissions from the facility would not meet required state and federal air quality standards or criteria or would otherwise constitute a danger to the public health, safety or the environment, taking into consideration*:

1. *the concentration and dispersion of emissions;*
2. *the number and proximity of sensitive receptors; and*
3. *the attainment status of the area.*

1. The concentration and dispersion of emissions - The proposed facility will not constitute a danger to the public health, safety, or the environment from anticipated air emissions. ISWM submitted a comprehensive document entitled, *Interim Risk Evaluation and Cumulative Impact Assessment of the Proposed Phased Landfill Development of the Town of Bourne Integrated Solid Waste Management Facility.* The analysis examined all current solid waste management activities at the site, including disposal of municipal waste combustor ash, and a projection of a full landfill build-out that assumed a maximum tonnage of 1,000 tons per day. These conditions, except for the assumed increase in maximum daily tonnage, are consistent with the Phase 7, Phase 8 and Phase 9 landfill expansion projects.

   After reviewing the report and supplemental information, Carol Rowan West, Director of MA DEP's Office of Research and Standards, stated in her letter dated July 1, 2003, "*We therefore recommend that this Facility Based Impact evaluation be approved with the caveats discussed above and detailed below."* This review was accepted by MA DEP as part of the ATC application approval for the Phase 3, Stage 3 lined landfill expansion. ISWM has implemented a Best Management Practice program as described above, in order to reduce diesel emissions from its heavy equipment. The site meets this criterion.

2. The number and proximity of sensitive receptors - The closest school is the Bourne Middle School on Waterhouse Road, which is located approximately one mile northwest of the site. The Bourne Manor Health Care Facility is located greater than one half mile from the 25-acre parcel. There are condominiums on Waterhouse Road and at Brookside as well as a campground that are located within one half mile of the facility. All of these receptors are located across Route 28 from the facility. The site meets this criterion.

3. The attainment status of the area – Barnstable County has attained all of the national ambient air quality standards (NAAQS) established by EPA for sulfur dioxide (SO_2), particulate matter ($PM_{2.5}$ and PM_{10}), ozone, lead, carbon monoxide and nitrogen dioxide (NO_2). The site meets this criterion.

g. _Potential for the Creation of Nuisances._ No *site shall be determined to be suitable or be assigned as a solid waste management facility where the establishment or operation of the facility would result in nuisance conditions which would constitute a danger to the public health, safety, or the environment, taking into consideration the following factors: (1) noise; (2) litter; (3) vermin such as rodents and insects; (4) odors, (5) bird hazards to air traffic, and (6) other nuisance problems*.

1. Noise - Certain levels of noise are associated with the operation of trucks and heavy equipment at the Facility. The operation of equipment, the dropping of tailgates and the sound of back up signals are some of the more common and unavoidable sounds at the Facility. Back up signals are a requirement meant to provide a safer environment for the workers and visitors to the Facility.

   Active operation and concurrent construction activities have occurred regularly at the Facility, without any indication that receptors have been adversely impacted by noise. The site is well buffered by distance, traffic noise along Route 28 and vegetation, mitigating potential impacts as confirmed in a previous noise survey. See Attachment 14 for the 2001 Sound Level Survey conducted by Cavanaugh Tocci Associates. The construction and operation of a landfill expansion in Phase 9, on the 25-acre parcel and handling operations of the 12-acre parcel will not result in any significant change of conditions from present and past noise impacts. The site meets this criterion.

2. *Litter* - Facility operations must be conducted to minimize blowing litter within the landfill and the handling facility area. The level of effort needed to control windblown litter is dictated by waste materials accepted, weather conditions and wind conditions. Methods available to control windblown litter include the following:

   <u>Portable litter fence.</u> The most suitable location for litter control fence should be determined on a daily, or even more frequent, basis, based on the wind's direction. The fencing should be placed as close to the active face as practical without interfering with the landfilling operations. The fencing should be constructed to allow the wind to pass through it.

   <u>Permanent litter fencing.</u> Litter fencing has been installed along the northern, eastern and western property lines. The permanent, existing fencing will be extended southerly from the limit of the existing fencing along the eastern and western property lines to the southern limits of the proposed Phase 7 and Phase 8 Landfill expansion.

Application of cover material. Cover material should be applied frequently on the active face on windy days, if required, to minimize the blowing of lightweight waste materials.

Active face on interior slopes. On windy days, the active face should be maintained on interior slopes, if possible. Waste disposal on outer slopes should be avoided when it is windy.

Litter patrols. Litter collection crews are deployed regularly and as needed to gather windblown litter. In addition, these crews must routinely police areas along MacArthur Boulevard and properties abutting the Facility, including JBCC.

Temporary fence. Temporary fence is installed at strategic locations within the operating landfill to create additional interception and collection points for wind-blown liter.

Covering Vehicles. All vehicles entering or leaving the facility shall be covered to prevent wind-blown litter.

Indoor loading and unloading. Whenever possible loads that have the potential of generating wind-blown litter should be loaded and unloaded under cover. When that is not feasible, care should be taken to minimize the potential by loading/unloading in an area shielded from the wind or in an area protected by litter nets.

The site meets this criterion.

3. *Vermin* - Vermin (vector and rodent) control at the landfill and at the handling facility may be accomplished by employing the following control methods:

Periodic application of cover material. If vermin are a problem, cover material should be placed more often.

Immediate application of cover material. Waste loads that attract vermin should be covered immediately to discourage the proliferation of vermin.

Mixing waste with soil. Some waste loads may be mixed with soil materials to discourage vermin contact.

Limiting storage of putrescible materials. Putrescible materials that could provide a feedstock for vermin should be removed from the site as quickly as possible.

Exterminator. Contracting with a licensed exterminator who conducts rodent control actions.

By far the best method for minimizing vermin is the timely application of cover materials and placing cover materials in sufficiently thick layers to prevent vermin contact with the waste.

In order to reduce the presence of vermin, the Facility maintains a contract with a licensed exterminator to conduct vermin control actions, such as setting bait stations on a regular schedule and as needed.

Proper compaction techniques and the application of six-inches of daily cover soil or ash at the end of daily operations will reduce the presence of rodents. Additionally, the size of the daily operating area at the Landfill's face will be kept to a minimum. This promotes good compaction and helps to control litter and odors that might attract rodents to the operating face. The contracted, licensed exterminator also conducts rodent control actions concurrent with vector controls.

The site meets this criterion.

4. *Odors* - A potential source of odor is at the operating face of the Landfill and within the handling and transfer operations. Proper compaction and covering methods (daily and intermediate cover) help to minimize odors generated at the operating face. The operators are instructed to immediately deal with odors at the operating face, should they arise. Measures such as the placement of daily cover and/or dry lime, as needed, to the surface of the area(s) that may be generating excessive odors are effective mitigation measures that are used at the Facility. The elimination of accepting C&D residuals and fines materials and shifting to a waste stream that is predominantly ash has significantly reduced the occurrence and/or magnitude of any odor generation. Another odor mitigation measure that is employed is the expansion and maintenance of the existing, active landfill gas collection and flare system. This system will continue to be expanded with the Landfill. Within the handling and transfer operations, odors are best mitigated by covering waste holding containers, and moving waste from floors and other accessible location and putting it into closed containers and removing them from the site or putting them in the Landfill. The site meets this criterion.

5. *Bird Hazards* – The operation of the Phase 7, Phase 8 and Phase 9 landfill expansions and the relocation of handling operations will not result in a bird hazard to aircraft. This has been demonstrated by the long-term operation of the Facility. While the Facility abuts the Joint Base Cape Cod, which includes Otis Air National Guard Base and Camp Edwards, the Facility is at least 4.5 miles from the closest runway area. No

incidents involving bird hazards have been reported. It is unlikely that continued operation of these facilities will have any impact. The site meets this criterion.

6. *Other* - Due to the nature of landfilling and handling operations, dust will be generated during dry periods of the year. The following control measures are employed at the Facility:

   <u>Soil wetting</u>. Facility access roads, on and off the landfill, are wetted using a water truck. This task is regularly performed several times during an operating day in the summer months.

   <u>Application of calcium chloride</u>. Calcium chloride, a soil wetting agent, may be used to control dust. However, using calcium chloride in large quantities is costly and may affect groundwater quality and will only be conducted if necessary.

   <u>Vegetative cover</u>. Inactive landfill areas may be seeded to encourage the growth of vegetation and reduce barren soils.

   <u>Secure Material Delivery</u>. All Trucks delivering MSW, ash, stone, soil or any other material to the site must have their loads covered.

   <u>Pavement sweeping.</u> The Facility operates a sweeper that it regularly uses to remove accumulated dirt from paved areas of the site. Removal of this dirt reduces dust generation.

   The site meets this criterion.

h. *<u>Size of Facility.</u> No site shall be determined to be suitable or be assigned as a solid waste management facility if the size of the proposed site is insufficient to properly operate and maintain the proposed facility. The minimum distance between the waste handling area or deposition area and the property boundary shall be 100 feet, provided that a shorter distance may be suitable for that portion of the waste handling or deposition area which borders a separate solid waste management facility.*

   A 100 foot buffer will be maintained along the eastern and western boundaries of the 25-acre and 12-acre parcels and the southern boundary of the 12-acre parcel, as will all other buffers for receptors, as required by the Site Assignment Regulations. The northern boundary of the 25-acre parcel is adjacent to the current 74-acre parcel upon which ISWM currently operates the Landfill. Full landfill build-out of the 74-acre parcel, through the Phase 6 and Phase 9 expansions, will extend landfill operations to the boundary of the 25-acre parcel. The current access roads and paved open areas within the 25-acre and 74-acre parcels, and those proposed for the 12-acre parcel, provide more than adequate room to maneuver and queue vehicles for all of the solid waste handling operations at the facility.

The Site Assignment Application requires the inclusion of a Land Use Plan, which is included as Figure 9 in Attachment 3 of this SSEIR. This plan identifies the location of certain sensitive receptors, relative to specified offsets from property and waste handling area limits. As can be noted from this plan, the facility is of adequate size to provide sufficient space for unencumbered, proposed operations and that there is adequate separation distance, or offset distance, from the identified, sensitive receptors.

The site meets this criterion.

i. <u>*Areas Previously Used for Solid Waste Disposal.*</u> *Where an area adjacent to the site of a proposed facility has been previously used for solid waste disposal the following factors shall be considered by the Department in determining whether a site is suitable and by the board of health in determining whether to assign a site:*

1. *The nature and extent to which the prior solid waste activities on the adjacent site currently adversely impact or threaten to adversely impact the proposed site.*

2. *The nature and extent to which the proposed site may impact the site previously used for solid waste disposal.*

3. *The nature and extent to which the combined impacts of the proposed site and the previously used adjacent site adversely impact the public health, safety, and the environment taking into consideration:*
   a. *whether the proposed site is an expansion of or constitutes beneficial integration of the solid waste activities with the adjacent site;*
   b. *whether the proposed facility is related to the closure and/or remedial activities at the adjacent site;*
   c. *the extent to which the design and operation of the proposed facility will mitigate existing or potential impacts from the adjacent site.*

The modification of the existing site assignment, so as to allow landfilling to occur within Phase 9, which is within the area that is currently site assigned for landfilling and on the 25-acre parcel that is currently site assigned for solid waste handling, and to the new site site assignment so as to allow solid waste handling to occur on portions of the 12-acre parcel, will provide beneficial, long term solid waste management capacity for Bourne and the greater Cape Cod region. Fortunately for the Town, it was able to acquire the 25-acre and 12-acre parcels, allowing it to proceed with its development of long term integrated solid waste management plans. The expansion of the proposed landfilling activities into Phase 9 and onto the 25-acre parcel is fully compatible with the current and projected build out of landfilling operations on the 74-acre parcel. The projected impacts from the future expansion of landfill operations into Phase 7, Phase 8 and Phase 9 will provide added disposal capacity and extended life to the Facility. The construction and operation of these phases will be the same as construction and operation of the existing landfill phases. With the build out of Phases 7 and 8, the solid waste handling, materials storage, residential recycling center and administration operations that currently occur on the 25-acre parcel, will be relocated to the 12-acre parcel.

The optimized use of the 74-acre parcel with Phase 9 and the development of the 25-acre parcel as the Phase 7 and Phase 8 landfill phases will allow the Town to maximize the potential utilization of the site for its solid waste management activities. ISWM can more fully use the combined parcels for landfilling, thereby providing a critical regional service as evidenced by the shortfall of disposal capacity in Massachusetts. The existing solid waste handling operations are intended to be relocated onto the 12-acre parcel that is immediately to the south of the 25-acre parcel, which was recently purchased by the Town. This relocation of solid waste handling operations will require a new site assignment that will allow solid waste handling operations to be permitted on portions of the 12-acre parcel which will provide regional solid waste management services after the landfill has closed.

The site meets this criterion.

j. <u>*Existing Facilities.*</u> *In evaluating proposed sites for new solid waste management facilities the Department and the board of health shall give preferential consideration to sites located in municipalities in which no existing landfill or solid waste combustion facilities are located. This preference shall be applied only to new facilities which will not be for the exclusive use of the municipality in which the site is located. The Department and the board of health shall weigh such preference against the following considerations when the proposed site is located in a community with an existing disposal facility:*

1. *the extent to which the municipality's or region's solid waste needs will be met by the proposed facility;*
2. *the extent to which the proposed facility incorporates recycling, composting, or waste diversion activities.*

Since the proposed expansion of landfill operations into Phase 7, Phase 8 and Phase 9 and the relocation of solid waste handling operations do not constitute a new facility, this criterion is not applicable. However, according to lists provided by the MA DEP on their website there are four identified landfills in Bourne. The inactive landfills are: Bourne Dump (SL0036.0020), MacArthur Boulevard; Nightingale Stump Landfill (SD0036.001), 260 MacArthur Boulevard; and Otis Air Force Base Landfill (SL 0036.003) Connery Road. The only active landfill is the Bourne Landfill (SL 0036.004), 201 MacArthur Boulevard, which is owned and operated by the Town. This is located on the 74-acre parcel that is site assigned for landfill operations, which includes the location of Phase 9 and the immediately adjacent 25-acre parcel that is site assigned for solid waste handling operations and is the subject of this Modification Application. Specifically, this Application seeks to modify the existing 74 acre landfilling site assignment, so as to allow for the operation of Phase 9, and on the 25-acre parcel to allow solid waste landfill operations to occur in this area and to site assign a portion of the 12-acre parcel allowing relocation of the solid waste handling operations to the adjacent 12-acre parcel. There are no combustion facilities in Bourne.

The proposed Phase 7 and Phase 8 expansion of landfill operations onto the 25-acre parcel will require the relocation of the handling operations onto the 12-acre parcel, located immediately south and contiguous to the 25-acre parcel. This will allow the continuation of services on a regional basis including ash and MSW disposal, C&D transfer, recycling and composting, as well as the residential drop off and recycling center. ISWM currently provides services to several municipalities on Cape Cod and the South Shore for management of C&D and recyclables. Therefore, the site will not be for the exclusive use of the Town of Bourne and should be given preferential consideration.

While this criterion is not applicable it is met.

k. <u>*Consideration of Other Sources of Contamination or Pollution.*</u> *The determination of whether a site is suitable and should be assigned as a solid waste management facility shall consider whether the projected impacts of the proposed facility pose a threat to public health, safety or the environment, taking into consideration the impacts of existing sources of pollution or contamination as defined by the Department, and whether the proposed facility will mitigate or reduce those sources of pollution or contamination.*

In accordance with previous Department guidance, ISWM submitted an analysis entitled, *Interim Risk Evaluation and Cumulative Impact Assessment of the Proposed Phased Landfill Development of the Town of Bourne Integrated Solid Waste Management Facility* (CIA). This examined the potential impact of the theoretical build out of the facility, which is consistent with the Phases 7, 8 and 9 expansions and relocation of handling operations to the 12-acre parcel, in conjunction with other local potential sources of contamination or pollution. The conclusion of the CIA is that there will be no significant impacts to receptors in the vicinity of the site and that Best Management Practices will be employed to mitigate any potential impacts from the facility. In addition, a review of the state's database revealed that local emissions of volatile organic compounds (VOCs) are insignificant. The site meets this criterion.

l. <u>*Regional Participation.*</u> *The Department and the board of health shall give preferential consideration to sites located in municipalities not participating in a regional disposal facility. The Department and the board of health shall weigh such preference against the following considerations when the proposed site is located in a community participating in a regional disposal facility:*

1. *the extent to which the proposed facility meets the municipality's and the*

region's solid waste management needs; and

The proposed facility contributes to the Town of Bourne and the region's ability to provide an economic and efficient means for the private and public sectors to dispose and recycle solid waste. The MA DEP's Solid Waste Master Plan clearly shows a need for capacity of all types and use of this land will enable Bourne to better assist in fulfilling those needs by significantly extending the operating life of the Landfill. The CCC Regional Policy Plan also specifically identifies the need for integrated solid waste management infrastructure. The site meets this criterion.

2. *the extent to which the proposed facility incorporates recycling, composting, or waste diversion activities.*

The proposed Phase 7, Phase 8 and Phase 9 landfill expansions are intended for disposal of residual materials resulting from recycling operations, municipal solid waste collection and ash resulting from combustion of MSW and is not for the disposal of C&D. The relocation of solid waste handling operations will permit the continuation of the existing recycling, composting and other waste diversion activities. The site meets this criterion.

3.3 310 CMR 16.40(5) PROMOTION OF INTEGRATED SOLID WASTE MANAGEMENT

(a) In determining whether a site is suitable for a combustion facility or a landfill, the Department shall consider the following factors:

1.The potential yearly and lifetime capacity created by the proposed site use(s) in relation to the reasonably anticipated disposal capacity requirements and reduction/diversion goals of the Commonwealth and the geographic area(s) which the site will serve.

Landfill capacity projections from MA DEP reveal a significant reduction in the number operational landfills starting in 2021, which provide capacity for many types of municipal solid waste (MSW) including; household and commercial trash, processing residuals, storm/disaster debris, municipal waste combustor ash, contaminated soils, dredge spoils and special wastes. The best management option for much of this waste, which cannot be recycled, composted or combusted, is for it to be disposed in a landfill.

Bourne will continue to play a critical role in providing regional solid waste infrastructure going forward. Primarily, ISWM will provide much needed local municipal waste combustor ash disposal capacity. This is important because operators of combustors must show they have several years of capacity for their ash as part of their operating plan. The proposed buildout of the Bourne Landfill capacity is part of the plan for SEMASS which has a contract with the Town running through the end of 2021, with options for extensions. This is especially important given that it is projected that the CMW Landfill in Carver, where ash and bypass MSW from SEMASS also are deposited, will close by the end of 2021.

The full buildout of the site for landfilling, as proposed, will add about 5,175,000 cubic yards of capacity, beyond the limits of the currently approved operations in Phase 6. If the current contract with SEMASS is continued indefinitely and the facility runs at its permitted capacity full time, the landfilling operations will extend to at least September 2041. If the current contract with SEMASS is discontinued and the facility switches to accepting only MSW and runs at its permitted capacity full time, the landfilling operations will extend to at least January 2036.

The site meets this criterion.

2.The extent to which the proposed site use(s), alone or in conjunction with other sites, provides or affords feasible means to maximize diversion or processing of each component of the anticipated waste stream in order to reduce potential adverse impacts from disposal and utilize reusable materials and only thereafter extract energy from the remaining solid waste prior to final disposal.

The Bourne facility provides feasible means to maximize diversion or processing of each component of the anticipated waste stream. With the current and anticipated future use of the Landfill being committed to 87% utilization for MSW combustor ash disposal, a significant component of the diversion of unprocessed waste from landfills is provided. Other components of the site's operations include the transfer of Single Stream Recyclables; a Residential Recycling Center that allows the source separation by residents and includes a Swap Shop; and processing and composting of brush and yard waste, and the processing of asphalt, brick and concrete (ABC) for reuse. The site meets this criterion.

3.The extent to which the proposed use(s) of the site, alone or in conjunction with other sites, will contribute to the establishment and maintenance of a statewide integrated solid waste management system which will protect the public health and conserve the natural resources of the Commonwealth.

From its very inception and being named the Bourne Integrated Solid Waste Management (ISWM) facility demonstrates the Town's commitment to providing facilities that are used to maximize the promotion of recycle/reuse and waste reduction. The facility is the predominant regional integrated solid waste management facility that can support other facilities in the region to protect the public health and conserve the natural resources of the Commonwealth. The site meets this criterion.

(b) In determining whether a site is suitable for a combustion facility or a landfill, the

Department and the board of health shall consider the extent to which the proposed use of the site directly incorporates recycling and composting techniques or is otherwise integrated into recycling and composting activities for the geographic area(s) which the site will serve.

The proposed expansion of the facility will incorporate all of the existing solid waste management operations, which includes recycling and composting activities. These operations are available to the region. The site meets this criterion.

(c) A site proposed for a combustion facility or a landfill shall be reviewed to determine if the site is also suitable for a recycling or composting facility either in conjunction with or instead of the proposed facility.

The site is an existing recycling and composting facility and will continue to include these operations. The site meets this criterion.

(d) Site assignment applications which incorporate significant recycling or composting uses, in accordance with the goals of the statewide plan, shall receive preferred consideration.

The site has an existing site assignment, which is to be modified and will obtain a new site assignment to suit the proposed expansion of operations at the facility which incorporate significant recycling or composting uses, in accordance with the goals of the statewide plan. Consequently, the proposed site expansion should receive preferred consideration. The site meets this criterion.

SECTION 4.0 MITIGATION AND PROPOSED SECTION 61 FINDINGS

In accordance with M.G.L. c. 30, Section 61 and 301 CMR 11.12(5), any State Agency that takes Action on a project for which the Secretary required an EIR shall determine whether the project is likely, directly or indirectly, to cause Damage to the Environment and shall make a finding describing the Damage to the Environment and confirming that all feasible measures have been taken to avoid or minimize the Damage to the Environment, as described in more detail below.

- Contents of Section 61 Findings (301 CMR 11.12(5)(a)): In all cases, the Agency shall base its Section 61 Findings on the EIR and shall specify in detail: *all feasible measures to be taken by the Proponent or any other Agency or Person to avoid Damage to the Environment or, to the extent that Damage to the Environment cannot be avoided, to minimize and mitigate Damage to the Environment to the maximum extent practicable; an Agency or Person responsible for funding and implementing mitigation measures, if not the Proponent; and the anticipated implementation schedule that will ensure that mitigation measures shall be implemented prior to or when appropriate in relation to environmental impacts.*
- Section 61 Findings and Agency Action (301 CMR 11.12(5)(b): Provided that mitigation measures are specified as conditions to or restrictions on the Agency Action, the Agency shall:
    1. Make its Section 61 Findings part of the Permit, contract, or other document allowing or approving the Agency Action, which may include additional conditions to or restrictions on the Project in accordance with other applicable statutes and regulations; or
    2. Refer in its Section 61 Findings to applicable sections of the relevant Permit, contract, or other document approving or allowing the Agency Action.
- Subject Matter Jurisdiction Limitations (301 CMR 11.12(5)(c)): In the case of a Project undertaken by a person that requires state permits or land transfers, but no funding, the Scope of any EIR is limited to those aspects of the project that are within the subject matter of the permit(s) or within the area subject to a land transfer that are likely, directly or indirectly, to cause damage to the environment. Any Participating Agency shall limit its Section 61 Findings, or any mitigation measures specified as conditions to or restrictions on the Agency Action, to those aspects of the Project that are within the subject matter of any required Permit or within the area subject to a Land Transfer. In the words of the MEPA statute (M.G.L. ch. 30, sec. 62A), “Any finding required by section sixty-one shall be limited to those matters which are within the scope of the environmental impact report, if any, required by this section.”

State Agencies that will be required to make Section 61 Findings for the project prior to issuing permits for, funding, or otherwise implementing the project include or may include the Massachusetts Department of Environmental Protection (MA DEP) and the Massachusetts Division of Fisheries and Wildlife (DFW) for construction of the Phase 7, Phase 8 and Phase 9 landfill expansions and the relocation of the Large Handling Facility (LHF). The final design of these structures and facilities, along with any other associated demolition and relocation of existing structures onto abutting land, is addressed within this filing.

With respect to GHG emissions, the Town hereby commits that it will self-certify to the MEPA Office that it will report on any mitigation measures or their equivalent, for any GHG emissions reduction measures it may adopt in addition to those it has already implemented.

Depending on agency procedures, as described above, the various Section 61 Findings may be part of permits or agency actions, or may be stand-alone documents. Moreover, agencies will generally limit Section 61 Findings to impacts and mitigation within the scope of the subject matter of their permits.

The following proposed Draft Section 61 Findings contain commitments the Town has made as a basis for respective agency Section 61 Findings.

4.1 POTENTIAL PROPOSED SECTION 61 FINDING – MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION (SOLID WASTE PROGRAM)

Project Name:	Town of Bourne, Phases 7, 8 and 9 Landfill Expansions and Relocation of a Large Handling Facility
Project Location:	201 MacArthur Boulevard, Bourne, MA 02532
Project Proponent:	Town of Bourne, MA, Department of Integrated Solid Waste Management
EOEA No.:	11333
Permits Sought:	Site Suitability, Authorization to Construct and Authorization to Operate

These Findings for the Town of Bourne, Phases 7, 8 and 9 Landfill Expansions and Relocation of a Large Handling Facility project have been prepared in accordance with the provisions of M.G.L. Chapter 30, Section 61 and 301 CMR 11.00. In February 2020, the Town of Bourne, Department of Integrated Solid Waste Management (ISWM) submitted an Expanded Notice of Project Change (ENPC) relative to the Bourne Integrated Solid Waste Management Facility located at 201 MacArthur Boulevard, (Route 28) Bourne, MA 02532. After consultation with MEPA staff, it was the intention of ISWM that the ENPC act as, in effect, an Expanded Environmental Notification Form (EENF) for the buildout of the ISWM site. The ENPC provided substantial details about the existing facility and the proposed Full Buildout development of the site. In response to the submittal of the ENPC, the Secretary issued a Certificate for the ENPC on April 24, 2020, that required the preparation of a SSEIR in lieu of Draft and Final Environmental Impact Reports. This Certificate provided a Scope for the SSEIR, which was submitted to MEPA on, or before, September 30, 2020.

The Massachusetts Department of Environmental Protection has reviewed the MEPA documents and the documents submitted in connection with the application for a permit. Based upon its review, the Department finds that implementation of the terms and conditions of this permit constitute all feasible measures to avoid damage to the environment and will minimize and mitigate such damage to the maximum extent practicable. Implementation of the mitigation measures will occur in accordance with the terms and conditions set forth in the permit.

4.1.1 Project Description

The ISWM proposes to continue the operation of the Bourne Landfill by constructing Phases 7, 8 and 9 landfill expansions on previously disturbed land and relocating the existing Large Handling Facility (LHF) to previously undisturbed adjacent land. These projects were not contemplated in the original FEIR in 1998. Following completion of the MEPA process the existing Site Assignment will have to be modified to allow for these landfilling operations and a new site assignment will be required for the handling facility on the 12 acre parcel. Following completion of the Site Assignment process, it is anticipated that an Authorization to Construct (ATC) the Phase 9 vertical landfill expansion will be submitted, with operations beginning in that phase during 2021. Subsequent to that, site preparation work will begin for the relocation of the LHF, followed by the construction of the Phase 7 and Phase 8 landfills.

There are potentially three alternative scenarios for the buildout development of the entire site. The first is the No Further Build (NFB) scenario. This alternative is to line and buildout the active Phase 6 Landfill and do no further expansions. The NFB scenario will provide an additional 750,000 cubic yards of capacity, to the currently operating Phase 6 Landfill. The second scenario is to complete the NFB scenario and build the Phase 9 Landfill Vertical Expansion to a maximum elevation of 225 and then cease landfill operations. Phase 9 will provide an additional 1,255,000 cubic yards of capacity, in addition to the NFB alternative, and will not require the relocation of the LHF. The third scenario and the preferred alternative, is the Full Buildout (FB) of Phases 7, 8 and 9 as well as the relocation of LHF, which is needed in order to construct Phases 7 and 8. This alternative absorbs the NFB capacity of 750,000 cy into the Phases 7 and 8 volume of 3,920,000 cy, which when combined with the Phase 9 volume results in a total potential additional capacity of 5,175,000 cubic yards. The FB capacity would extend the life of the landfilling operations until at least 2036 to 2041, if the facility were to operate continuously at its permitted capacity. The shorter operating life will result if the incoming waste load is limited to MSW, while the longer operating life will result from continuing to accept SEMASS combustor ash as the majority of waste.

4.1.2 MEPA History

The Bourne Landfill and the associated solid waste handling facilities, were the subject of a Final Environmental Impact Report (FEIR) in 1999. The filing described a full build-out of the Landfill through Phase 6, or the NFB scenario. A FEIR Certificate was issued on November 29, 1999 which acknowledged the conceptual development of the Landfill in phases and required the Town to submit Notices of Project Change (NPC) to the MEPA Office for updates to the project.

Notice of Project Change 1 in 2003 addressed accepting a broader range of materials to include municipal solid waste (MSW) and municipal combustor ash while not increasing the daily tonnage limits to the site. Notice of Project Change 2 was submitted in 2007 as an Emergency Action to allow a temporary increase in daily tonnage to accept MSW that was displaced by a fire at the SEMASS waste-to-energy facility in Rochester, MA. Notice of Project Change 3 addressed construction of a potential landfill gas to energy facility utilizing reciprocating engines/electric generator sets to create up to 4.3 megawatts (MW) of electricity. Notice of Project Change 4 was submitted in 2016 and provided a report on the Phase 1D Reclamation Project and a final development plan for the Phase 5 Landfill Expansion. In all cases, the preparation of an EIR was not warranted. Notice of Project Change 5, which was an Expanded Notice of Project change (ENPC,) was submitted in 2017 and a subsequent Single Supplemental Environmental Impact Report (SSEIR) was submitted in 2018 for the Phase 6 Landfill Expansion, the legislatively authorized disposition of Article 97 land on the adjacent JBCC and outlined further site development into Phases 7, 8, 9 and the relocation of the LHF.

Similar to Phase 6, the preparation of an EIR for the development of the Phases 7, 8 and 9 landfill expansions and the relocation of the LHF, is warranted because of the potential to create more than ten acres of impervious surface. After consultation with the MEPA Office, it was determined the Town would file and Expanded Notice of Project Change (ENPC) (Notice of Project Change 6) that would act in effect as an Expanded Environmental Notification Form (EENF) in which the Town requested that the Secretary consider allowing the preparation of Single EIR (SEIR) as part of his ENPC Certificate. The Secretary subsequently issued an ENPC Certificate on April 24, 2020 that required the preparation of a Single Supplemental Environmental Impact Report (SSEIR) with a limited Scope.

4.1.3 Intent of the Section 61 Findings

A Section 61 Finding, which is a determination that all feasible measures have been taken to avoid or minimize impacts to the Environment, is required to be issued by each state agency that will issue permits for the project. This Section 61 Finding has been prepared by DEP to comply with its responsibilities under M.G.L. c. 30 s. 61 and to meet the requirement of the Secretary's Certificate on the Expanded Notice of Project Change that a complete and current overview of the mitigation program for the project be presented. This finding presents an overview of mitigation measures that have been developed in accordance with permit requirements and to respond to concerns identified in the Secretary's April 24, 2020 Certificate on the Expanded Notice of Project Change.

4.1.4 Potential Project Impacts

As with any heavy industrial activity, such as solid waste landfilling and handling operations, there is the potential for adverse impacts to be imposed on the neighbors of the site and to cause damage to the natural resources on and in the vicinity of the site. Impacts can be both short term (construction phase) and long term (operations phase) impacts. However, adequate and appropriate design and operating procedures can substantially mitigate, if not eliminate entirely, these impacts. When combined, current regulatory requirements, best engineering judgment, and good business practices will result in a solid waste management facility at the Bourne Landfill site that continues to be environmentally sound, as has been proven by decades of expansion and operations.

Potential impacts that may result from the proposed Phases 7, 8 and 9 Landfill expansion and relocation of the existing Large Handling Facility (LHF) at the existing Bourne Landfill site that have been identified by the MEPA review process are:

1. The proposed expansion of the landfill operations could result in contamination of the groundwater.
2. The proposed expansion of the landfill and handling operations could result in erosion and sedimentation as a result of stormwater runoff.
3. The proposed expansion of the landfill and handling operations could result in the

increased production of greenhouse gases (GHG), which could contribute to climate change.

4. The proposed expansion of the landfill and handling operations could produce increased noise in the immediate vicinity and in the region of the facility.
5. The proposed expansion of the landfill and handling operations could produce the temporary degradation of air quality as a result of the emissions of dust and odor.
6. The presence of solid waste operations can be an attraction as a food source to a variety of vermin, including rodents, insects and birds.
7. The presence of solid waste operations can be the source of litter.

4.1.5 Project Impact Mitigation

The following mitigation measures have been developed for the proposed Phases 7, 8 and 9 Landfill expansion and relocation of the existing Large Handling facility (LHF) at the existing Bourne Landfill facility, that have been identified by the MEPA review process.

Groundwater Protection

The existing landfill operations include leachate collection and storage facilities, landfill gas collection and treatment systems and an environmental monitoring system that is sampled and evaluated for impacts to groundwater and soil gas conditions in the vicinity of the Landfill. (See Figure 8 in Attachment 3 for a plan of the existing environmental monitoring system.) These systems will be expanded and maintained for the proposed expansions to the facilities. The leachate collection and storage systems include double composite liner system with primary and secondary leachate collection and monitoring capacity. The double composite liner system consists of 12 inches of low permeable soil, upon which multiple layers of geosynthetic liner materials are installed. These include primary and secondary geosynthetic clay liners (GCL) and 60-mil HDPE geomembranes, with an interstitial leak detection/drainage layer material that drains to a secondary sump and allows for the measurement of leachate that might leak through the primary liner system. On top of the primary geomembrane is a leachate collection system consisting of a network of pipes and 18-inches of drainage sand which allows for the collection and discharge of leachate to the primary leachate sump. There are pumps installed in both the primary and secondary leachate sumps, which pump the collected leachate through a force main to one of two leachate storage tanks. The stored leachate is transferred to tanker trucks and hauled to licensed wastewater treatment plants for treatment and disposal. The leachate collection system will be expanded to Phase 7 by extending the existing Phase 6 leachate collection system. It is anticipated that Phase 8 will be designed and constructed with its own collection system and leachate sump. Phase 9 will be developed by removing any final or intermediate cover systems onto which it will be built, so that leachate will flow vertically into the existing landfill phases and collection system.

Stormwater Controls

Stormwater will be managed on-site by two large retention/infiltration basins through a network of let-down channels, swales, culverts and piping and an infiltration field in the LHF area. All stormwater runoff discharges to one of the two existing large stormwater retention basins, which are large enough to contain flow volumes greater than the 100 year storm event. The buildout of the site will result in the abandonment of one of the existing basins with it being relocated and replaced with a basin of approximately equal capacity, on site. In addition a subsurface stormwater infiltration system will be constructed within the LHF area, to serve that facility. All stormwater runoff will completely discharge to groundwater, with no discharges to “waters of the United States”. Consequently, the National Pollutant Discharge Elimination System (NPDES) requirements do not apply to this site. Additionally, best management practices will be implemented during construction to mitigate dust, noise and emissions.

Greenhouse Gas Controls Mitigation

The Town has made considerable efforts to mitigate the emission of greenhouse gases (GHG) through an extensive landfill gas collection system and thermal destruction system. It has also evaluated its overall site operations to increase efficiency and explored various options to utilize landfill gas as an energy source. Future projects are under consideration to mitigate GHGs, including installation of a solar photovoltaic array on the Landfill.

Noise Mitigation

Certain levels of noise are associated with the operation of trucks and heavy equipment at the Facility. The operation of equipment, the dropping of tailgates and the sound of back up signals are some of the more common and unavoidable sounds at the Facility. Back up signals are a requirement meant to provide a safer environment for the workers and visitors to the Facility. Active operation and concurrent construction activities have occurred regularly at the Facility, without any indication that receptors have been adversely impacted by noise. The site is well buffered by distance, traffic noise along Route 28 and vegetation, mitigating potential impacts as confirmed in a previous noise survey. The construction and operation of a landfill expansion in Phase 9, on the 25-acre parcel and handling operations of the 12-acre parcel will not result in any significant change of conditions from present and past noise impacts.

Dust Mitigation

Landfill operations will be conducted on soil or ash surfaces that have the potential for creating dust. Therefore, mitigation of dust generation will be an active component of the Landfill’s operation. ISWM will continue to use Town owned street sweepers and water trucks to maintain site roads to control dust. ISWM will also conduct active water applications to open surfaces that may generate dust, with particular attention being paid to the Landfill’s access roads where heavy equipment operation is conducted. When a contractor is working on the site, they are contractually bound to control dust, principally by water application.

Odor Mitigation

A potential source of odor is at the operating face of the Landfill and within the handling and transfer operations. Proper compaction and covering methods (daily and intermediate cover) help to minimize odors generated at the operating face. The operators are instructed to immediately deal with odors at the operating face, should they arise. Measures such as the placement of daily cover and/or dry lime, as needed, to the surface of the area(s) that may be generating excessive odors are effective mitigation measures that are used at the Facility. The elimination of accepting C&D residuals and fines materials and shifting to a waste stream that is predominantly ash has significantly reduced the occurrence and/or magnitude of any odor generation. Another odor mitigation measure that is employed is the expansion and maintenance of the existing, active landfill gas collection and flare system. This system will continue to be expanded with the Landfill. Within the handling and transfer operations, odors are best mitigated by covering waste holding containers, and moving waste from floors and other accessible locations and putting it into closed containers and removing them from the site or putting them in the Landfill.

Vermin Mitigation

The best method for minimizing vermin is the timely application of cover materials in sufficiently thick layers to prevent vermin contact with the waste. In order to reduce the presence of vermin, the Facility maintains a contract with a licensed exterminator to conduct vermin control actions, such as setting bait stations on a regular schedule and as needed. Proper compaction techniques and the application of six-inches of daily cover soil or ash at the end of daily operations will reduce the presence of rodents. Additionally, the size of the daily operating area at the Landfill's face will be kept to a minimum. This promotes good compaction and helps to control litter and odors that might attract rodents to the operating face. The contracted, licensed exterminator also conducts rodent control actions concurrent with vector controls.

Litter Mitigation

Facility operations must be conducted to minimize blowing litter within the landfill and the handling facility area. The level of effort needed to control windblown litter is dictated by waste materials accepted, weather conditions and wind conditions. Methods available to control windblown litter include: portable litter fence; permanent litter fencing; utilize temporary fence; covering vehicles; and indoor loading and unloading in handling operations.

4.1.6 Mitigation Implementation

ISWM is directly responsible for the implementation of all mitigation measures that are proposed for the construction and operation of the Phases 7, 8 and 9 Landfill Expansions and Relocation of a Large Handling Facility (LHF). ISWM is under the direct supervision of the Bourne Town Administrator, who in turn is under the direct supervision of the Bourne Board of Selectmen. The following is a summary table of proposed mitigation measures, their implementation schedule and their estimated costs.

MITIGATION MEASURE	IMPLEMENTATION SCHEDULE	COST ESTIMATE
Phased construction of Phase 7 & 8 double composite liner and leachate collection systems.	Starting in 2027	$8,000,000
Continue on-going environmental monitoring of groundwater quality and landfill gas migration.	Until 30 years after the close of the Landfill.	$80,000/yr
Phased construction of final closure caps, including gas collections system extension, starting with Phase 9 and continuing as areas reach final subgrades.	Starting in 2022	$12,000,000
Construct stormwater management facilities, as part of the construction of the LHF.	Starting in 2024	$800,000
Mitigate GHG by continuing to operate gas collection & treatment system, install solar photovoltaic arrays and evaluate other GHG mitigation measures. As heavy equipment is replaced purchase EPA air quality compliant equipment.	Ongoing operations with solar arrays added following area closure completions.	$ 1,000,000
Enforce noise mitigation measures during construction and operations.	For the life of the Facility	$1,000/yr
Enforce dust mitigation measures during construction and operations, including road sweeping and water applications.	For the life of the Facility	$10,000/yr
Enforce odor mitigation measures during construction and operations, including continued operation of gas collection and treatment system, as included above.	For the life of the Facility	$50,000/yr
Enforce vermin mitigation measures during construction and operations, including proper cover placement and maintaining exterminator services.	For the life of the Facility	$30,000/yr
Enforce litter mitigation measures during operations, including maintenance of fencing, cover application and litter patrols.	For the life of the Facility	$70,000/yr

4.1.7 Findings

Based upon its review of the MEPA documents, the permit applications submitted to date, and the Department's regulations, the Department finds that the terms and conditions to be incorporated into the permit required for this Project will constitute all feasible measures to avoid damage to the environment, including consideration of the potential effects of climate change, and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to the Department's authority. Implementation of the mitigation measures will occur in accordance with the terms and conditions set forth in the permit.

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MA Department of Environmental Protection

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By

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4.2 POTENTIAL PROPOSED SECTION 61 FINDING – MASSACHUSETTS DIVISION OF FISHERIES AND WILDLIFE (NATURAL HERITAGE AND ENDANGERED SPECIES PROGRAM)

Project Name:	Town of Bourne, Phases 7, 8 and 9 Landfill Expansions and Relocation of a Large Handling Facility
Project Location:	201 MacArthur Boulevard, Bourne, MA 02532
Project Proponent:	Town of Bourne, MA, Department of Integrated Solid Waste Management
EOEA No.:	11333
Permits Sought:	Conservation Management Permit

These Findings for the Town of Bourne, Phases 7, 8 and 9 Landfill Expansions and Relocation of a Large Handling Facility project have been prepared in accordance with the provisions of M.G.L. Chapter 30, Section 61 and 301 CMR 11.00. In February 2020, the Town of Bourne, Department of Integrated Solid Waste Management (ISWM) submitted an Expanded Notice of Project Change (ENPC) relative to the Bourne Integrated Solid Waste Management Facility located at 201 MacArthur Boulevard, (Route 28) Bourne, MA 02532. After consultation with MEPA staff, it was the intention of ISWM that the ENPC act as, in effect, an Expanded Environmental Notification Form (EENF) for the buildout of the ISWM site. The ENPC provided substantial details about the existing facility and the proposed Full Buildout development of the site. In response to the submittal of the ENPC, the Secretary issued a Certificate for the ENPC on April 24, 2020, that required the preparation of a SSEIR in lieu of Draft and Final Environmental Impact Reports. This Certificate provided a Scope for the SSEIR, which was submitted to MEPA on, or before, September 30, 2020.

The Natural Heritage and Endangered Species Program (NHESP) has reviewed the MEPA documents and the documents submitted in connection with the application for a permit. Based upon its review, NHESP finds that implementation of the terms and conditions of this permit constitute all feasible measures to avoid damage to the environment and will minimize and mitigate such damage to the maximum extent practicable. Implementation of the mitigation measures will occur in accordance with the terms and conditions set forth in the permit.

4.2.1 Project Description

The ISWM proposes to continue the operation of the Bourne Landfill by constructing Phases 7, 8 and 9 landfill expansions on previously disturbed land and relocating the existing Large Handling Facility (LHF) to previously undisturbed adjacent land. These projects were not contemplated in the original FEIR in 1998. The project includes previously disturbed land (25-acre and 74-acre parcels that are existing solid waste handling and landfilling areas) and undisturbed land (12-acre parcel), that do not contain a habitat of rare species, vernal pools, priority sites of rare species or exemplary natural communities, and therefore, no alteration of designated significant habitat or taking of an endangered or threatened species will occur. However, the 12-acre parcel, in its entirety, and small portions of 25-acre parcel, do contain Eastern Box Turtle habitat, a species of Special Concern. Any taking of this land will require mitigation in close coordination with NHESP. NHESP has confirmed that Phase 7, Phase 8, Phase 9, and areas outside of the delineated habitat, are exempt from further MESA review.

The Town has committed to work closely with NHESP on its plans to develop the 12-acre parcel to relocate the existing solid waste handling and support facilities. This particular parcel contains virgin *Priority Habitat* for the Eastern Box Turtle and will likely result in a Take. Any portions that are taken for use by ISWM will have to be mitigated with suitable habitat that is placed under a new conservation restriction at a ratio of 1.5 acres for each acre that is taken. The Town has identified such land and is in the process of acquiring it for this purpose. ISWM is working closely with NHESP staff on this issue and no disturbance of the area will occur until all requirements are met including the preparation and approval of a Conservation and Management Permit (CMP).

4.2.2 MEPA History

The Bourne Landfill and the associated solid waste handling facilities, were the subject of a Final Environmental Impact Report (FEIR) in 1999. The filing described a full build-out of the Landfill through Phase 6, or the NFB scenario. A FEIR Certificate was issued on November 29, 1999 which acknowledged the conceptual development of the Landfill in phases and required the Town to submit Notices of Project Change (NPC) to the MEPA Office for updates to the project.

Notice of Project Change 1 in 2003 addressed accepting a broader range of materials to include municipal solid waste (MSW) and municipal combustor ash while not increasing the daily tonnage limits to the site. Notice of Project Change 2 was submitted in 2007 as an Emergency Action to allow a temporary increase in daily tonnage to accept MSW that was displaced by a fire at the SEMASS waste-to-energy facility in Rochester, MA. Notice of Project Change 3 addressed construction of a potential landfill gas to energy facility utilizing reciprocating engines/electric generator sets to create up to 4.3 megawatts (MW) of electricity. Notice of Project Change 4 was submitted in 2016 and provided a report on the Phase 1D Reclamation Project and a final development plan for the Phase 5 Landfill Expansion. In all cases, the preparation of an EIR was not warranted. Notice of Project Change 5, which was an Expanded Notice of Project change (ENPC,) was submitted in 2017 and a subsequent Single Supplemental Environmental Impact Report (SSEIR) was submitted in 2018 for the Phase 6 Landfill Expansion, the legislatively authorized disposition of Article 97 land on the adjacent JBCC and outlined further site development into Phases 7, 8, 9 and the relocation of the LHF.

Similar to Phase 6, the preparation of an EIR for the development of the Phases 7, 8 and 9 landfill expansions and the relocation of the LHF, is warranted because of the potential to create more than ten acres of impervious surface. After consultation with the MEPA Office, it was determined the Town would file and Expanded Notice of Project Change (ENPC) (Notice of Project Change 6) that would act in effect as an Expanded

Environmental Notification Form (EENF) in which the Town requested that the Secretary consider allowing the preparation of Single EIR (SEIR) as part of this ENPC Certificate. The Secretary subsequently issued an ENPC Certificate on April 24, 2020 that required the preparation of a Single Supplemental Environmental Impact Report (SSEIR) with a limited Scope. There has been no previous review of the proposed Take and CMP by the MEPA Office. Where Take and approval of a CMP is required by NHESP, the Town included a description of the project in the filing of the ENPC and the SSEIR.

4.2.3 Intent of the Section 61 Findings

A Section 61 Finding, which is a determination that all feasible measures have been taken to avoid or minimize impacts to the Environment, is required to be issued by each state agency that will issue permits for the project. This Section 61 Finding has been prepared by NHESP to comply with its responsibilities under M.G.L. c. 30 s. 61 and to meet the requirement of the Secretary's Certificate on the Expanded Notice of Project Change that a complete and current overview of the mitigation program for the project be presented. This finding presents an overview of mitigation measures that have been developed in accordance with permit requirements and to respond to concerns identified in the Secretary's April 24, 2020 Certificate on the Expanded Notice of Project Change.

4.2.4 Potential Project Impacts

The project includes previously disturbed land (the 25-acre parcel and the 74-acre existing landfill area) and undisturbed land (12-acre parcel), that does not contain a habitat of rare species, vernal pools, priority sites of rare species or exemplary natural communities, and therefore, no alteration of designated significant habitat or taking of an endangered or threatened species will occur. However, the 12-acre parcel in its entirety, and small portions of 25-acre parcel, do contain Eastern Box Turtle habitat, a species of Special Concern. Any taking of this land will require mitigation in close coordination with NHESP. NHESP has confirmed that Phase 7, Phase 8, Phase 9, and areas outside of the delineated habitat are exempt from further MESA review.

4.2.5 Project Impact Mitigation

The Town will work closely with NHESP on its plans to develop the 12-acre parcel it recently acquired. This particular parcel contains virgin *Priority Habitat* for the Eastern Box Turtle and will likely result in a Take. As such, the Town will apply for a Conservation and Management Permit (CMP) for any development of that site. The Town has researched parcels in the nearby area that appear to provide suitable mitigation and could be placed under permanent protection. This research has yielded two candidate parcels and, working with its consulting team, the Town is preparing an assessment of the parcels for NHESP review to ensure that they are suitable. Based on a positive determination, ISWM will proceed with plans to gain ownership of the candidate parcels that are compliant with all aspects of MESA. The Town's consultant has completed the field reconnaissance on the 12-acre parcels as outlined in the

Wildlife and Plant Technical Bulletin (Cape Cod Commission (CCC) 2018 Regional Policy Plan (RPP)), and is in the process of preparing the Natural Resources Inventory (NRI) to support the Town's Development of Regional Impact (DRI) application with the CCC.

Documentation gathered during these site visits and at the proposed mitigation parcels will serve to support the anticipated CMP for review and approval by NHESP under the Massachusetts Endangered Species Act or MESA.

4.2.6 Mitigation Implementation

ISWM is directly responsible for the implementation of all mitigation measures that are proposed for the construction and operation of the Phases 7, 8 and 9 Landfill Expansions and Relocation of a Large Handling Facility (LHF). ISWM is under the direct supervision of the Bourne Town Administrator, who in turn is under the direct supervision of the Bourne Board of Selectmen. The following is a summary table of proposed mitigation measures, their implementation schedule and their estimated costs.

MITIGATION MEASURE	IMPLEMENTATION SCHEDULE	COST ESTIMATE
Prepare and negotiate a Conservation Management Plan with NHESP.	Starting in 2020	$75,000
Purchase proposed compensatory, mitigation properties.	2021	$250,000

4.2.7 Findings

Based upon its review of the MEPA documents, the permit applications submitted to date, and the NHESP regulations, the Division finds that the terms and conditions to be incorporated into the permit required for this Project will constitute all feasible measures to avoid damage to the environment, and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to NHESP authority. Implementation of the mitigation measures will occur in accordance with the terms and conditions set forth in the permit.

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MA Division of Fisheries and Wildlife

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By

SECTION 5.0 CAPE COD COMMISSION DRAFT DEVELOPMENT OF REGIONAL IMPACT

5.1 INTRODUCTION

(1) Included in this section is a summary of the draft text for the Town's Development of Regional Impact (DRI) submittal to the Cape Cod Commission (CCC) which will follow the completion of MEPA's review and the issuance of a final certificate by the Secretary. A DRI is triggered whenever an EIR for MEPA is required and as a municipality on Cape Cod in Barnstable County, the Town is subject to the regulations of the CCC.

(2) This overview, which is part of the SSEIR, is for informational purposes and is not a complete DRI submittal or a substitute for the process with the CCC. The Town will file a separate DRI application with the Cape Cod Commission subsequent to the review by MEPA with any updated information that is required or may be illustrative. As such, references will be made to sections contained within the SSEIR to avoid redundancy at this stage. However, full text and appendices and attachments will be included in the DRI so that it will be a stand-alone document.

(3) As with the SSEIR, the purpose of the DRI is to provide a comprehensive view of the full build-out potential of the Bourne Landfill and associated facilities. As noted in the final Certificate for Phase 6 in June 2018, the Secretary stated that "… the Town will submit an NPC to address development of Phase 7 and 8. This subsequent NPC should provide an updated development plan for Phase 7, Phase 8, the residential recycling center and relocated offices…" This was done when the Town submitted an Expanded Notice of Project Change (ENPC) to MEPA in February 2020. The Secretary subsequently issued a Certificate for the ENPC that required the preparation and submittal of an SSEIR.

(4) The DRI will build upon the submittal of this SSEIR and also address how the development plans are in compliance with the Regional Policy Plan (RPP) published by the CCC. As noted in her comment letter on the ENPC dated April 10, 2020, Ms. Kristy Senatori, Executive Direction of the CCC, stated, "Staff suggest that it may benefit MEPA review and ultimately better facilitate the Cape Cod Commission's review if the Town were to include in the EIR, among other things, discussion of the proposal relative to the pertinent goals and objectives from the Cape Cod Regional Policy Plan."

(5) The formal submittal of the DRI will be in accordance with that path and will discuss not only horizontal and vertical landfill expansions for Phase 7 and Phase 8, but it will also discuss the full site development plans, including Phase 9. These proposed expansions which are anticipated to extend the life of the landfill well into the 2030s, or longer, will also require relocation of existing structures such as offices and transfer operations onto currently pervious land. A detailed description of the proposed phasing and changes to the site master plan over the long-term are described in Section 2.2.1. Supporting attachments that provide more details and illustrations are referenced as well.

(6) Subsequent to the MEPA review process, as an integral part of the approval process for this long-range development plan, the Town will coordinate with the Massachusetts Department of Environmental Protection (MA DEP) to submit two Site Suitability applications (one for a modification of the landfill Phase 7, 8, 9 expansion and a new site assignment to relocate the handling facility onto the 12 acre parcel) that will need to be reviewed by the Bourne Board of Health at public Site Assignment hearings in order to accommodate the site master development plan. Section 3.0 of the SSEIR includes a section that discusses, in draft form, how the Town will meet both Facility-Specific Site Suitability Criteria and General Site Suitability Criteria for these applications. Two separate Site Suitability Applications will be submitted to MA DEP for the landfill expansions and the LHF projects, respectively, after the MEPA review and will address any comments received. Once MA DEP has finished its Site Suitability review, the Bourne Board of Health will review submittals by the ISWM and schedule public hearings. These hearings are anticipated to occur in early 2021.

(7) The CCC DRI process will commence after MEPA review as well and it is the intent of the Town to submit its DRI application on a parallel path with the Site Suitability/Site Assignment process.

5.2 PREVIOUS CAPE COD COMMISSION AND MEPA REVIEWS

(1) The Bourne Integrated Solid Waste Management Facility (ISWM) has been extensively reviewed by the MEPA office and the CCC for over 20 years. Below is a timeline that lists prior submittals and approvals. Changes addressed in these reviews listed below include; adding Municipal Solid Waste (MSW) and Municipal Combustor Ash (MCA) to the approved wastestreams for acceptance at the facility, incorporating adjacent land that the Town purchased into the site development plans, temporary disposal tonnage increases in response to a fire at the Covanta SEMASS municipal waste combustor, plans for a landfill gas-to-energy facility, a final report on the Phase 1D/Phase 5 reclamation project and the Phase 6 landfill expansion. The most recent DRI decision and Certificate of Compliance are included in Attachment 15.

MEPA - Final EIR Certificate	November 1999
CCC- Development of Regional Impact Decision	February 2000
CCC- Partial Certificate of Compliance	February 2001
MEPA- Advisory Opinion	August 2001
CCC- Minor Modification #2	August 2001
MEPA- Notice of Project Change	August 2003
CCC- Major Modification	March 2004
CCC- Minor Modification #2	April 2007
MEPA- Notice of Project Change	May 2007
CCC- Final Certificate of Compliance	May 2008
MEPA- Notice of Project Change	January 2009
CCC- Minor Modification #2	August 2009
MEPA- Notice of Project Change	February 2016
CCC- Minor Modification #1	April 2016
MEPA- Single Supplemental EIR Certificate	June 2018

CCC- Development of Regional Impact Decision	November 2018
CCC- Certificate of Compliance	January 2020

5.3 NEED

(1) Landfill capacity projections from DEP reveal a significant reduction in the number of operational landfills in 2021. These landfills provide capacity for many types of municipal solid waste (MSW) including; household and commercial trash, processing residuals, storm/disaster debris, municipal waste combustor ash, contaminated soils, dredge spoils and special wastes. The best management option for much of this waste, which cannot be recycled, composted or combusted, is for it to be deposited in a landfill.

(2) As a result, Bourne will play a critical role in providing infrastructure going forward. Primarily, ISWM will provide much needed local municipal waste combustor ash capacity. This is important because operators of combustors must show they have several years of capacity for their ash as part of their operating plan. However, ISWM may decide not to move forward with a mostly ash business model and instead use its permitted disposal capacity to accept MSW from communities on the Cape and the region, including commercial sources. The Phase 7, Phase 8 and Phase 9 capacity will play a vital role in providing a viable option as disposal capacity dwindles and communities are forced to look further away for options, including out-of-state rail and trucking options in Ohio and Virginia.

(3) Further exacerbating the regional capacity inventory are the recent closures of MA landfills in Southbridge, Taunton, Chicopee with another closure anticipated by the end of 2020 in Carver. Together, this represents approximately 991,845 tons of annual permitted disposal capacity.

(4) Landfill capacity projections from the latest MA DEP 2030 Solid Waste Master Plan (SWMP) issued in draft form in September 2019 reveal a significant reduction in the amount of landfill disposal capacity in Massachusetts in 2021 and even more significant reductions in 2025 and 2030. Projections show a reduction from 842,245 tons of capacity in 2019 to 86,000 tons per year in 2027. Locating greenfield areas for a new landfill or even expansions of sites that have an old unlined landfill with room to grow, are exceedingly difficult to permit because of local resistance. Therefore, it is critical that existing sites be utilized to their full potential.

(5) The SWMP outlines an aggressive goal to reduce waste disposal tonnage from a baseline of 5.7 million tons in 2018 to 4 million tons by 2030, representing a 30% reduction. By 2050, the state has goals of reducing disposal to 570,000 tons per year, or a 90% reduction. However, the SWMP plan notes that, “Massachusetts has a projected capacity shortfall of 700,000 tons/year by 2030, even assuming we meet our 2030 waste reduction goal. Massachusetts will retain capacity for municipal waste combustion within the existing 3.5 million tons of annual capacity.” The MA DEP further states that “… solid waste disposal capacity in Massachusetts and throughout the Northeast has continued to shrink as more landfills close and they are not replaced by new in-state disposal capacity. This tightening of disposal capacity has weakened the

resiliency of Massachusetts waste disposal infrastructure and facility outages that were routine in the past are causing frequent operational problems." Furthermore, DEP noted this looming disposal shortfall in the 2013 SWMP excerpted below:

This capacity can be made up for by:

- *Preventing waste from being generated in the first place;*
- *Increasing recycling and composting;*
- *Developing new in-state disposal capacity; and/or*
- *Increasing export of waste to disposal facilities in other states.*

A loss of landfill capacity will also create issues for a number of special wastes that are currently managed (in part) at landfills. These materials, which are not generally tracked with MSW and C&D, include contaminated soil, residuals from vehicle shredding operations, dredge spoils, and some sewage sludge. Please see the text box on page 7 for more information on how these materials are managed. As there are fewer landfills in Massachusetts, in-state outlets for these materials are becoming scarcer. MA DEP will continue to track the status of how these materials are managed and identify and assess additional management alternatives.

(6) This excerpt highlights the unique role landfills play in an integrated solid waste management system. While export of waste to distant landfills, such as those in Ohio, is an option for generators in Massachusetts, it comes with the risks of increased transportation expense, potential exposure to import taxes from pending federal legislation that would allow for significant import taxes on out-of-state waste and, on a basic logistics level, the availability of long-haul trucking or rail cars to manage waste flow in a timely manner.

(7) Additionally, as in-state capacity shrinks, any disruption to the existing on-line capacity, such as from a fire at a facility, or increased stress by the generation of large volumes of waste from a natural disaster such as a flood or hurricane, will create a ripple effect in the service chain increasing the potential for temporary closure of transfer stations that reach capacity in the short-term and shortened service life at landfills in the long-term. This has already been experienced in the construction and demolition debris processing infrastructure in recent years. Another example of this was in 2007 when SEMASS was off-line for several months as a result of an explosion and fire, and the Bourne Landfill accepted MSW from all of the Cape towns without financial impact to the municipalities. ISWM again played this role in the summer of 2018 when it helped a Cape Cod municipality, who is a SEMASS customer, dispose of multiple loads of MSW that were displaced when SEMASS was operating under reduced capacity due to routine maintenance.

(8) Therefore, maintaining well-run landfill facilities that can alleviate this pressure is an important part of the long-term planning calculus for solid waste managers and regulators in Massachusetts. Adding to the planning challenges is that Connecticut and Rhode Island are facing similar landfill capacity issues and will not be able to provide a closer waste export option, especially in Rhode Island where the Central Landfill is

reserved for in-state capacity.

(9) Barnstable County has taken note of the impacts of fewer facilities and is planning to issue a Request for Proposal (RFP) to determine options for out-of-state disposal and local options to manage a number of difficult-to-manage items. The ISWM facility was specifically mentioned as a subject of investigation in a recent presentation to the County Commissioners excerpted below which demonstrates the acknowledgment by local planners and management at the Barnstable County Administration, Cape Cod Commission, Barnstable County Department of Health and the Environment, and the Cape Cod Cooperative Extension who are working jointly to look at solid waste management solutions for Cape Cod. The Commissioners approved $150,000 to move forward with an RFP demonstrating the high degree of interest in locally sustainable solid waste infrastructure.

(10) On-Cape opportunities to collect, process for reuse or energy generation, and recycle materials at Joint Base Cape Cod UCRTS, the Bourne Integrated Solid Waste Management facility, and the Yarmouth transfer station will be examined

Excerpted from: The Future of Solid Waste Management on Cape Cod
Understanding Options for Municipal Solid Waste Processing, Disposal, and Recycling
Barnstable County Commissioners August 5, 2020

5.4 IDENTIFICATION OF IMPACTS

(1) The impacts of operations at the original site-assigned parcel, including the landfill were addressed as part of the original MEPA and CCC review processes in 1998, 1999 and in 2018 with the Phase 6 expansion. Phase 7, Phase 8 and Phase 9 will be located on previously disturbed land. Existing roads will provide access to and around the site. However, the undisturbed southern 12-acre parcel will be significantly disturbed by the construction of new offices and transfer station facilities that replace the current operations which will be displaced by the Phase 7 and 8 Landfills. All environmental baseline impacts and mitigation measures have been reviewed as part of the MEPA and CCC processes for this site area. These impacts and mitigation measures are addressed in more detail in the draft Site Suitability criteria discussions included in Section 3.0. Construction and operation of future landfill phases will not change the way waste is currently managed at the facility.

(2) A summary of the findings for each of the environmental criteria that will be evaluated during the MEPA review process for the Bourne Landfill and subsequently for obtaining DEP approval is provided below and is discussed further in other sections of the SSEIR.

- (a) Rare Species, Species of Special Concern and CCC Natural Areas
  The majority of the site and the area identified for landfilling, involves previously disturbed land that does not contain a habitat of rare species, species of special concern, vernal pools, priority sites of rare species or exemplary natural communities, and therefore, no alteration of designated significant habitat or taking of an endangered or threatened species will occur. This has been

confirmed by the Natural Heritage and Endangered Species Program (NHESP) and is exempt from further review under Massachusetts Endangered Species Act (MESA) as discussed in other sections of the SSEIR.

With regard to future plans, the Town is in close communication and coordination with staff of the NHESP and CCC staff for development on the southern 12-acre parcel that is not exempt from MESA review and contains virgin *Priority Habitat* for the Eastern Box Turtle, which is a species of special concern. To address the proposed taking of any lands needed for development, the Town will apply for a Conservation and Management Permit with NHESP, including any review by the CCC. The Town has already identified suitable habitat to replace any land that it takes for development at the 1.5:1 ratio required by NHESP. Presently, the Town is reviewing two proposals from respondents to a Request for Proposals issued by the Town seeking suitable land. Both parcels are ideal replacements, have had a survey done and are known to NHESP. The Town hopes to finish the procurement and acquisition process for these parcels before the end of 2020.

In addition to the MESA process with the state, the CCC has identified that the 12-acre parcel is a Natural Area as mapped by the CCC's RPP Data Viewer. The 100-acre parcel is also identified as a Military and Transportation Place type, however this area has been fully developed for solid waste disposal and handling operations and ISWM does not anticipate utilizing any buffer land and therefore will not need to provide 1:1 land mitigation. The Town has had and will continue to have discussions with the CCC staff to ensure that it meets the intent of the RPP to provide off-site mitigation for the taking of this land which will be reviewed by NHESP staff prior to submitting a DRI. It is likely, however, that the Town will seek a waiver and/or flexibility under Section 9 of the RPP with regard to the 3:1 ratio for additional land mitigation for the taking of Natural Areas. The Town will demonstrate that the use of the land meets other significant regional goals and objectives for regional solid waste infrastructure as identified in the RPP. In preparation of these discussions and its DRI submittal, the Town has procured the services of Horsley and Witten Group which has conducted a Natural Resources Inventory (NRI) of the 12-acre parcel and has also identified all *Priority Habitat* for the Eastern Box Turtle that will be part of any MESA and CCC review. Furthermore, the Town has had areas on both the 25-acre parcel and 12-acre parcel reviewed by a licensed soil scientist who also reviewed U.S. Department of Agriculture soils maps for the Town-owned land. These collective efforts will be part of the formal application process once the Town has procured the required off-site mitigation land.

On an operational note, ISWM makes significant efforts to protect wildlife on-site. Vermin control is provided by a contractor who uses appropriately designed bait stations that are accessible only by targeted wildlife to reduce accidental exposure to non-target species. Additionally, ISWM no longer maintains a supply of calcium chloride on-site, discontinuing its use. While calcium chloride is not currently used, if severe nuisance conditions arise from dust that cannot otherwise be controlled, ISWM may consider using a limited amount of it.

- (b) Historical/archaeological resources
  The Landfill does not include any structure, site or district listed in the State Register of Historic Places or inventory of historic and archaeological assets of the Commonwealth. Therefore, the Project will not destroy or alter or have any impacts on any historical or archaeological resource.

- (c) Areas of Critical Environmental Concern
  The proposed change will have no impact on the nearby Back River ACEC.

- (d) Land
  The development of the Landfill and relocation of associated transfer stations, buildings, roads and parking will result in an area greater than ten acres which is a trigger for the SSEIR.

- (e) Wetlands
  The Project Change will not alter any wetlands, waterways or tidelands, and the work performed to construct the Project Change will not be within a 100-foot buffer zone of bordering vegetated wetlands.

- (f) Stormwater
  All stormwater will be retained on-site for discharge to the groundwater by existing and new infiltration basins and systems. A discussion of the components of the final Stormwater Management Plan, including nitrogen loading and bio-retention calculations is discussed in Section 2.2.3 and Attachment 7 of this SSEIR. ISWM is fully committed to continuing its efforts to properly manage stormwater on-site and reduce impacts and will work with the CCC staff on a phased certificate of compliance process as the site is developed, especially with regard to permanent structures such as the new office and maintenance facilities. As noted, all stormwater is managed on-site and therefore no National Pollution Discharge Elimination System (NPDES) permit is required. Attachment 9 includes a flow chart from the U.S. Environmental Protection Agency (EPA) which details this process. The Project Change will not exceed any MEPA thresholds regarding water use.

- (g) Groundwater
  Groundwater monitoring at ISWM is of paramount importance and the Town has worked extensively with the DEP, CCC and the BOH to ensure that a comprehensive monitoring system is in place which will continue to be reviewed and updated as necessary. DEP and CCC have concluded that, while there have been impacts to groundwater from the old unlined landfill which ceased operation in 1999, the Town has taken the appropriate measures to protect downgradient receptors of the facility and that the modern design of the landfill is protective of human health and the environment and therefore, expansions have been granted over the last twenty years.

- (h) Wastewater
  Landfill leachate and condensate will continue to be managed by a groundwater protection system similar to the current state of the art system that is installed for the current operation. Leachate is conveyed to two large on-site storage tanks and will be either removed from the site via trucks or managed on-site at a proposed wastewater treatment plant, if it is constructed. ISWM is reviewing options for the possible construction of a leachate pre-treatment system on-site as well as construction of a full treatment system. If the latter option is pursued, ISWM may connect to the wastewater treatment plant effluent line on Joint Base Cape Cod (JBCC) which abuts the landfill, via a pending easement from the MA Department of Fish and Game (DFG) and further review of any impacts to habitat and Natural Areas by NHESP and the CCC. An additional easement will need to be obtained from the U.S. Army Corps of Engineers as well as Use Agreements with the MA Air National Guard, 102nd Intelligence Wing. Any such connection and discharge will need to be reviewed and permitted by DEP prior to construction and operation, as well as by representatives from the military authorities on JBCC.

  Currently, domestic wastewater that is generated on-site is treated and disposed by three Title 5 septic systems. The system for the existing garage is expected to remain and the two systems for the existing office and single stream recyclable transfer station will be abandoned in accordance with Title 5. Those two systems will be replaced by either two systems or a single combined system for the facilities to be located on the 12-acre parcel. There will be no increase in flow to the new systems, thus there will be no net change to the site's wastewater discharge.

- (i) Transportation
  The Town has invested in significant site improvements that have excess capacity for its approved tonnage and is prepared to address any scenario for disposal and/or transfer whether it remains mostly ash or if it were to become mostly MSW. This is detailed in a Traffic Assessment Memorandum found in Attachment 13, which includes an analysis of recent crash data.

- (j) Energy
  The project does not meet the size thresholds for MEPA review under energy.

- (k) Air
  A major air plan approval has already been obtained from DEP and has also received an Operating Permit "application shield" for the initial application as MA DEP reviews the application. The primary impacts to air quality were from emissions of landfill gas (LFG), which contains methane. The Town has made commitments to LFG collection and control in order to mitigate the air quality impacts. The Project currently has a flare as the primary pollution control device for mitigating emissions of LFG to the environment. The secondary air emissions from the flaring of LFG are subject to DEP permit conditions. It should be noted that ISWM applies daily cover to the active landfill face, utilizes intermediate

cover where appropriate and installs horizontal landfill gas collection systems in the active landfill, all in an effort to contain and control landfill gas emissions.

- (l) Solid and hazardous waste
  The mitigation of impacts from solid waste disposal at the Landfill were adequately addressed in the original FEIR and DRI as well as through each subsequent DEP approval for construction and operation. Of note, for Phase 7, Phase 8 or Phase 9, is that there is no request to increase daily or annual tonnage limits at the Landfill. As with all phases before, the construction and operation is subject to state regulation and permit conditions by DEP.

5.5 BENEFITS OF THE ISWM FACILITY

(1) As part of the original DRI application in 1998, ISWM provided a list of benefits to the region. Below is a brief overview of how those have been fulfilled over the last 20 years and how the continued operation, including the development of Phase 7, Phase 8 and Phase 9 will benefit the region.

(2) 1998 Benefits

Benefit	Outcome
Provides environmentally safe, affordable and convenient lined landfill capacity and processing options for difficult-to-manage wastes, thereby reducing the risk of illegal dumping which could threaten the aquifer.	Over the last 20 years, the Town of Bourne has provided not only state-of-the-art lined landfill capacity for non-MSW items, MSW and ash, it has built a multi-faceted, integrated site that includes a Construction and Demolition (C&D) debris transfer station, a single stream recyclables transfer station and residential recycling open to other towns. Additionally, ISMW hosts an annual regional Household Hazardous Waste collection event, a regional latex paint collection event, and is a regional mattress recycling center.
Potential for future mitigation of existing unlined sections of the current landfill in future phases.	In 2011, ISWM completed reclamation of the Phase 1D unlined landfill dating back to the early 1970s. This was a tremendous success as describe in a Notice of Project Change to MEPA in great detail. The reclamation provided capacity for the Phase 4 Landfill. It also allowed for the complete redesign of the entrance to the facility that greatly increases the capacity, flow and safety of traffic on the site as well as the overall aesthetics of the site with the construction

	of a new scale house and scales.
Upgraded management and equipment will more effectively utilize landfill airspace thereby extending the lifespan of the facility.	ISWM has consistently been able to acquire the latest landfill and construction equipment. This has increased its compaction rates of in-place waste to meet modern industry standards, increased its overall efficiency of operations and reduced its air emissions as engine technology has improved.
Provide alternative disposal and processing options for municipalities that currently operate unlined landfills. This local option can help to accelerate the closure of these sites thereby reducing leachate generation and landfill gas migration.	By the late 1990s, Bourne was the only active landfill left on the Cape. ISWM has continuously worked with municipalities on the Cape in a variety of ways over the years to meet a need that was created by this reduction in capacity. This has included providing discounted landfill disposal, processing and later transfer options for non-MSW items such as grits and screenings, catch basin cleanings, mattresses and other bulky items and C&D wastes.
Increased groundwater monitoring infrastructure and testing.	This has been accomplished. The groundwater monitoring network has been upgraded over the years to become a comprehensive network. MA DEP and CCC have reviewed this plan, which has included testing of an off-site monitoring well network. MA DEP has issued an approval of the Comprehensive Site Assessment which represent a review of long-term trends at the facility. The Board of Health has also passed a bylaw prohibiting the installation and use of private and/or public drinking water supply wells downgradient of the facility.
Less total travel by haulers and residents thereby reducing usage of fuel and generation of emissions.	Having local infrastructure provides an option for companies to manage materials here without having to travel over the bridge.

Possibility of using landfill gas for flares and/or energy production.	ISWM has explored many options over the years including; a stand-alone landfill gas-to-energy facility, with and without the contribution of biogas from an anaerobic digester; direct pipeline injection; and leachate evaporation. To date, a feasible economic model, in an ever-changing energy and regulatory market, has not emerged, given the small amount of gas ISWM generates, especially now that it takes mostly ash which does not produce landfill gas. However, ISWM is still evaluating options to recovery energy in some form and will continue to do so. The SSEIR discusses this extensively.
Strategically plan to work to identify local waste management challenges facing Cape Cod and find creative solutions.	ISWM has participated extensively in regional solid waste management planning discussions, especially in the wake of the end of the Tier 1 contracts with the SEMASS facility in Rochester, MA. Bourne currently serves the Town of Falmouth, as well as its own MSW disposal needs and will continue to play a role in regional planning and is actively exploring options for technologies that will provide services beyond the life of the landfill.
The residential drop-off area will be maintained and expanded.	ISWM built a new, expanded, thoughtfully laid-out residential recycling center in 2011. It includes a new Swap Shop and has sheds for a variety of materials such as waste oil and antifreeze to mercury containing devices. ISWM has also opened up limited access to residential traffic from other towns on a pay as you go basis. This has been especially popular with residents of Falmouth.
Develop education resources and facilities that can showcase state-of-the-art integrated solid waste management.	ISWM has had annual open houses since 2000 and the main open house now is in the spring during Earth Day celebrations. This includes an extensive tour of all the operations of the facility. Additionally, ISWM staff have provided many arranged tours for schools and universities in the region and from the Boston area.

(3) Phase 7, Phase 8 and Phase 9 Benefits

Benefit
Provide much needed disposal capacity for municipal waste combustor ash from Covanta SEMASS. Several Cape Cod communities send their waste to SEMASS and in order for SEMASS to continue to operate, it must have disposal capacity for its residual ash. Alternatively, this capacity may be utilized to provide MSW disposal options instead of ash for municipalities on the Cape whose current short-term contracts will be expiring in the near future.
Provide a local, in-state option that reduces the need to look for out of state options to manage residuals as well as other materials such as contaminated soils. Within the next 5 or 6 years landfill capacity in Massachusetts will likely shrink significantly and Bourne could be one of only three to five facilities remaining. This will mean exports to places such as Ohio by rail haul will rise along with potential increases in cost and logistical challenges such as obtaining an adequate supply of rail cars.
As the main revenue source for the ISWM Department, the continuation of the Landfill will provide the financial resources that will allow the continued investments in the operation and maintenance of needed local infrastructure. This not only includes the Landfill, but also transfer stations for C&D materials and single stream recyclables, as well as collection events for organics, mattresses, household hazardous waste (HHW) and latex paint. Additionally, by being on sound financial footing, ISWM can do advanced planning and investing in research and development of the site to host potential solid waste management technologies that could serve the region well beyond the life of the landfill.
The proposed landfill capacity, that will extend at least into the 2030s, will afford ISWM the time to work with DEP, MEPA, CCC and the entire Cape Cod community to further develop waste reduction infrastructure and goals to reduce dependence on disposal.
Provide the region with emergency capacity in the event of disruptions to regional infrastructure or as a result of storm events. In 2007, ISWM managed all of the MSW from the towns on Cape Cod after a devastating fire at SEMASS closed the facility for many months. While the region has been fortunate and not experienced a hurricane since Hurricane Bob in 1991, having ISWM and its facilities operational in the time of need after a major storm event will be of critical importance.
Provide a platform for renewable energy or thermal recovery from the combustion of landfill gas. An extensive discussion of the Town's greenhouse gas mitigation efforts and potential for solar energy recover is discussed in Section 2.2.5.5.

(4) Compliance with Local Policy Plans and Goals

The sections below will address local planning documents and goals.

(5) Bourne Local Comprehensive Plan

ISWM is compliant with the Town of Bourne Local Comprehensive Plan (LCP) which has been certified by the Cape Cod Commission. The department is charged with the responsibility of meeting and implementing the waste management goal and policies noted on page 49 which sets a goal of recycling or composting 60% of solid waste by 2030. These sections discuss the Town's efforts to maximize recycling and composting and to dispose of what cannot be recycled in an economical and environmentally sound manner. These efforts include expansion of recycling programs both at the facility and at the curbside, improving enforcement of mandatory recycling, reducing the generation of solid waste, continued support of a household hazardous waste management program and expansion of composting operations. Bourne's plan was approved at the Bourne Special Town Meeting on October 28, 2019 and certified by the Cape Cod Commission on December 5, 2019. A copy of the latest LCP can be found on the Town's website at: https://www.townofbourne.com/planning/news/local-comprehensive-final-certified-plan. Information about the process for the updating the LCP, can be found on a separate webpage at: https://townofbournelcp.wordpress.com/plan-elements/.

(6) Cape Cod Commission Regional Policy Plan

The Town has worked closely with the CCC over the course of the development of the Regional Policy Plan (RPP) to ensure that is in concert with the goals and regulations for solid waste management. ISWM has been a leader on Cape Cod in developing local recycling, composting and disposal infrastructure that serves other local municipalities. This includes the development and operation of a C&D transfer station and a single stream recyclable transfer station.

The Town also played an active role in helping communities and the CCC, determine how to manage their MSW after the original contracts with SEMASS expired. This resulted in the Town of Falmouth signing a ten-year contract with Bourne to accept its MSW. The County currently has an open Request for Proposal (RFP) seeking long-term solutions for managing waste on Cape Cod and the ISWM facility is specifically listed as one of the options to consider.

ISWM fully supports Objective WM1 and WM2 and the methods for achieving those objectives as outlined the RPP. Objective WM1 states "To reduce waste and waste disposal by promoting waste diversion and other Zero Waste initiatives.", Recent activities to support the region include being a host to a regional mattress recycling initiative as part of a DEP grant program, as well as managing the Cape Cod Latex Paint Collection and Recycling Initiative to divert clean reusable latex paint to a recycler in Hanover, MA. This was also done as part of a DEP grant program. Objective WM2 states- "Support an integrated solid waste management system." This is the very mission of ISWM which is Integrated Solid Waste Management and the substantial infrastructure that Bourne has invested in at the site demonstrates its commitment to the principle of and integrated approach. This include composting, recycling, C&D transfer for recycling, scrap metal recycling and numerous sheds for diverting other items such as its popular Swap Shop.

Additionally, ISWM plays a significant role in supporting Objective CAP1 and Objective CAP2. Objective CAP1 states- "Ensure capital facilities and infrastructure promote long-term sustainability and resiliency." Objective CAP2 states- "Coordinate the siting of capital facilities and infrastructure to enhance the efficient provision of services and facilities that respond to the needs of the region. The efficient and well-planned use of the land at the ISWM facility supports both of these objectives. In particular, the long-term site master plan as described in this SSEIR directly addresses both of these objectives.

Further details of how ISWM supports Objective WM1, Objective WM2, Objective CAP1 and Objective CAP2 will be discussed in the final DRI submittal later this year. For further information, the RPP can be found at https://capecodcommission.org/.

(7) Cape Cod Commission Act

The Town would like to make note that the ISWM facility is the manifestation of goal 7 of the Cape Cod Commission Act itself which states “Further the provision of adequate capital facilities, including transportation, water supply, and solid, sanitary and hazardous waste disposal facilities, coordinated with the achievement of other goals. The RPP must include regional goals for the provision of capital facilities, including waste disposal.”

Increasingly, local leaders are recognizing the importance of Cape Cod controlling its own fate with regard to the management of infrastructure. Solid waste is no different and finding a location where projects of all types, such as those that Bourne manages, is exceedingly difficult. The landfill expansion is a critical part of what the Town needs to continue its mission to provide the region with a range of environmentally sound solid waste management options in concert with these goals.

ATTACHMENT 1

RESPONSE TO COMMENTS, SECRETARY’S CERTIFICATE
AND COMMENT LETTERS

RESPONSE TO COMMENTS TABLE

BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

SINGLE SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT

DOCUMENTS

1 - Certificate of the Secretary – April 24, 2020
2 - Massachusetts Department of Environmental Protection - April 9, 2020
3 - Division of Fisheries & Wildlife – April 9, 2020
4 - Cape Cod Commission – April 10, 2020

DOCUMENT NUMBER	COMMENT NUMBER	COMMENT DESCRIPTION	RESPONSE LOCATION
1.	1.1	Detailed project description and any changes since ENPC	2.1 (8); 2.2.1
1	1.2	Updated plans.	Attach. 3
1	1.3	Revised description of regulatory standards and requirements with list of required approvals	2.2.1 (1), (2), (10), (11), (12)
1	1.4	Update on CCC review process.	2.2.1 (11); Section 4.0
1	1.5	Describe future emergency response scenario and required other approvals, noting MEPA regulations at 310 CMR 11.13.	2.2.1 (13), (14), (15), (16)
1	2.1	Note that no waivers will be requested to Site Suitability Criteria.	2.2.2 (1)
1	2.2	Describe existing monitoring wells and gas collection system.	2.2.2 (4)
1	2.3	Plans and description for leachate and gas collection in Phases 7, 8 & 9.	2.2.2 (2), (3)
1	2.4	Monitoring wells, leachate & gas collection infrastructure removed or modified within footprint of Phase 7, 8 & 9.	2.2.2 (2), (3), (4)
1	2.5	Phase 9 capping sequence plan and schedule, specs for long term intermediate cover and provisions for gas collection.	2.2.2 (5), (6)
1	2.6	Present the Preferred Alternative with Land Use and Water Resources Plans.	2.2.2 (7), (9); Attach. 3
1	2.7	Updated Site Plans with limit of site assignment and waste handling, showing compliance with 310 CMR 16.40(4)(h) Size of Facility.	2.2.2 (2); 3.2.a.1.; Attach. 3
1	2.8	Present groundwater contour map with nearest public and potential drinking water supplies.	2.2.8.2 (2); 3.1.1 (12); Attach. 3
1	2.9	Provide update on evaluation of on-site leachate treatment.	2.2.2 (9)

DOCUMENT NUMBER	COMMENT NUMBER	COMMENT DESCRIPTION	RESPONSE LOCATION
1	3.1	Graphic and narrative description of new impervious areas and alternatives for minimizing impervious paving.	2.2.3 (1); Attach.3
1	3.2	Describe existing, proposed and relocated stormwater infrastructure with narrative and plans.	2.2.3 (2), (3), (4)
1	3.3	Stormwater system construction sequencing with interim or temporary erosion control and structures as site develops.	2.2.3 (6); Attach. 7
1	4.1.	Analyze impacts to the Eastern Box Turtle and evaluate avoidance/mitigation strategies.	2.2.4 (1); Attach 4
1	4.2	Provide an update on consultation with the NHESP and include additional details on how the project will provide a suitable long-term net benefit and meet performance standards for issuance of a CMP.	2.2.4 (2), (3), (4)
1	4.3	Provide information on size and location of permanently protected land.	2.2.4 (2); 3.2.c.1
1	4.4	Identify necessary construction and post-construction conditions and commitments to avoid an adverse impact to resource area habitats within and adjacent to project areas	2.2.6 (1), (3), (5)
1	5.1	Identify features that could increase resiliency of each phase under future sea level conditions.	2.2.5.1
1	5.2	Develop climate change scenarios and identify potential adaptation measures for the design life of the project.	2.2.5.1
1	5.3	Provide update on SEMASS contract (and provide what alternative is feasible).	2.2.2 (7)
1	5.4	Describe additional measures should Town go back to MSW.	2.2.2 (7)
1	5.5	Consult with MEPA Staff and DOER to discuss how to assess GHG impacts of construction prior to submission.	2.2.5.6
1	5.6	In draft Section 61 Findings, provide a self-certification that all require mitigation measures have been completed.	4.0, 4.1.3
1	6.1	Construction sequencing with interim erosion controls and drainage structures, per above.	2.2.6 (1), (2) Attach. 9
1	6.2	Describe listed construction management components.	2.2.6 (1), (2) Attach. 9
1	6.3	Commit to Clean Air Construction initiatives and include in Section 61 findings.	2.2.6 (2), NA
1	6.4	Comply with Mass. Idling regulation.	2.2.6 (2); 3.2(f)
1	7.1	Include a separate chapter for summarizing proposed mitigation measures and include draft Section 61 Findings for each permit or approval.	4.1, 4.2

DOCUMENT NUMBER	COMMENT NUMBER	COMMENT DESCRIPTION	RESPONSE LOCATION
1	7.2	Provide clear commitments to implement measures, estimate costs, identify parties responsible, and provide a schedule for implementation.	4.1.6, 4.2.6
1	7.3	Clearly indicate when measures will be implemented based upon project phasing.	4.1.6
2	8.1	Site appears to be subject to NPDES MSGP for discharges from industrial activity, Sector L: Landfills.	2.2.3 (2), 2.2.6 (3)
2	8.2	Site appears to be subject to NPDES for Construction Activities.	2.2.3 (2), 2.2.6 (3)
2	8.3	Site appears to be subject to NPDES for Dewatering General Permit and Remediation General Permit.	2.2.3 (2), 2.2.6 (3)
2	9.1	Acknowledge that ISWM will comply with MCP reporting requirements.	2.2.2 (4)
2	10.1	Demonstrate that construction and operations will not cause air pollution (310 CMR 7.09 & 7.10).	2.2.6 (3) Attach 9
2	10.2	Compliance with EPA's Tier 4 emissions limits and create a list of site equipment engines with emissions tier and BACT for each.	2.2.6 (2)
2	10.3	Commitment to Mass. Idling Regulation for construction and operations equipment.	2.2.6 (1)
2	10.4	Spill Prevention Contingency Plan	2.2.6 (4), (5)
2	10.5.1	DEP has determined that Phase 9 requires a Major Modification to the Site Assignment, with limitations on site suitability criteria.	2.2.1 (10); 2.2.2 (1); 3.0
2	10.5.2	DEP expressed an opinion that the proposed Handling Facility requires a new Site Assignment (BWP SW 01), rather than a modification to the existing Site Assignment, (BWP SW 38), as ISWM intends to submit.	2.2.1 (10)
2	10.5.3	MA DEP commented on the Site Assignment process and involvement of the BOH.	2.2.1 (10)
2	10.5.4	ISWM will seek a pre-application meeting and will seek clarification on the need for "additional evaluation for each... criteria and .... plans".	2.2.1 (9)
2	10.5.5	Evaluate the impacts of Scenario 1 (continue to accept moistly SEMASS ash) and 2 (accept only MSW), regarding cited criteria in SA application.	2.2.2 (7); 2.2.5.4 (2), (3)
2	10.5.6	Present Land Use and Water Resources Plans. Updated Site Plans with limit of site assignment and waste handling, showing compliance with 310 CMR 16.40(4)(h) Size of Facility.	Attach. 3; 3.2.h
2	10.5.7	State that no waivers will be requested to Site Suitability Criteria.	2.2.2 (1)

DOCUMENT NUMBER	COMMENT NUMBER	COMMENT DESCRIPTION	RESPONSE LOCATION
2	10.5.8	Prepare Phase 9 capping sequence plan and schedule, specs for long term intermediate cover and provisions for gas collection.	2.2.2 (5); Attach (3)
2	10.5.9	MA DEP recommends and ISWM will seek a pre-application meeting to discuss Phase 9.	2.2.1 (9)
2	10.5.10	Present groundwater contour map with nearest public and potential drinking water supplies.	3.1.1.7; Attach. 3
2	10.5.11	Similar to comments 8.1, 8.2 and 8.3, above.	See Comments 8.1, 8.2 and 8.3 Above
2	10.5.12	Discuss the status of private wells; include Bourne Water District most recent letter private well analysis.	3.1.1.7
2	10.5.13	Provide additional analysis, based on hydrogeologic studies to demonstrate compliance with Suitability Criteria.	3.1.1.10; 2.2.8.3
2	10.5.14	Provide a plan with monitoring wells and discuss need for additional wells within Phase 7 & 8 and the 12-acre parcel.	2.2.2 (4); Attach. 3
2	10.5.15	Respond to DEP's comment about validity of previous traffic analysis and discuss recent crash data.	2.2.2 (7); 3.2(b); Attach. 13
2	10.5.16	Commit to compliance with ACM requirements when demolishing its own buildings.	2.2.2 (4)
2	10.6.1	Consider climate change impacts, including GHG emissions and effects.	2.2.5.1
2	10.6.2	Consider GHG impacts in the context of furthering state goals and policies.	2.2.5.1
2	10.7	See comments 7.1, 7.2 and 7.3, relative to Section 61 Findings.	4.0, 4.1, 4.2
3	11.1	Portions of the project are Priority Habitat for Eastern Box Turtle, for which NHESP has a fact sheet	2.2.4 (1), Attach 4
3	11.2	The Division of Fisheries and Wildlife (DFW) have determined that Phases 7, 8 and 9 are exempt from review.	2.2.4 (1), Attach 4
3	11.3	The LHF on the 12-acre parcel results in a Take and will require a Conservation and Management Permit (CMP).	2.2.4 (2), Attach 4
3	11.4	ISWM has proactively consulted with DFW on obtaining a CMP.	2.2.4 (2), Attach 4
3	11.5	The Division of Marine Fisheries (DMF) has no recommendations for minimizing impacts from the project.	NA
4	12.1	The Cape Cod Commission (CCC) recommends that the SSEIR include discussions relative to the Cape Cod Regional Policy Plan.	5.5 (6)

DOCUMENT No. 1

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Executive Office of Energy and Environmental Affairs
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April 24, 2020

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
EXPANDED NOTICE OF PROJECT CHANGE

PROJECT NAME	: Bourne Integrated Solid Waste Management Facility
PROJECT MUNICIPALITY	: Bourne
PROJECT WATERSHED	: Cape Cod
EOEA NUMBER	: 11333
PROJECT PROPONENT	: Town of Bourne
DATE NOTICED IN MONITOR	: February 26, 2020

Pursuant to the Massachusetts Environmental Policy Act (MEPA; M.G. L. c. 30, ss. 61-62I) and Section 11.10 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project **requires** the preparation of a Supplemental Environmental Impact Report (EIR). The Town submitted an Expanded Notice of Project Change (NPC) with a request that I allow a Single Supplemental EIR to be submitted in lieu of the usual two-stage Draft and Final EIR process. While I hereby grant the Town's request to submit a Single Supplemental EIR in accordance with the Scope below, I expect that the Single Supplemental EIR will include a comprehensive response to the detailed comments from the Massachusetts Department of Environmental Protection (MassDEP) and remind the Town that I reserve the right to find the Single Supplemental EIR inadequate and require the Town to file a Second Supplemental EIR in accordance with 301 CMR 11.08(8)(d)(3).

The project was published in the Environmental Monitor on February 26, 2020. The Proponent requested an extended comment period which closed on February 10, 2020. The deadline for issuance of this Certificate was extended from April 17, 2020 pursuant to the Governor's Covid-19 Order No. 17: Order Suspending State Permitting Deadlines and Extending the Validity of State Permits.

Project Change Description

As described in the Expanded NPC, the project consists of the phased expansion (Phases 7, 8 and

9) of the Bourne Integrated Solid Waste Management Facility (ISWMF) project. Specifically, the Town of Bourne is proposing a vertical and horizontal landfill expansion and the relocation of the solid waste handling facility and other offices and facilities on the property. The three phase 25.0-acre expansion will provide a total of 5,175,000 cubic yards (cy) of disposal capacity which will extend the life of the landfill through 2040.

The horizontal expansion of the landfill (Phase 7 and 8) will require the development of new lined landfill cells in an area located south of Phase 6. These new cells will incorporate leachate collection and landfill gas management infrastructure. Phases 7 and 8 will provide approximately 3,920,000 cy of disposal capacity. The horizontal expansion will be located within a 25-acre parcel that is currently site assigned for solid waste handling and contains a residential recycling area, transfer station, office building, and other appurtenant structures. The development of Phases 7 and 8 will require the relocation of the transfer station and other structures to an adjacent 12-acre parcel which was acquired by the Town in 2016 and abuts the residential recycling center at the southern boundary of the site. The vertical expansion (Phase 9) is proposed over uncapped areas of the landfill and areas that have been capped with a final cover system. Phase 9 will increase the maximum height of the landfill by 40 feet (from 185 ft to 225 ft) and will provide approximately 1,255,000 cy of disposal capacity which could extend the life of the landfill up to four and a half years.

The Certificate on the Final Environmental Impact Report (FEIR), issued November 29, 1999, acknowledged that certain aspects of the landfill project, including future phases, were conceptual and required that the Town submit NPCs to the MEPA Office to address development of subsequent phases. This Expanded NPC provides an updated site development plan for the landfill and describes the development of Phase 7, Phase 8 and Phase 9 of the landfill expansion.

Procedural History

Review of the Bourne ISWMF project was initiated with the submission of an Environmental Notification Form (ENF) in 1997. As described in the 1997 ENF, the ISWMF project entailed the development of a regional waste management facility within the Bourne Landfill located off MacArthur's Boulevard (Route 28). The project was intended to meet a regional need for the processing and disposal of construction and demolition (C&D) material, and Difficult-To-Manage (DTM) wastes on Cape Cod. The project included the capping and/or mining of previously landfilled areas, as well as the development of a number of new lined landfill phases for regional non-municipal solid waste. The average disposal rate was identified as 300 to 500 tons per day (tpd). The project was designed to accept a maximum of 825 tpd of waste materials at full build-out. As described in the ENF, approximately 400 tpd would be disposed of on-site, 250 tpd of C&D waste would be processed; 100 tpd would be recycled; 50 tpd would be composted; and 25 tpd would consist of diverted waste. The ENF was followed by a Draft and a Final EIR in 1998 and 1999 (respectively), both of which were determined to be adequate. The Certificate on the FEIR, issued November 29, 1999, acknowledged that certain aspects of the landfill project were conceptual and required that the Town submit Notices of Project Change (NPCs) to the MEPA Office to address development of subsequent phases.

NPC-1 was submitted in April 2003 and expanded the waste stream to include Municipal Solid Waste (MSW) and Municipal Combustor Ash (MCA), increased the quantity of MCA it received, and allowed it to be co-mingled with MSW for landfilling with the Facility. NPC-1 did not increase the maximum permitted capacity (825 tpd) accepted for disposal, reuse, composting, and recycling. The Town committed to cease accepting unprocessed C&D material by January 1, 2004 in accordance with the Authorization to Operate (ATO) permit. The August 7, 2003 Certificate on NPC-1 determined that the potential impacts associated with the proposed project change did not warrant the preparation of an EIR.

On April 2, 2007, the MEPA Office determined that the Bourne ISWMF's temporary increase in capacity of 500 additional tpd of MSW (1,325 tpd total) qualified as an Emergency Action pursuant to the MEPA regulations. The additional MSW would be diverted from the SEMASS waste-to-energy facility in Rochester, MA which was damaged by a fire on March 31, 2007. A second NPC (NPC-2) was filed on April 17, 2007 under the Emergency Action provisions of the MEPA Regulations to address these actions and the Certificate issued on May 25, 2007 determined that the emergency action did not warrant the preparation of an EIR.

In December 2008, the Town submitted a third NPC (NPC-3) which included the phased construction of five landfill gas (LFG) reciprocating engine/electric generator sets with equipment to recover and convert LFG from the facility to electricity. The proposed energy facility was designed to generate up to 4.3 megawatts (MW) of electricity. The Certificate issued on January 23, 2009 determined that the potential impacts associated with NPC-3 did not warrant the preparation of an EIR.

In January 2016, the Town submitted a fourth NPC (NPC-4) which included an update on the Phase 1D landfill reclamation project and a final development plan for Phase 5 of the landfill. The NPC proposed a hybrid version of two scenarios that were considered in prior MEPA review. The February 5, 2016 Certificate on NPC-4 determined that the potential impacts associated with the proposed project change did not warrant the preparation of an EIR.

The Proponent submitted an Expanded NPC (NPC-5) in December 2017 for Phase 6 with a request that I allow a Single Supplemental EIR to be prepared in lieu of a Draft and Final Supplemental EIR. The Certificate issued on January 12, 2018 granted that request. Phase 6 was designed to support Phase 7 and Phase 8 (described in this Certificate). In May 2018, the Town submitted a Single Supplemental Single Supplemental EIR. The Certificate issued on June 26, 2018 determined that it adequately and properly complied with MEPA and its implementing regulations.

Project Site

The Bourne ISWMF, located at 201 MacArthur Boulevard (Route 28), is comprised of a 74-acre site-assigned parcel which contains the landfill operations and facilities. In 2001, a 25-acre parcel immediately abutting the landfill to the south was purchased and has been used for recycling and transfer operations. The landfill contains lined and unlined waste disposal areas. Phases 1A, 1B, 1C, and 1D are unlined cells that comprise the oldest portion of the landfill. Phases 1A, 1B, and 1C are closed and capped. Phase 1D was part of a pilot landfill reclamation project with the Massachusetts Department of Environmental Protection (MassDEP) that removed the solid waste in this area in order to create additional landfill space. Phases 2 and Phase 3 are both lined and are closed and capped with leachate collection systems. Phase 4, an active landfill cell, is located in the area previously occupied by Phase 1D. Phase 5 consists of a vertical expansion proposed over Phases 1A, 1B, and 1C. MassDEP issued an Authorization to Construct (ATC) and ATO Permit in 2019 for Phase 6 which is currently under construction.

Permits and Jurisdiction

The development of Phases 7, 8 and 9 is undergoing MEPA review and requires a NPC because it consists of a material change to the project prior to the taking of all Agency Actions. The project change exceeds the mandatory EIR threshold at 301 CMR 11.03 (1)(a)(2) because it will result in the creation of ten or more acres of impervious area. The project change also exceeds the Solid Waste ENF threshold at 301 CMR 11.03(9)(b)(1). Because it requires an EIR, the project change is subject to review in accordance with the MEPA Greenhouse Gas (GHG) Emissions Policy and Protocol ("GHG Policy").

The proposed landfill expansion will require the following Permits from MassDEP: Site Suitability Report for a Major Modification of an Existing Site Assignment (BWP SW 38), Authorization to Construct (ATC) a Large Landfill Expansion (BWP SW 26), and Authorization to Operate (ATO) (BWP SW 10). Relocation of the transfer station to the 12-acre parcel will require the following Permits from MassDEP: Site Suitability Report for a New Site Assignment (BWP SW 01), ATC a Large Handling Facility (BWP SW 05), and ATO a Large Handling Facility (BWP SW 06). The project may also require a Conservation Management Permit (CMP) from the Division of Fisheries and Wildlife's (DFW) Natural Heritage and Endangered Species Program (NHESP).

The project will require a Development of Regional Impact (DRI) Modification from the Cape Cod Commission (CCC), Site Assignment Approval from the Bourne Board of Health, and a National Pollutant Discharge Elimination System (NPDES) Construction General Permit from the U.S. Environmental protection Agency (EPA).

Because the project is not seeking Financial Assistance from the Commonwealth, MEPA jurisdiction extends to those aspects of the project that are within the subject matter of required, or potentially required, State Agency Actions and that may cause Damage to the Environment as defined in the MEPA regulations. The subject matter of the Site Assignment regulations is sufficiently broad to confer the equivalent of broad scope jurisdiction over the potential environmental impacts of the project. Therefore, MEPA jurisdiction is broad in scope and extends to all aspects of a project that are likely, directly or indirectly, to cause Damage to the Environment, as defined in the MEPA regulations.

Environmental Impacts and Mitigation

According to the Expanded NPC, potential environmental impacts of the project change will include alteration of 38 acres of land (112 total acres) and creation of 16.23 acres of impervious area. Measures to avoid, minimize, and mitigate project impacts include: construction period Best Management Practices (BMPs), permanent protection of rare species habitat, dust control measures, erosion and sedimentation controls, leachate management, and measures to maximize LFG collection efficiency.

Single EIR Request

The Expanded NPC included a request to file a Single Supplemental EIR and was subject to an extended comment period. Consistent with the criteria for granting a Single EIR, the NPC provided a detailed project description, a baseline for evaluating environmental impacts and a comprehensive alternatives analysis. The Expanded NPC identified how the project is designed to achieve consistency with regulatory standards and measures to avoid, minimize and mitigate project impacts.

Review of Expanded NPC

The Expanded NPC described the project, identified existing conditions, and described potential environmental impacts and mitigation measures. It provided a brief description of applicable statutory and regulatory standards and requirements, and described how the project will meet those standards. The Expanded NPC provided a list of required local, state, and federal permits and provided an update on the status of each of these actions.

Comments from MassDEP identify information that should be provided in the Single Supplemental EIR to ensure the facility design and operational measures will comply with solid waste regulations and applicable polices. Comments from the Cape Cod Commission (CCC) request the Town provide a discussion of the project relative to the pertinent goals and objectives from the Cape Cod Regional Policy Plan.

Alternative Analysis

The Expanded NPC provided a limited alternative analysis that evaluated expanding the landfill with Phases 7-9 (the Preferred Alternative, as described herein) and a No-Build alternative which would close the landfill once Phase 6 has reached capacity. The Expanded NPC provided a series of plans and cross-section views for each alternative. The Expanded NPC indicated that the No-Build Alternative was dismissed as the existing landfill is approaching capacity and this alternative would not extend the life span of the facility. The Expanded NPC indicated that the Preferred Alternative was selected as it will provide flexibility for additional expansion of the landfill (Phases 7, 8 and 9).

Solid Waste

The project will be regulated under MassDEP’s Site Assignment Regulations for Solid Waste Facilities and Solid Waste Regulations. The Town will be required to modify its Site Assignment with the Board of Health prior to development of Phases 7, 8 or 9. The Expanded NPC included a narrative that addressed the project’s consistency with the applicable regulatory approval criteria. I refer the Town to MassDEP’s detailed comment letter which identifies additional information necessary to evaluate compliance with site suitability criteria. The Scope for the Single Supplemental EIR requires that the Town provide additional information that addresses the applicable Site Assignment and Solid Waste regulatory approval criteria to support MassDEP permitting.

As described in the Expanded NPC, Phases 7 and 8 will be constructed in progression southward from Phase 6 (which was previously described in the 2018 NPC-5). Phase 7 will be constructed over the southern slope of Phase 6 and Phase 8 will be constructed over the southern slope of Phase 7. The Expanded NPC indicated that Phase 7 and 8 will be located in areas that are currently used for site-assigned solid waste handling activities. Both phases would be constructed using a double composite lined landfill design with leak detection designed to meet regulatory requirements for liner construction. Phase 9 will be constructed over previously lined and filled areas of the landfill including Phases 2, 2A/3A, 3, 4, 5 and 6. I refer the Town to comments from MassDEP which request that the Town schedule a pre-filing meeting to discuss the design of Phase 9 and the requirements of 310 CMR 19.110(5). The Expanded ENF indicated that Phase 9 will be constructed above portions of the landfill that will remain uncapped by installing a long-term intermediate cover in lieu of a final cover system. According to the Expanded NPC, this is intended to avoid the need to cap an area that will then be disturbed a few years later to provide the new capacity. I refer the Town to comments from MassDEP which request a schedule for capping and proposed specifications for the long-term intermediate cover system, including provisions or the collection of landfill gas.

Wastewater from the landfill, including leachate and condensate, will be collected via a groundwater protection system and conveyed to on-site storage tanks prior to being trucked off-site for disposal at a wastewater treatment facility. The Expanded NPC indicated the Town is evaluating the potential construction of an on-site leachate pre-treatment system or full treatment system. An update on this evaluation should be provided in the Single Supplemental EIR.

The Expanded NPC indicated that the project does not require an increase to the permitted tonnage the site can accept and therefore will not generate new traffic or impact traffic patterns. The Expanded NPC included a traffic assessment memorandum (dated August 31, 2017) which indicated that traffic generation has decreased since 2015 when the ash, delivered in large trailers, became the primary waste stream. I refer the Town to comments from MassDEP which requests additional information regarding the traffic study, including recent crash data.

Land Alteration/Stormwater

The new liner areas and area required for new structures and associated pavement will create 16.23 total acres of impervious area. According to the Expanded NPC, stormwater will be managed onsite through the use of diversion berms, swales, culverts, retention basins, and infiltration basins. The Expanded NPC did not identify stormwater infrastructure that may need to be relocated nor provide an additional description of the existing or proposed stormwater management infrastructure. This should be provided in the Single Supplemental EIR.

Rare Species

According to the Expanded NPC, portions of the project site are located within mapped habitat of the Eastern Box Turtle *(Terrapene carolina)*, which is state-listed as a species of Special Concern. This species and its habitat are protected pursuant to the Massachusetts Endangered Species Act (MESA; MGL c.131A) and its implementing regulations (321 CMR 10.00). Comments from NHESP indicate that the project is anticipated to result in a Take and, therefore, will require a CMP pursuant to 321 CMR 10.23. Projects resulting in a Take of state-listed species may be permitted only if they meet the performance standards for a CMP. In order for a project to qualify for a CMP, the Town must demonstrate that the project has avoided, minimized and mitigated impacts to state-listed species consistent with the following performance standards: (a) adequately assess alternatives to both temporary and permanent impacts to the state-listed species, (b) demonstrate that an insignificant portion of the local population will be impacted, and (c) develop and agree to carry out a conservation and management plan that provides a long-term net benefit to the conservation of the state-listed species. The Expanded NPC indicated the Town intends to meet these performance standards by permanently protecting off-site land in the vicinity of the site as open space and state-listed species habitat. NHESP anticipates that the project will provide a suitable long-term net benefit and meet the performance standards for issuance of a CMP.

Greenhouse Gas Emissions (GHG)

The project is subject to the GHG Policy because it exceeds thresholds for a mandatory EIR. The Policy requires Proponents to quantify carbon dioxide (CO_2) emissions and identify measures to avoid, minimize or mitigate such emissions. The Policy directs proponents to use applicable building codes to establish a project emissions baseline that is "code-compliant." However, there is no building energy code equivalent that applies specifically to landfills or energy use models (such as eQUEST) designed to estimate the projected energy use of the landfill energy loads. Therefore, prior to the submittal of the Expanded NPC the Town had consulted with the MEPA Office and the Department of Energy Resources (DOER) in development of the GHG analysis. The Expanded NPC provided an overview of the measures the Proponent currently employs to avoid, minimize, and mitigation GHG emissions including: recycling, implementation of a LFG collection and flare system, improving collection efficiency (95% vs 75%), and use of Tier 4 emissions reduction equipment in all on-site heavy machinery. The Expanded NPC also provided an overview of additional measures to reduce GHG emissions which were pursued by the Town and ultimately determined to be financially or technically infeasible, including: LFG conversion to pipeline natural gas, microturbines fueled by LFG, LFG-to-energy facility, anaerobic digestion of organic materials and biogas-to-energy. I commend the Town for its ongoing commitment to GHG reduction and for continuing to evaluate and pursue options to reduce the impacts of LFG emissions.

The Town currently mitigates the emission of GHG through an extensive landfill gas collection system and thermal destruction system. A major reduction in the production of GHGs has been achieved by shifting the waste it accepts. Approximately 86 percent of its annual tonnage is in the form of municipal combustor ash (MCA) which does not produce gases. The Town's 10-year contract to accept MCA from SEMASS will terminate at the end of 2021. The Town intends to extend the contract and to continue accepting up to 189,000 tpy of MCA and 30,000 tpy of biodegradable MSW from Bourne and Falmouth (Scenario 1). However, if the contract is not extended, the Town will return to accepting up to 219,000 tpy of biodegradable municipal solid waste (MSW) (Scenario 2). The Expanded NPC described both MSW/MCA contract scenarios, the decrease in LFG associated with each, the actual LFG collection system efficiency compared to industry standards, and the flare efficiency. It also quantified GHG emissions from direct (flaring and fugitive emissions) and indirect (flare and LFG collection motors) sources. The greenhouse gas evaluation of both scenarios reflect the reductions associated with aggressive measures to capture, collect and destroy landfill gas. The Expanded NPC identified the resulting CO_2 emissions that would be generated each year over a 20 year period (2021 through 2041) for each of the two scenarios. The GHG emissions associated with Scenario 1 would decline annually from 2021 to 2041 and would generate a total of 390,706 tons of GHG emissions over this period. The GHG emissions associated with Scenario 2 would increase annually from 2021 to 2036, and then decline annually to 2041. Scenario 2 would generate a total of 815,844 tons of GHG emissions over this period. The Town's preferred scenario (Scenario 1), representing continued acceptance of MCA, would decrease GHG emissions by 425,138 total tons over the 40 year period (2021 through 2041) compared to Scenario 2. This represents an approximate 52 percent reduction in GHG emissions compared to Scenario 2.

According to the Expanded NPC, the Town is assessing the feasibility and potential development of the following projects which would provide additional reductions in GHG emissions:

- Recovering thermal energy (140 tpy);
- LFG-to-Energy (219,000 tpy);
- LFG Blower Powers with 40 horsepower motors (75 tpy); and
- Solar PV (6.2 MW) on final closed plateau of landfill and existing facility roof (3,714 tpy);
- Development of on-site leachate treatment (would eliminate 1,000 to 2,000 truck trips each year);
- Operation of an animal crematory that would use LFG as a fuel (and displace the use of natural gas from other sources;
- Additional thermal recovery of LFG from combustion to heat the maintenance building;
- Vertical axis wind turbines;
- Use of compressed natural gas for trucks; and,
- Regional composting.

Construction Period

The Expanded NPC identifies construction period impacts including increases in construction related truck traffic, dust, noise, stormwater runoff, and construction waste. Mitigation measures identified in the Expanded NPC include implementation of a traffic control and construction management plan, dust suppression measures, and construction waste management and recycling.

All construction and demolition activities should be managed in accordance with applicable MassDEP's regulations regarding Air Pollution Control (310 CMR 7.01, 7.09-7.10), and Solid Waste Facilities (310 CMR 16.00 and 310 CMR 19.00, including the waste ban provision at 310 CMR 19.017). The project should include measures to reduce construction period impacts (e.g., noise, dust, odor, solid waste management) and emissions of air pollutants from equipment, including anti-idling measures in accordance with the Air Quality regulations (310 CMR 7.11). I encourage the Town to require that its contractors use construction equipment with engines manufactured to Tier 4 federal emission standards, or select project contractors that have installed retrofit emissions control devices or vehicles that use alternative fuels to reduce emissions of volatile organic compounds (VOCs), carbon monoxide (CO) and particulate matter (PM) from diesel-powered equipment. Off-road vehicles are required to use ultra-low sulfur diesel fuel (ULSD). If oil and/or hazardous materials are found during construction, the Proponent should notify MassDEP in accordance with the Massachusetts Contingency Plan (310 CMR 40.00). All construction activities should be undertaken in compliance with the conditions of all State and local permits. I encourage the Town to reuse or recycle construction and demolition (C&D) debris to the maximum extent.

Conclusion

Based on review of the Expanded NPC, consultation with State Agencies and review of comment letters, I have determined that the Proponent may submit a Single Supplemental EIR. The Single Supplemental EIR should be prepared in accordance with the following Scope. The primary emphasis of this Scope is to demonstrate that the project's design and operational measures will comply with solid waste regulations and applicable polices and provide sufficient information for MassDEP to use in making their permitting decisions and associated Section 61 Findings.

SCOPE

General

The Single Supplemental EIR should follow Section 11.07 of the MEPA regulations for outline and content, as modified by this Scope.

1. Project Description and Permitting

The Single Supplemental EIR should include a detailed description of the proposed project and 1.1
describe any changes to the project since the filing of the Expanded NPC. The project description should
identify individual components of the project and identify impacts associated with each component. The 1.2
Single Supplemental EIR should include updated plans as necessary to reflect modifications to
infrastructure design, access roadways, and mitigation. It should provide a revised description and 1.3
analysis of applicable statutory and regulatory standards and requirements, and a description of how the project will meet those standards. The Single Supplemental EIR should include a list of required State
permits or other State approvals and provide any relevant updates. The Single Supplemental EIR should 1.4
include an update on the CCC review process and a discussion of the project's compliance with the pertinent goals and objectives from the Cape Cod Regional Policy Plan.

According to the Expanded NPC, the landfill is anticipated to play a leading role in responding to future emergency conditions on Cape Cod in order to ensure that the public health and the environment are protected. The Expanded NPC included a request that MEPA review be waived for such emergencies and defer to MassDEP for any technical oversight. Specifically, the Expanded NPC requests presumptive approval to operate any or all of its facilities 24 hours per day, with a total inbound tonnage not to exceed 1,500 tons in any 24 hour period, for a minimum of five consecutive days, or 120 hours. The Expanded NPC did not describe the anticipated future emergency conditions nor provide additional details on what may trigger the need for implementation of this scenario. If there is a specific future emergency scenario to which this request relates, this should be described in the Single Supplemental EIR. It should also identify any additional Permits or Agency Actions that may be
required specific to the emergency. Lastly, I note the MEPA regulations currently include provisions 1.5
that address review of emergency actions necessary to avoid or eliminate an imminent threat to environmental resources or quality or public health or safety (301 CMR 11.13).

2. Solid Waste

Comments from MassDEP identify information required to demonstrate the project's consistency with the applicable Site Assignment and Solid Waste regulatory approval criteria. I hereby incorporate by reference the comment letter from MassDEP dated April 9, 2020, into the Scope for the
Single Supplemental EIR. The Single Supplemental EIR should identify whether the Proponent intends 2.1
to request a waiver of any Site Suitability Criteria identified at 310 CMR 16.40 and should include additional information and analysis to address the issues identified in MassDEP's comment letter.

The Single Supplemental EIR should include a description of the existing monitoring wells and 2.2
leachate and landfill gas collection systems. It should provide plans and describe how leachate and 2.3

landfill gas will be collected and managed within Phase 7-9. The Single Supplemental EIR should identify any monitoring wells and leachate or gas collection infrastructure located within the footprint of 2.4 the expansion that will need to be removed, modified, or relocated to accommodate the expansion. As noted above, the Town intends to keep a section of the landfill upcapped by installing a long-term intermediate cover system in lieu of a final cover system. In order to evaluate the adequacy of this plan, the Single Supplemental EIR should include a detailed capping sequence plan that includes a site plan 2.5 and schedule for capping and proposed specifications for the long-term intermediate cover system including provisions for the collection of landfill gas.

The Single Supplemental EIR should develop and present the Preferred Alternative with both a 2.6 Land Use Plan and a Water Resources Plan in accordance with the Site Assignment. The Single Supplemental EIR should include site plans depicting the proposed limits of site assignment and waste 2.7 handling. The Single Supplemental EIR should also include site plans depicting the conceptual plan for the proposed landfill expansion areas and the proposed handling facility to demonstrate compliance with 310 CMR 16.40(4)(h) Size of Facility as requested by MassDEP. The Single Supplemental EIR should include a groundwater contour map in order to delineate where the nearest public drinking water supply 2.8 or potential public water supply is located.

3. Land Alteration/Stormwater

The Single Supplemental EIR should include a graphic and narrative description of the 3.1 impervious areas that will be created by the project and should review alternatives for minimizing new impervious surfaces associated with pavement. The Single Supplemental EIR should provide plans and a narrative that describes the existing and proposed stormwater management system. The plans should 3.2 clearly identify stormwater infrastructure that will be eliminated, newly constructed, or modified. The Single Supplemental EIR should include additional information regarding construction sequencing that 3.3 includes interim erosion controls and temporary stormwater structures (as applicable) to address the changing contours throughout the landfill.

4. Rare Species

The Single Supplemental EIR should analyze the impacts to Eastern Box Turtle and evaluate 4.1 avoidance/mitigation strategies. It should provide an update on consultation with the NHESP and include additional details on how the project will provide a suitable long-term net benefit and meet the 4.2 performance standards for issuance of a CMP. This should include information on the size (sf) and location of the land that will be permanently protected as open space and state-listed habitat. The Single 4.3 Supplemental EIR should identify necessary project construction and post-construction conditions and commitments to avoid an adverse impact to resource area habitats of state-listed species located within 4.4 and adjacent to the project areas.

5. Climate Change and GHG

Governor Baker's Executive Order 569: Establishing an Integrated Climate Change Strategy for the Commonwealth (EO 569; the Order) was issued on September 16, 2016. The Order recognizes the serious threat presented by climate change and directs agencies within the administration to develop and implement an integrated strategy that leverages state resources to combat climate change and prepare for its impacts. The Order seeks to ensure that Massachusetts will meet greenhouse gas (GHG) emissions reduction limits established under the Global Warming Solution Act of 2008 (GWSA) and will work to prepare state government and cities and towns for the impacts of climate change. Review of these issues through the GHG Policy and requirements to analyze the effects of climate change through EIR review is an important part of this statewide strategy. These analyses inform State Agencies and proponents' understanding of a project's GHG emissions and its vulnerability to the effects of climate change.

Adaptation and Resiliency

The Town is a participant in the Commonwealth's Municipal Vulnerability Preparedness (MVP) program. The MVP program is a community-driven process to define natural and climate-related hazards, identify existing and future vulnerabilities and strengths of infrastructure, environmental resources and vulnerable populations, and develop, prioritize and implement specific actions the Town can take to reduce risk and build resilience.

The Single should identify design features that could increase the resiliency of each of the 5.1
proposed phases under future sea level conditions. The Town should consult the best available data on climate change predictions, including data available on the resilientMA.org website, to develop climate change scenarios for the project and identify potential adaptation measures for the appropriate design life of the project. EEA's Climate Change Adaptation Report (September 2011) and the Town's Climate Change Vulnerability Assessment (dated December, 2019) provide additional resources to assist in this 5.2
analysis.

Greenhouse Gas Emissions

If the Town's contract with SEMASS is not extended, the Town will return to accepting up to 219,000 tpy of biodegradable municipal solid waste (MSW) (Scenario 2). As noted above, this scenario results in significant more GHG emissions than Scenario 1 (primarily MCA). The Single Supplemental EIR should provide an update on the SEMASS contract situation. It should indicate which of the two 5.3
scenarios is likely to occur (to the extent this is feasible). The Single Supplemental EIR should identify additional measures which will be implemented to reduce GHG emissions should Scenario 2 occur. The 5.4
project includes the relocation of the solid waste handling facility and other offices and facilities on the property. The Town should consult with MEPA staff and representatives of DOER prior to filing the 5.5
Single Supplemental EIR to discuss how to assess the GHG impacts of this new construction.

To ensure that all GHG emissions reduction measures adopted by the Proponent in the Preferred Alternative are actually constructed or performed by the Town, I require Proponents to provide a self- 5.6
certification to the MEPA Office indicating that all of the required mitigation measures, or their equivalent, have been completed. The self-certification should be included in the draft Section 61 Findings.

6. <u>Construction</u>

The Single Supplemental EIR should include information regarding construction sequencing that 6.1
includes interim erosion controls and temporary stormwater structures (as applicable) to address the changing contours throughout the phased development of the landfill. The Single Supplemental EIR

should describe proposed construction management components including site preparation and staging, 6.2
hazardous and solid waste management, and implementation of measures to control construction traffic,
noise, and air quality impacts. The Town should commit to participating in MassDEP's Clean Air 6.3
Construction initiative and include this as a mitigation measure in its Section 61 findings. The Single
Supplemental EIR should also address how the project will comply with the Massachusetts Idling 6.4
regulation at 310 CMR 7.11.

7. <u>Mitigation Measures/Section 61 Findings</u>

The Single Supplemental EIR should include a separate chapter summarizing proposed 7.1
mitigation measures. This chapter should also include draft Section 61 Findings for each permit or other
approval to be issued by State Agencies. The Single Supplemental EIR should contain clear
commitments to implement these mitigation measures, estimate the individual costs of each proposed 7.2
measure, identify the parties responsible for implementation, and a schedule for implementation. The
Single Supplemental EIR should clearly indicate which mitigation measures will be constructed or 7.3
implemented based upon project phasing to ensure that adequate measures are in place to mitigate
impacts associated with each phase of the landfill expansion.

<u>Response to Comments</u>

The Single Supplemental EIR should contain a copy of this Certificate and a copy of each comment letter received. In order to ensure that the issues raised by commenters are addressed, the Single Supplemental EIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended to, and shall not be construed to, enlarge the Scope of the Single Supplemental EIR beyond what has been expressly identified in this certificate.

<u>Circulation</u>

The Proponent should circulate the Single Supplemental EIR to those parties who commented on the EENF, to any State Agencies from which the Proponent will seek permits or approvals, and to any parties specified in section 11.16 of the MEPA regulations. Per 301 CMR 11.16(5), the Proponent may circulate copies of the Single Supplemental EIR to commenters in CD-ROM format or by directing commenters to a project website address. However, the Proponent must make a reasonable number of hard copies available to accommodate those without convenient access to a computer and distribute these upon request on a first-come, first-served basis. The Proponent should send correspondence accompanying the CD-ROM or website address indicating that hard copies are available upon request, noting relevant comment deadlines, and appropriate addresses for submission of comments. The Single Supplemental EIR submitted to the MEPA office should include a digital copy of the complete document. A copy of the Single Supplemental EIR should be made available for review at the Bourne public library.[1]

[1] Requirements for hard copy distribution or mailings will be suspended during the Commonwealth's COVID-19 response. Please consult the MEPA website for further details on interim procedures during this emergency period: https://www.mass.gov/orgs/massachusetts-environmental-policy-act-office.

K. Theoharides

April 10, 2020
Date

Kathleen A. Theoharides

Comments received:

4/09/2020	Natural Heritage and Endangered Species Program (NHESP)
4/10/2020	Cape Cod Commission (CCC)
4/10/2020	Massachusetts Department of Environmental Protection (MassDEP) – Southeast Regional Office (SERO)

KAT/ACC/acc

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

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Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

April 9, 2020

Kathleen A. Theoharides
Secretary of Environment and Energy
Executive Office of Energy and
Environmental Affairs
ATTN: MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: NPC Review. EOEEA 11333
BOURNE. Bourne Integrated Solid Waste
Management Facility at 201 MacArthur
Boulevard

Dear Secretary Theoharides,

The Southeast Regional Office of the Department of Environmental Protection (MassDEP) has reviewed the Notice of Project Change (NPC) for the Bourne Integrated Solid Waste Management Facility at 201 MacArthur Boulevard, Bourne, Massachusetts (EOEEA 11333). The Project Proponent provides the following information for the Project:

The purpose of this ENPC, which in effect is acting as an Expanded Environmental Notification Form (EENF), is to provide a comprehensive view of the full build-out potential of the Bourne Landfill and associated facilities. As noted in the final Certificate for Phase 6 in June 2018, the Secretary stated that "... the Town will submit a NPC to address development of Phase 7 and 8. This subsequent NPC should provide an updated development plan for Phase 7, Phase 8, the residential recycling center and relocated offices. The NPC should provide a cumulative assessment of potential impacts and avoidance, minimization, and mitigation measures for Phase 7 and Phase 8. As stated previously subsequent phases may result in a "Take" of the Eastern Box Turtle and require a CMP from the NHESP."

The submittal of this ENPC is in accordance with that path, however this NPC is in an expanded form so that it can act, in effect, as an Expanded Environmental Notification Form (EENF) in preparation for a Single Supplemental Environmental Impact Report (SSEIR) which the Town is requesting and is the process utilized to review Phase 6. The proposed site development plan for horizontal and vertical expansions of the landfill into the 2040s with new landfill liners, will also require relocation of existing structures such as offices and transfer operations onto currently pervious land. Together, the new liner areas and the areas required for the new structures and associated pavement will result in an increase of more than ten acres of new impervious land and therefore the preparation of an EIR is required.

8. ***Bureau of Water Resources Comments:***
Wetlands and Waterways Comments: As proposed, this Project does not affect wetlands or waterways protected resources and is therefore not subject to the Wetlands Protection Act.

Industrial Stormwater Permit. The Facility appears to be a subject to the U.S. Environmental Protection Agency (US EPA) National Pollutant Discharge Elimination System (NPDES) Multi-Sector General Permit (MSGP) for stormwater discharges from industrial activity as an activity under Sector L: Landfills and Land Application Sites. MassDEP reviewed the Notices of Intent (NOI) available for the 2015 MSGP in the EPA ECHO and E-enterprise databases and did not find an NOI for the Facility. More information on the MSGP may be found at: https://www.epa.gov/sites/production/files/2015-10/documents/sector_l_landfills.pdf 8.1

Construction Stormwater Permit., The Project construction activities are scheduled to disturb 112 acres of land and therefore, may require a NPDES Stormwater Permit for Construction Activities. This permit is issued by the U.S. Environmental Protection Agency where the Proponent can access information regarding the NPDES Stormwater requirements and an application for the Construction General Permit at the EPA website: https://www.epa.gov/sites/production/files/2017-07/documents/cgp_flow_chart_do_i_need_a_permit2.pdf 8.2

The Proponent should also determine if any of the following U.S. EPA NPDES permits are necessary prior to commencing Project construction: 8.3

Dewatering General Permit - https://www.epa.gov/npdes-permits/dewatering-general-permit-dgp-massachusetts-new-hampshire.

Remediation General Permit - https://www.epa.gov/npdes-permits/remediation-general-permit-rgp-massachusetts-new-hampshire.

Additional information regarding these permits may be found at:
http://www.epa.gov/region1/npdes/stormwater/assets/pdfs/CGP-DGP-RGP-Flow-Chart.pdf

9. ***Bureau of Waste Site Cleanup Comments:***
NPC #11333 – Based upon the information provided, the Bureau of Waste Site Cleanup (BWSC) searched its databases for disposal sites and release notifications that have occurred at or might impact the proposed Project area. A disposal site is a location where there has been a release to the environment of oil and/or hazardous material that is regulated under M.G.L. c. 21E, and the Massachusetts Contingency Plan [MCP – 310 CMR 40.0000].

There are several listed MCP sites located within 1000-feet of the proposed Project area. The disposal sites have all been closed under the MCP, and no further response actions or reporting are required. Note that one of the closed disposal sites is located at the Bourne ISWM facility (Release Tracking Number 4-14181). It is unlikely that any of these closed sites will impact the proposed MEPA Project area.

There are no other listed MCP disposal sites located at or in the vicinity of the site that would appear to impact the proposed Project area. Interested parties may view a map showing the location of BWSC disposal sites using the MassGIS data viewer (Oliver) at:
http://maps.massgis.state.ma.us/map_ol/oliver.php Under "Available Data Layers" select "Regulated Areas", and then "DEP Tier Classified 21E Sites". The compliance status and report

submittals for specific MCP disposal sites may be viewed using the BWSC Waste Sites/Reportable Release Lookup at: https://eeaonline.eea.state.ma.us/portal#!/search/wastesite

The Project Proponent is advised that if oil and/or hazardous material are identified during the implementation of this Project, notification pursuant to the Massachusetts Contingency Plan (310 9.1
CMR 40.0000) must be made to MassDEP, if necessary. A Licensed Site Professional (LSP) should be retained to determine if notification is required and, if need be, to render appropriate opinions. The LSP may evaluate whether risk reduction measures are necessary if contamination is present. The BWSC may be contacted for guidance if questions arise regarding cleanup.

10. ***Bureau of Air and Waste Comments:***

Air Quality. Construction and operation activities shall not cause or contribute to a condition of air 10.1
pollution due to dust, odor or noise. To determine the appropriate requirements please refer to:

310 CMR 7.09 Dust, Odor, Construction, and Demolition
310 CMR 7.10 Noise

Construction-Related Measures

MassDEP requests that all non-road diesel equipment rated 50 horsepower or greater meet EPA's 10.2
Tier 4 emission limits, which are the most stringent emission standards currently available for off-road engines. If a piece of equipment is not available in the Tier 4 configuration, then the Proponent should use construction equipment that has been retrofitted with appropriate emissions reduction equipment. Emission reduction equipment includes EPA-verified, CARB-verified, or MassDEP-approved diesel oxidation catalysts (DOCs) or Diesel Particulate Filters (DPFs). The Proponent should maintain a list of the engines, their emission tiers, and, if applicable, the best available control technology installed on each piece of equipment on file for Departmental review.

Massachusetts Idling Regulation

The NPC reports that the Project Proponent proposes simply to "minimize idling." MassDEP 10.3
reminds the Proponent that unnecessary idling (i.e., in excess of five minutes), with limited exception, is not permitted during the construction and operations phase of the Project (Section 7.11 of 310 CMR 7.00). With regard to construction period activity, typical methods of reducing idling include driver training, periodic inspections by site supervisors, and posting signage. In addition, to ensure compliance with this regulation once the Project is occupied, MassDEP requests that the Proponent install permanent signs limiting idling to five minutes or less on-site.

Spills Prevention. A spills contingency plan addressing prevention and management of potential 10.4
releases of oil and/or hazardous materials from pre- and post-construction activities should be presented to workers at the site and enforced. The plan should include but not be limited to, refueling of machinery, storage of fuels, and potential on-site activity releases.

Solid Waste Management. MassDEP Solid Waste staff (Solid Waste) has reviewed the NPC for the Town of Bourne Integrated Solid Waste Management Facility in Bourne ("Project" or "Site" or "facility") EEA No. 11333.

NPC Project Information:

The Town of Bourne Department of Integrated Solid Waste Management (ISWM or Proponent or Town) is proposing a vertical and horizontal landfill expansion and the relocation of the solid waste handling facility and other offices and facilities on the property. The proposed vertical expansion, designated as Phase 9, involves placing waste vertically over previously landfilled areas *including Phase 2, 2A/3A, 3, 4, 5, and 6. Phase 9 would increase the maximum height of the landfill from elevation 185-ft MSL to elevation 220-ft MSL and would provide approximately 1,255,000 cubic yards of additional air space. The proposed horizontal expansion, designated as Phase 7 and Phase 8, involves the development of new landfill cells in an area located south of the existing Phase 6 landfill, within the 25-acre parcel that is currently site-assigned for solid waste handling. The Phase 7 and Phase 8 expansions would provide approximately 3,920,000 cubic yards of additional airspace. The development of Phase 7 and Phase 8 requires the relocation of the existing solid waste handling facility and other offices and facilities currently located on the 25-acre parcel. The Town has acquired a 12-acre parcel of undeveloped land, located south of the existing facility, and is proposing to use the land to develop a solid waste transfer station, residential recycling area, and other facilities.*

1. The following Solid Waste permits are required for the proposed landfill expansion Project:

   a. A Site Suitability Report for a Major Modification of an Existing Site Assignment **(BWP SW 38)** for the Phase 7 and Phase 8 horizontal expansion and the Phase 9 vertical expansion.

   It should be noted that Page 20 of the ENPC states that the Phase 9 vertical expansion will not require a site assignment modification since it is within previously site assigned areas. MassDEP has reviewed the requirements of the 310 CMR 16.00 Site Assignment Regulations and determined that the Phase 9 vertical expansion requires a major modification to site assignment. The following criteria should be addressed for Phase 9: 16.40(4)(b) *Traffic and Access to the Site*; 16.40(4)(f) *Potential Air Quality Impacts*; 16.40(4)(g) *Potential for the Creation of Nuisances*; 16.40(4)(h) *Size of facility*; 16.40(4)(i) *Areas Previously Used for Solid Waste Disposal*; 16.40(4)(k) *Consideration of Other Sources of Contamination or Pollution*; and 16.40(5) *Promotion of Integrated Solid Waste Management.* 10.5.1

   b. The landfill expansion will also require the following permits from MassDEP's solid waste management section: Authorization to Construct a Large Landfill Expansion **(BMP SW 26)** and Authorization to Operate **(BWP SW 10).**

2. The following Solid Waste permits are required for the proposed solid waste transfer station:

   a. A Site Suitability Report for a New Site Assignment **(BWP SW 01)**; 10.5.2
   b. Authorization to Construct a Large Handling Facility **(BWP SW 05)**; and
   c. Authorization to Operate a Large Handling Facility **(BWP SW 06).**

3. MassDEP would like to note that site assignment permits, described in comments 1.a and 2.a above, are unlike all other MassDEP solid waste permits, in that MassDEP does not make the decision whether to site assign or not site assign a property. MassDEP only reviews a Site Suitability Report Application and determines whether a parcel of land meets specific criteria for use as the site for a solid waste management facility. If the site meets all siting criteria, MassDEP issues a Site Suitability Report to the local Board of Health with a positive determination. If the site does not meet all siting criteria, MassDEP issues a Site Suitability Report to the local Board of Health with a negative determination. However, ultimately the local Board of Health will decide whether to approve or deny a Site Assignment for a proposed facility. 10.5.3

4. MassDEP has reviewed the draft site suitability criteria information submitted within the ENPC. It should be noted that additional information will be required for the formal site suitability application, including but not limited to, additional evaluation for each suitability criteria and all applicable engineering design plans. MassDEP requires a pre-application meeting to discuss comments received from the public on the ENPC and to ensure the facility design and operational measures will comply with solid waste regulations and applicable policies with an emphasis on odor, noise, and traffic mitigation. 10.5.4

5. Page 13 of the NPC discusses the Town's current contract with SEMASS which requires the Bourne Landfill to accept and dispose of combustion ash from SEMASS at a rate of up to 189,000 tons per year. The ENPC details two scenarios upon the conclusion of the contract with SEMASS which occurs at the end of 2021. In "Scenario 1", the Town would extend the contract with SEMASS which would result in the facility accepting mostly combustion ash and an additional 30,000 tons per year of biodegradable waste (i.e. MSW). In "Scenario 2", the Town would utilize its 219,000 tons per year of disposal capacity entirely for MSW. The Town should evaluate both scenarios in the application for Site Suitability Report for a Major Modification for the landfill expansion since siting criteria may be affected by the rate of MSW acceptance including, but not limited to, 16.40(4)(b) *Traffic and Access to the Site*; 16.40(4)(f) *Potential Air Quality Impacts*; and 16.40(4)(g) *Potential for the Creation of Nuisances*. 10.5.5

6. The Proponent will be required to prepare a Land Use Plan and Water Resources Plan in accordance with Section I.H of the site suitability application form. The Proponent should also prepare a site plan depicting the proposed limits of site assignment and waste handling. The Proponent should also prepare site plans depicting the conceptual plan for the proposed landfill expansion areas and the proposed handling facility to demonstrate compliance with 310 CMR 16.40(4)(h) *Size of Facility*. MassDEP recommends the Proponent submit the plans in the subsequent MEPA filing. 10.5.6

7. The Proponent should state whether or not any waivers of the site suitability criteria are being requested under provisions of 310 CMR 16.40(6). 10.5.7

8. Page 8 of the NPC describes the Town's plan to keep sections of the landfill upcapped by installing a long-term intermediate cover system in lieu of a final cover system. In order to evaluate the adequacy of this plan, the Proponent should submit to MassDEP a detailed capping sequence plan that includes a site plan and schedule for capping and proposed specifications for the long-term intermediate cover system including provisions for the collection of landfill gas for MassDEP approval pursuant to 310 CMR 19.130(15)(e)1. 10.5.8

9. The proposed Phase 9 vertical expansion includes the placement of waste over areas of fill that have been capped with a final cover system and areas that are uncapped. The Proponent should schedule a pre-application meeting with MassDEP to discuss the design of Phase 9 and the requirements of 310 CMR 19.110(5) *Vertical Expansions over Existing Fill.* 10.5.9

10. Page 21 of the NPC addresses criteria 16.40(3)(a)4 and states "the nearest public drinking water supply well is about 0.55 miles south and cross-gradient (not downgradient) to the 25-acre parcel. The Facility is not upgradient of an existing or potential public water supply." MassDEP recommends that the Proponent submit a groundwater contour map in the subsequent MEPA filing. 10.5.10

11. Page 21 of the NPC discusses criteria 16.40(3)(a)5 which addresses discharges from the facility. MassDEP recommends the Proponent discuss the status of the Landfill's compliance with U.S. EPA NPDES Industrial Stormwater Multi-Sector General Permit for Stormwater Discharges Associated with Industrial Activity (MSGP), Sector L, Landfills and Land Application Sites. 10.5.11

12. Page 22 of the NPC discusses criteria 16.40(3)(a)6 which addresses areas of waste deposition over the recharge area of a Sole Source Aquifer. The ENPC states "All previously identified water supply wells have been replaced with connections to the public water supply system." Mass DEP recommends the Proponent discuss when the most recent private well analysis in the vicinity of the Landfill was conducted. In addition, the ENPC states "The Bourne Water District has stated in a letter that it does not have, nor will it seek to locate future drinking water sources downgradient of the Landfill." The Proponent should include the letter from the Bourne Water District. The ENPC also states "The Bourne Water District public water supply system is capable of meeting the municipality's project needs." The Proponent should include a statement from the Bourne Water District. 10.5.12

13. Page 22 of the NPC discusses criteria 16.40(3)(a)10 which addresses areas of waste deposition within a Potentially Productive Aquifer. The Proponent must provide additional analysis, based on hydrogeological studies, to demonstrate that the Phase 7 and Phase 8 expansion will meet the requirements of 16.40(3)(a)10.b. 10.5.13

14. Page 24 of the NPC discusses criteria 16.40(3)(a)12 which addresses maximum high groundwater for the proposed landfill expansion. Similarly, page 27 of the ENPC discusses criteria 16.40(3)(d)7 which addresses maximum high groundwater for the proposed solid waste handling facility. The Proponent should provide a site plan depicting the locations of all groundwater monitoring wells. The Proponent should discuss the groundwater monitoring wells within the proposed Phase 7 and Phase 8 expansion areas and within the 12-acre parcel and discuss the facility's protocol for determining groundwater elevation (*e.g.* frequency of measurements). 10.5.14

15. Page 29 of the NPC discusses criteria 16.40(4)(b) which addresses traffic and access to the site. The ENPC states "Site access, volume and regional impacts of traffic coming and going from the Bourne ISWM were thoroughly analyzed during the EIR/DRI Joint review process with MEPA and CCC." MassDEP has comments on the assumption that the previously conducted traffic study can demonstrate suitability with criteria 16.40(4)(b). The Proponent should include the traffic study and discuss why the assumptions, analysis, and conclusions of the traffic study are still valid. In addition, the Proponent should include a discussion of recent crash data. 10.5.15

Asbestos Comment

16. Demolition and Asbestos Containing Waste Material: 10.5.16
The proposed Project includes the demolition of structures which may contain asbestos. The Project Proponent is advised that demolition activity must comply with both Solid Waste and Air Quality Control regulations. Please note that MassDEP promulgated revised Asbestos Regulations (310 CMR 7.15) that became effective on June 20, 2014. The new regulations contain requirements to conduct a pre-demolition/renovation asbestos survey by a licensed asbestos inspector and post abatement visual inspections by a licensed asbestos Project monitor. The

Massachusetts Department of Labor and Work Force Development, Division of Labor Standards (DLS) is the agency responsible for licensing and regulating all asbestos abatement contractors, designers, Project monitors, inspectors and analytical laboratories in the state of Massachusetts.

In accordance with the revised Asbestos Regulations at 310 CMR 7.15(4), any owner or operator of a facility or facility component that contains suspect asbestos containing material (ACM) shall, prior to conducting any demolition or renovation, employ a DLS licensed asbestos inspector to thoroughly inspect the facility or facility component, to identify the presence, location and quantity of any ACM or suspect ACM and to prepare a written asbestos survey report. As part of the asbestos survey, samples must be taken of all suspect asbestos containing building materials and sent to a DLS certified laboratory for analysis, using USEPA approved analytical methods.

If ACM is identified in the asbestos survey, the Proponent must hire a DLS licensed asbestos abatement contractor to remove and dispose of any asbestos containing material(s) from the facility or facility component in accordance with 310 CMR 7.15, prior to conducting any demolition or renovation activities. The removal and handling of asbestos from the facility or facility components must adhere to the Specific Asbestos Abatement Work Practice Standards required at 310 CMR 7.15(7). The Proponent and asbestos contractor will be responsible for submitting an ***Asbestos Notification Form ANF-001*** to MassDEP at least ten (10) working days prior to beginning any removal of the asbestos containing materials as specified at 310 CMR 7.15(6).

The Proponent shall ensure that all asbestos containing waste material from any asbestos abatement activity is properly stored and disposed of at a landfill approved to accept such material in accordance with 310 CMR 7.15 (17). The Solid Waste Regulations at 310 CMR 19.061(3) lists the requirements for any solid waste facility handling or disposing of asbestos waste. Pursuant to 310 CMR 19.061(3) (b) 1, no asbestos containing material; including VAT, asphaltic-asbestos felts or shingles; may be disposed at a solid waste combustion facility.

If you have any questions regarding the Solid Waste Management Program or Asbestos Program comments above, please contact Mark Dakers at (508) 946-2847 or Cynthia Baran at (508) 946-2887.

Climate Change Comments

Climate Change – Greenhouse Gas Emissions. Pursuant to the Global Warming Solutions Act of 2008 (GWSA) (Chapter 298 of the Acts of 2008) and the Commonwealth's Clean Energy and Climate Plan the Commonwealth has established economy-wide greenhouse gas (GHG) emission reduction limits for Massachusetts that will achieve reductions of 25 percent below statewide 1990 GHG emission levels by 2020 and 80 percent below statewide 1990 GHG emission levels by 2050. Furthermore, Section 7 of the GWSA amended Section 61 of Chapter 30 of the Massachusetts General Laws by inserting, "in considering and issuing permits, licenses and other administrative approvals and decisions, the respective agency, department, board, commission or authority shall also consider reasonably foreseeable climate change impacts, including additional greenhouse gas emissions, and effects, such as predicted sea level rise." 10.6.1

The Proponent should consider potential GHG impacts (e.g., energy demand, use of renewable energy sources, transportation modes, etc.) of its Project in the context of furthering the Commonwealth's goals and recommended GHG mitigation policies in the *Clean Energy and Climate Plan for 2020*. Additional information on the Commonwealth's efforts to reduce GHG emissions can be found at: http://www.mass.gov/eea/air-water-climate-change/climate-change/massachusetts-global-warming-solutions-act/. 10.6.2

Proposed s.61 Findings

The "Certificate of the Secretary of Energy and Environmental Affairs on the Notice of Project Change" may indicate that this Project requires further MEPA review and the preparation of an Environmental Impact Report. Pursuant to MEPA Regulations 301 CMR 11.12(5)(d), the Proponent will prepare Proposed Section 61 Findings to be included in the EIR in a separate chapter updating and summarizing proposed mitigation measures. In accordance with 301 CMR 11.07(6)(k), this chapter should also include separate updated draft Section 61 Findings for each State agency that will issue permits for the Project. The draft Section 61 Findings should contain clear commitments to implement mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation. 10.7

Other Comments/Guidance

The MassDEP Southeast Regional Office appreciates the opportunity to comment on this NPC. If you have any questions regarding these comments, please contact George Zoto at (508) 946-2820.

Very truly yours,

SETH PICKERING

FOR David Johnston
Deputy Regional Director
Bureau of Water Resources

DJ/GZ

Cc: DEP/SERO

ATTN: Millie Garcia-Serrano, Regional Director
Gerard Martin, Deputy Regional Director, BWSC
Seth Pickering, Deputy Regional Director, BAW
Jennifer Viveiros, Deputy Regional Director, ADMIN
Jonathan Hobill, Regional Engineer, BWR
Dan Gilmore, Wetlands and Waterways, BWR
Mark Dakers, Solid Waste, BAW
Alison Cochrane, Solid Waste, BAW
Allen Hemberger, Site Management, BWSC

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

April 9, 2020

Kathleen A. Theoharides, Secretary
Executive Office of Environmental Affairs
Attention: MEPA Office
Anne Canaday, EEA No. 11333
100 Cambridge Street
Boston, Massachusetts 02114

Project Name:	*Bourne Integrated Solid Waste Management Facility*
Proponent:	*Town of Bourne, Dept. of Integrated Solid Waste Management (ISWM)*
Location:	*201 MacArthur Boulevard, Bourne, MA*
Project Description:	*Landfill Expansion – Phases 7, 8 and 9*
Document Reviewed:	*Expanded Notice of Project Change*
EEA File Number:	*11333*
NHESP Tracking No.:	*17-36534*

Dear Secretary Theoharides:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the Division) has reviewed the *Expanded Notice of Project Change* (ENPC) for the Town of Bourne ISWM's proposed Phase 7, 8 and 9 Landfill Expansion Project and would like to offer the following comments regarding state-listed species and their habitats.

According to the information provided in the ENPC, portions of the Project site are mapped as Priority Habitat for the Eastern Box Turtle (*Terrapene carolina*), a species state-listed as Special Concern according to the *Massachusetts Natural Heritage Atlas* (14th Edition). This species and its habitats are protected pursuant to the Massachusetts Endangered Species Act (MGL c.131A) and its implementing regulations (MESA; 321 CMR 10.00). A Fact Sheet for this species can be found on our website, www.mass.gov/nhesp. 11.1

All projects or activities proposed within Priority Habitat, which are not otherwise exempt pursuant to 321 CMR 10.14, require review through a direct filing with the Division for compliance with the MESA (321 CMR 10.18). The Division determined (letter dated February 5, 2020) that Phases 7, 8 and 9 of the Project, as currently proposed, appear to be exempt from MESA review pursuant to 321 CMR 10.14. 11.2

As noted in the Division's previous comments (dated June 19, 2018) on the Supplemental Single Environmental Impact Report, future development of the proposed Future Handling Area and proposed effluent connection projects will require a direct filing with the Division for compliance with the MESA. This includes any work within the "Limit of Box Turtle Habitat" shown on the site plans entitled "Conceptual Site Buildout Plan Through Phase 9 To Elevation 225" (ENPC, Attachment 3). The Proponent has initiated pre-filing consultations with the Division to discuss conceptual development plans associated with the Future Handling Area. In advance of a formal MESA filing, the Division anticipates –

based on ongoing consultations with the Proponent and information submitted to date – that future development of the Future Handling Area, as proposed, will likely result in a Take (321 CMR 10.18 (2)(b)) of the Eastern Box Turtle.

Projects resulting in a Take of state-listed species may only be permitted if they meet the performance standards for a Conservation and Management Permit (CMP; 321 CMR 10.23). In order for a project to qualify for a CMP, the applicant must demonstrate that the project has avoided, minimized and 11.3
mitigated impacts to state-listed species consistent with the following performance standards: (a) adequately assess alternatives to both temporary and permanent impacts to the state-listed species; (b) demonstrate that an insignificant portion of the local population will be impacted; and (c) develop and agree to carry out a conservation and management plan that provides a long-term net benefit to the conservation of the state-listed species.

The Proponent has continued to proactively consult with the Division on a pre-filing basis to avoid, minimize and mitigate impacts to state-listed species and their habitats associated with potential development of the Future Handling Area. Based on ongoing consultations and information submitted to date, we understand that the Proponent intends to meet the performance standards of a CMP by 11.4
permanently protecting off-site land in the vicinity of the site as open space and state-listed species habitat. Although the exact details of the long-term net benefit required under a CMP have not yet been finalized, the Division anticipates that a suitable long-term net benefit can be achieved through the protection of suitable, high quality off-site habitat and that the Project should be able to meet the performance standards of a CMP.

The Division will not render a final decision regarding the Future Handling Area until the MEPA review process and its associated comment period is complete, and until all required MESA filing materials are submitted to the Division. No work associated with the Future Handling Area or proposed effluent connection projects shall occur on the property until the MESA review process is complete.

If you have any questions about this letter, please contact Jesse Leddick, Chief of Regulatory Review, at (508) 389-6386 or jesse.leddick@mass.gov. We appreciate the opportunity to comment on this project.

Sincerely,

Everose Schlüter

Everose Schlüter, Ph.D.
Assistant Director

cc: Daniel T. Barrett, Town of Bourne ISWM Department
Phil Goddard, Town of Bourne ISWM Department
Town of Bourne Board of Selectmen
Town of Bourne Conservation Commission
Town of Bourne Planning Department
DEP Southeast Regional Office
Amy Ball, Horsley Witten Group, Inc.

March 30, 2020

Secretary Kathleen Theoharides
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
Anne Canaday, EEA No. 11333
100 Cambridge Street, Suite 900
Boston, MA 02114

Dear Secretary Theoharides:

The Division of Marine Fisheries (MA DMF) has reviewed the Notice of Project Change (NPC) for the Town of Bourne's Integrated Solid Waste Management Facility.
The project was reviewed with respect to potential impacts to marine fisheries resources and habitat.

Based on the information provided, MA DMF has no recommendation for sequencing, timing, or methods that would avoid or minimize impact at this time. 11.5

Questions regarding this review may be directed to John Logan in our New Bedford office at (508) 742-9722.

John Logan, Ph.D.
MA Division of Marine Fisheries
836 South Rodney French Boulevard
New Bedford, MA 02744
(508) 742-9722
http://www.mass.gov/eea/agencies/dfg/dmf/
https://www.researchgate.net/profile/John_Logan
Join the conversation! DMF is on Twitter, Flickr, Facebook, and YouTube.

DOCUMENT No. 4

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630

(508) 362-3828 • Fax (508) 362-3136 • www.capecodcommission.org

CAPE COD COMMISSION

Via Email

April 10, 2020
Kathleen A. Theoharides, Secretary of Energy and Environmental Affairs
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office, Eva Anne Canaday, MEPA Analyst
100 Cambridge Street, Suite 900, Boston, MA 02114

Re: Expanded Notice of Project Change — EEA No. 11333
Bourne Integrated Solid Waste Management Facility- Future Development

Dear Secretary Theoharides:

Commission staff believe the ENPC sufficiently details the scope of the Town's proposed future phases 7, 8 & 9 for the Facility and support the Town's request for, and the Secretary's allowance of, a Supplemental 12.1
Single EIR (SSEIR). The Cape Cod Commission reserves further substantive comment on the proposal for later stages of the MEPA review. Ultimately, after MEPA review concludes, the Cape Cod Commission will undertake Development of Regional Impact review of the proposed future phases. Staff suggests that it may benefit MEPA review and ultimately better facilitate the Cape Cod Commission's review if the Town were to include in the EIR, among other things, discussion of the proposal relative to the pertinent goals and objectives from the Cape Cod Regional Policy Plan.

Thank you for the opportunity to comment on the above-referenced ENPC. Commission staff are available to discuss any questions you might have about these comments.

Sincerely,

Kristy Senatori

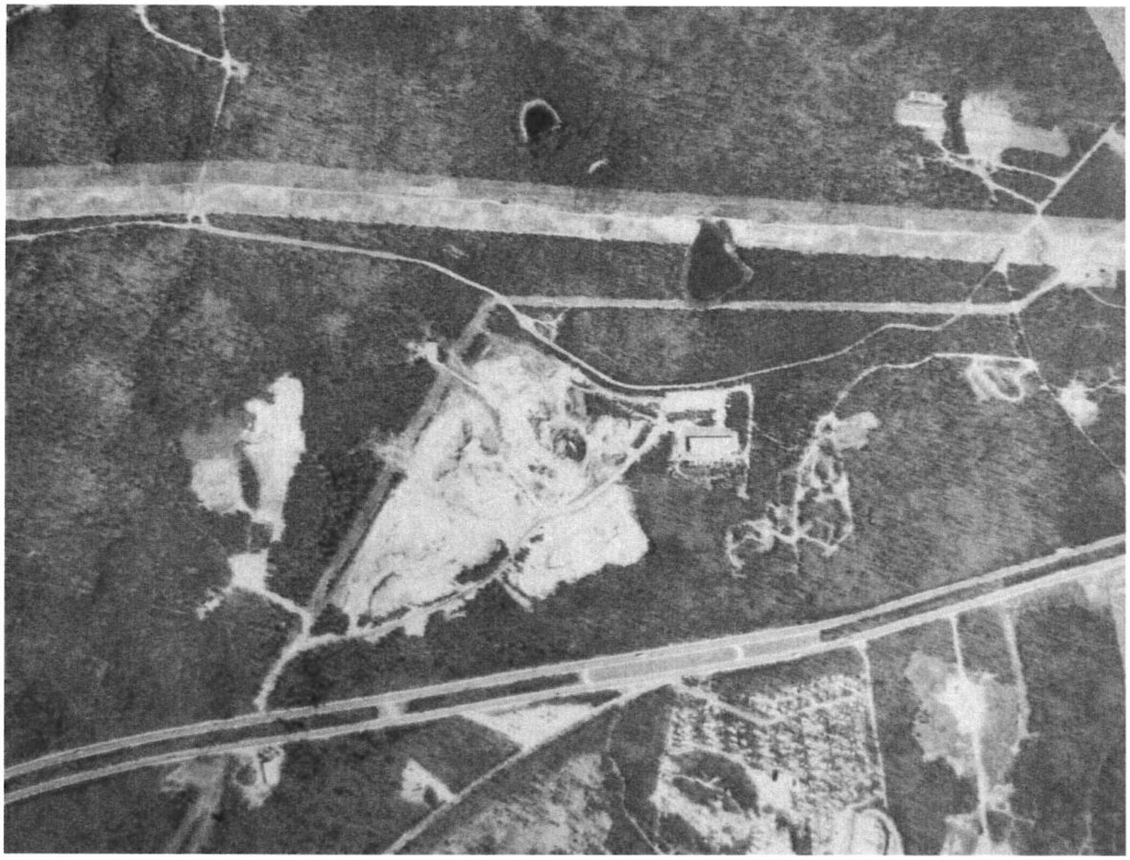
Kristy Senatori
Executive Director

Cc: Project File
Phil Goddard, Bourne ISWM Department, via email
Bourne Cape Cod Commission Representative via email
Cape Cod Commission Chair via email
Cape Cod Commission Committee on Planning and Regulation Chair via email

ATTACHMENT 2

HISTORICAL AERIAL PHOTOGRAPHS

ISWM Facility circa 1972



ISWM Facility 1999


ISWM Facility December 2019

ATTACHMENT 3

DRAWINGS

LIST OF DRAWINGS

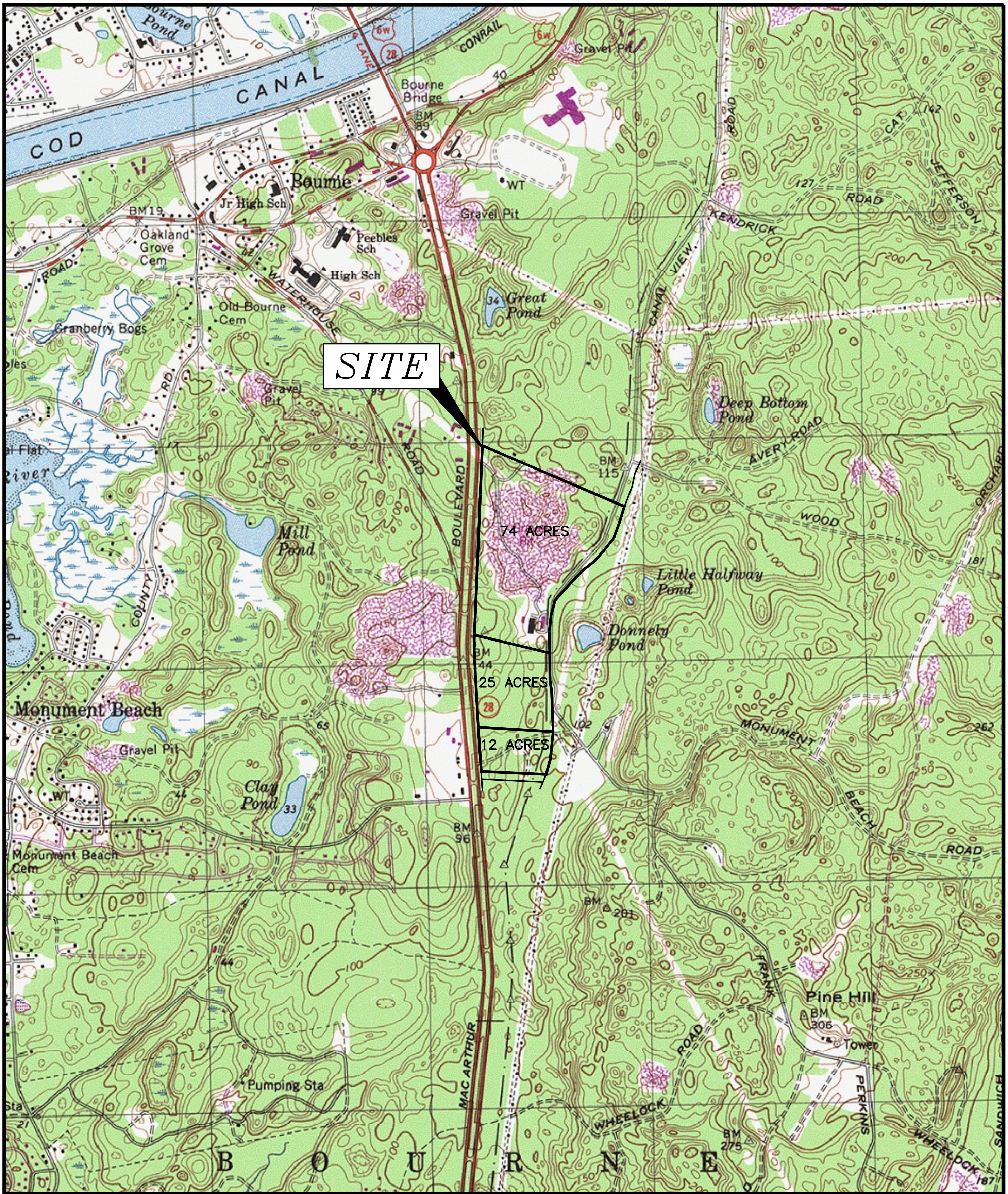


FIGURE 1 – LOCUS PLAN

BOURNE LANDFILL

201 MACARTHUR BOULEVARD

BOURNE, MASSACHUSETTS

SITEC
ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781-)319-0100
FAX (781) 834-4783

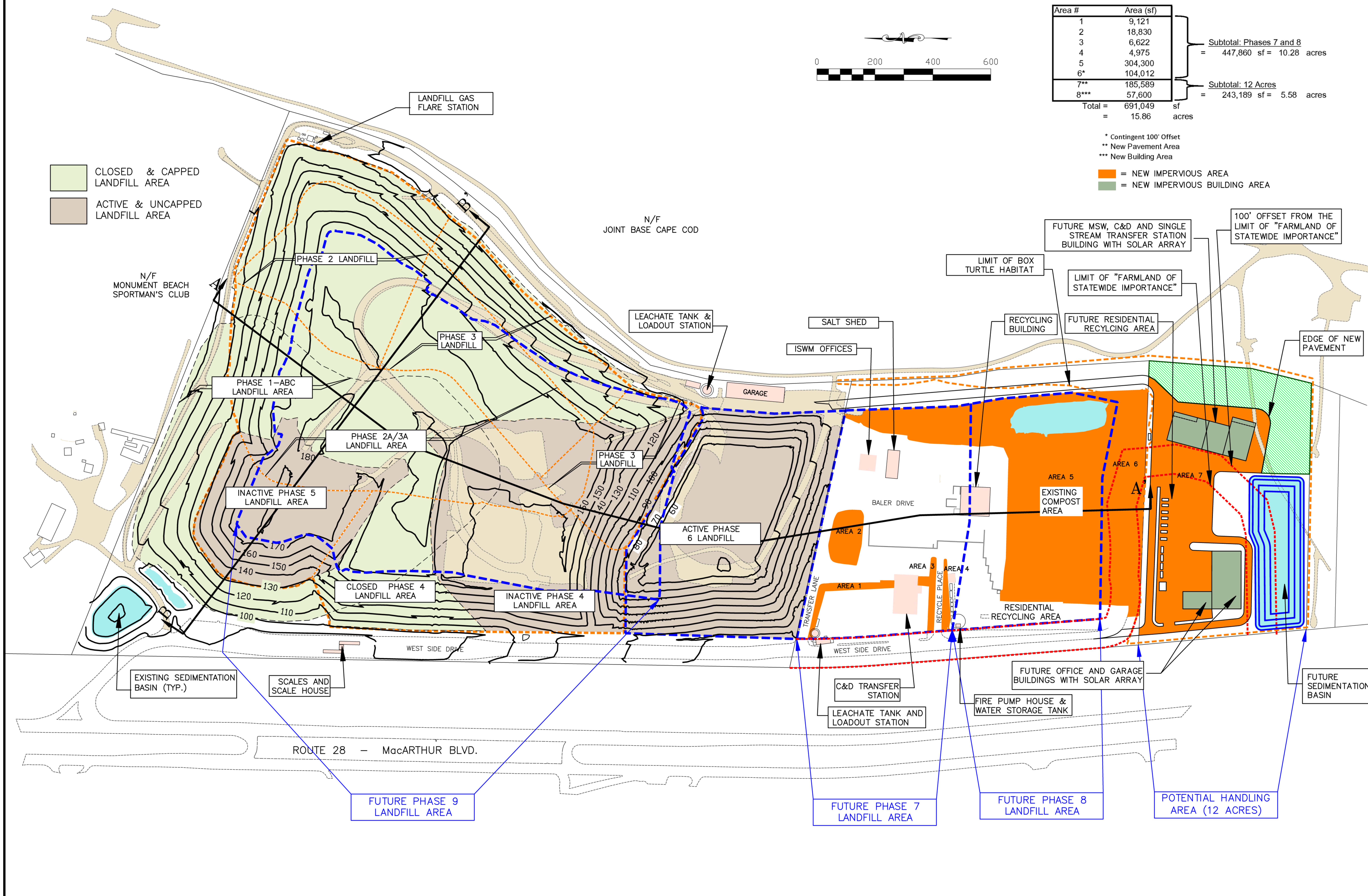
CLOSED & CAPPED LANDFILL AREA
ACTIVE & UNCAPPED LANDFILL AREA
0 200 400 600
LANDFILL GAS FLARE STATION
N/F JOINT BASE CAPE COD
N/F MONUMENT BEACH SPORTMAN'S CLUB
PHASE 2 LANDFILL
PHASE 3 LANDFILL
PHASE 1-ABC LANDFILL AREA
PHASE 2A/3A LANDFILL AREA
PHASE 3 LANDFILL
INACTIVE PHASE 5 LANDFILL AREA
ACTIVE PHASE 6 LANDFILL
CLOSED PHASE 4 LANDFILL AREA
INACTIVE PHASE 4 LANDFILL AREA
LEACHATE TANK & LOADOUT STATION
GARAGE
SALT SHED
ISWM OFFICES
RECYCLING BUILDING
LIMIT OF BOX TURTLE HABITAT
LIMIT OF "FARMLAND OF STATEWIDE IMPORTANCE"
100' OFFSET FROM THE LIMIT OF "FARMLAND OF STATEWIDE IMPORTANCE"
BALER DRIVE
TRANSFER LANE
RECYCLE PLACE
WEST SIDE DRIVE
EXISTING SEDIMENTATION BASIN (TYP.)
SCALES AND SCALE HOUSE
C&D TRANSFER STATION
LEACHATE TANK AND LOADOUT STATION
FIRE PUMP HOUSE & WATER STORAGE TANK
ROUTE 28 — MacARTHUR BLVD.
FUTURE PHASE 9 LANDFILL AREA
FUTURE PHASE 7 LANDFILL AREA
FUTURE PHASE 8 LANDFILL AREA
POTENTIAL HANDLING AREA (12 ACRES) (CURRENTLY WOODED)
No. Date Revision Description Chk'd By Appvd. By
scale: AS SHOWN
date: JULY 27, 2020
checked: ARQ
approved: ARQ
project: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY
client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT
drawing title: FIGURE 2 EXISTING CONDITIONS SITE PLAN
SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants
Acad No. SSEIR SITE PLAN-EXIST COND.dwg
SE01-456-12

New Impervious Area Summary Table

Area #	Area (sf)	
1	9,121	Subtotal: Phases 7 and 8 = 447,860 sf = 10.28 acres
2	18,830	
3	6,622	
4	4,975	
5	304,300	
6*	104,012	
7**	185,589	Subtotal: 12 Acres = 243,189 sf = 5.58 acres
8***	57,600	
Total =	691,049	sf
=	15.86	acres

* Contingent 100' Offset
** New Pavement Area
*** New Building Area

= NEW IMPERVIOUS AREA
= NEW IMPERVIOUS BUILDING AREA



No.	Date	Revision Description	Chk'd By	Appvd. By

scale: AS SHOWN
date: JULY 27, 2020
drawn:
checked: ARQ
approved: ARQ
drawing number:

project: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

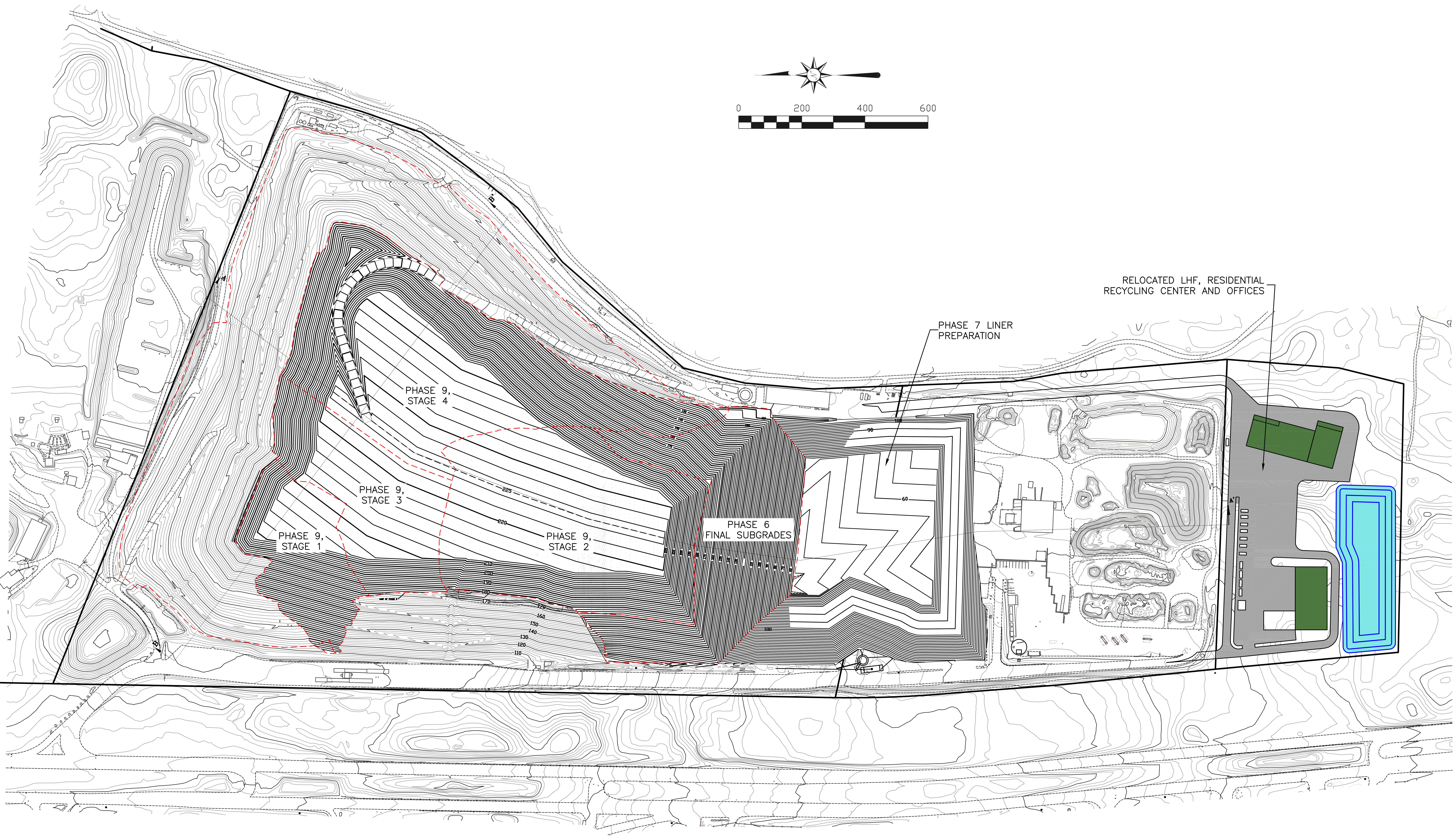
client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: FIGURE 3 SCHEMATIC SITE BUILDOUT PLAN

SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319-0100
FAX (781) 834-4783

SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants

Acad No.
SSEIR SITE PLAN-EXIST COND.dwg
SE01-456-12



BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

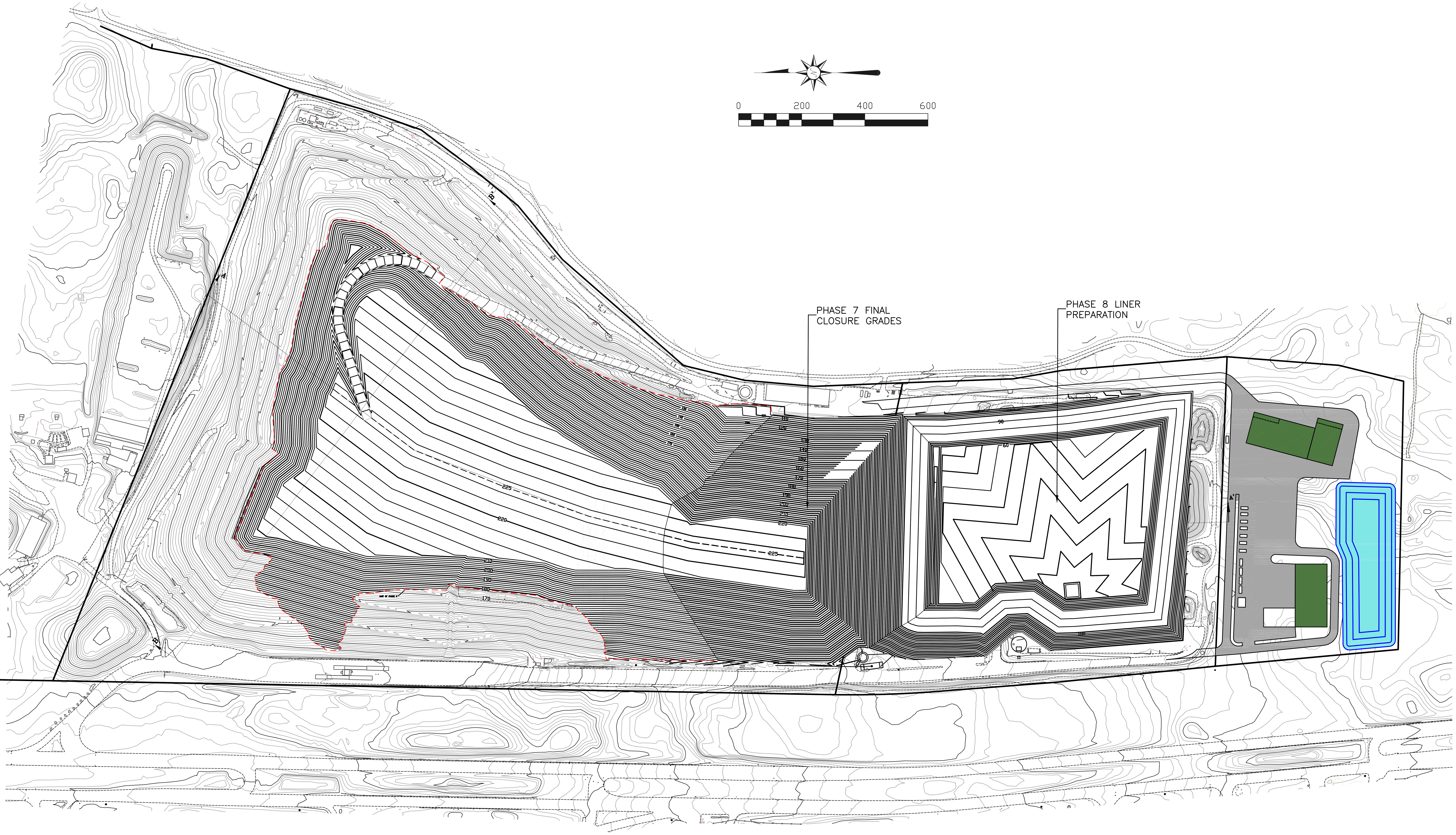
date: JULY 27, 2020
drawn:
checked: ARQ
approved: ARQ
drawing number:

client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: FIGURE 4 INITIAL CONSTRUCTION PHASES PLAN

SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants
SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319-0100
FAX (781) 834-4783

Acad No. LANDFILL PROFILE PLAN.dwg
SE01-456-12



BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

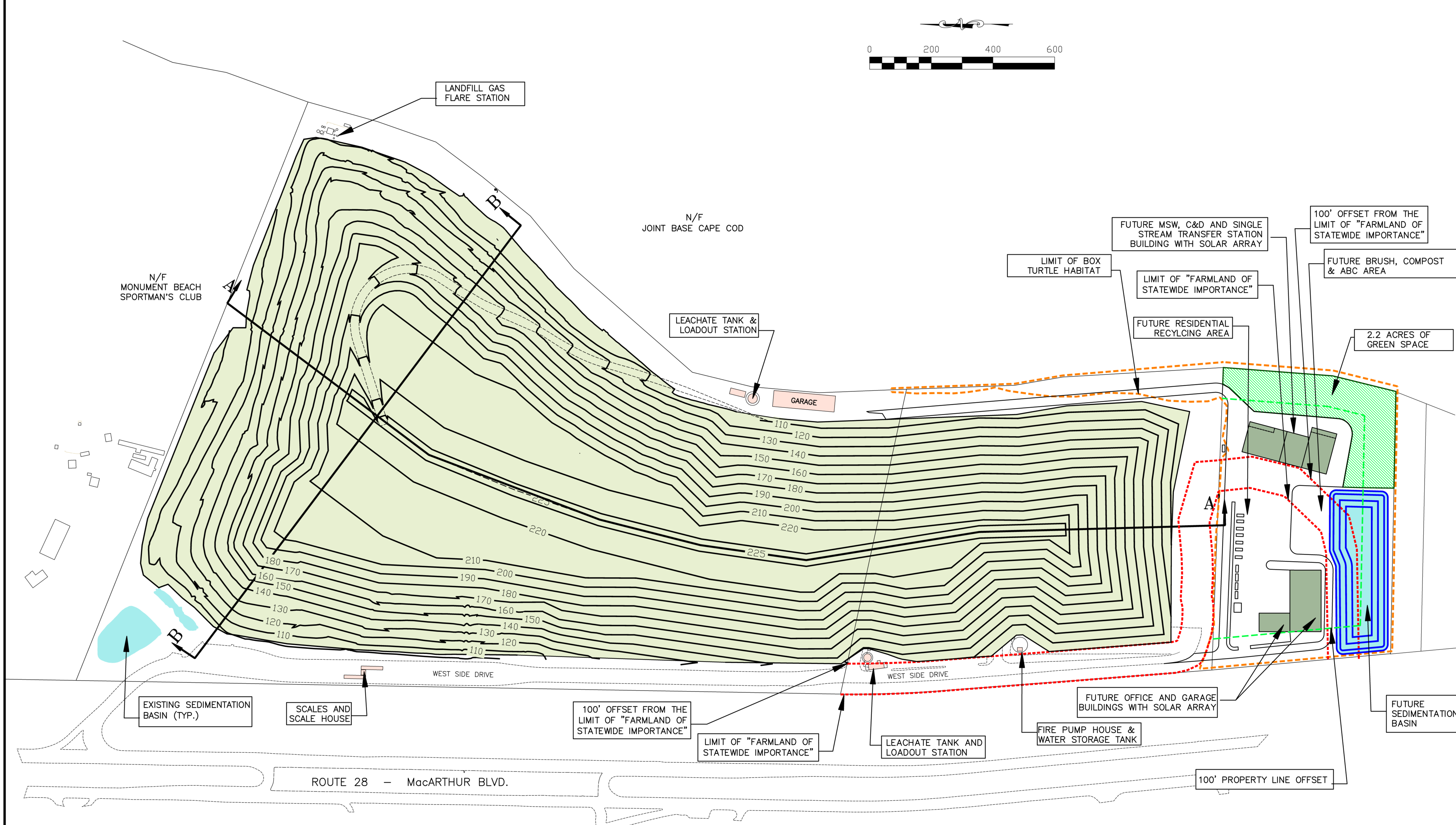
drawing title: FIGURE 5
INTERMEDIATE CONSTRUCTION PHASES PLAN

date: JULY 27, 2020
drawn:
checked: ARQ
approved: ARQ
drawing number:

SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants

SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319-0100
FAX (781) 834-4783

Acad No.
LANDFILL PROFILE PLAN.dwg
SE01-456-12



scale: AS SHOWN
date: JULY 27, 2020
drawn:
checked: ARQ
approved: ARQ
drawing number:

project: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

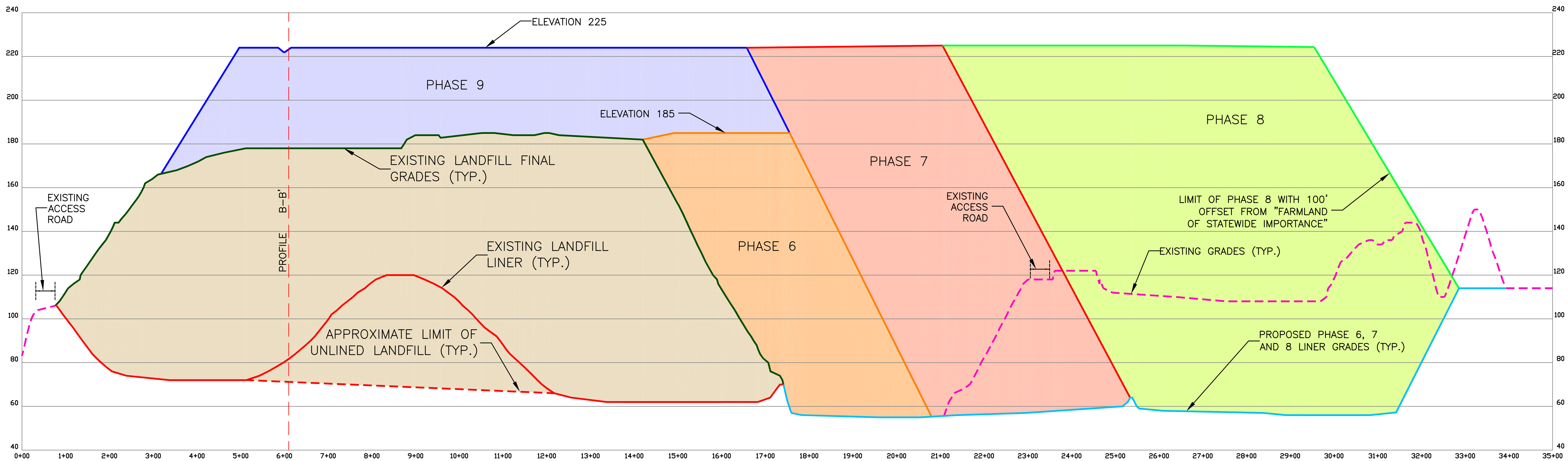
client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: FIGURE 6
CONCEPTUAL SITE BUILDOUT PLAN

SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319–0100
FAX (781) 834–4783

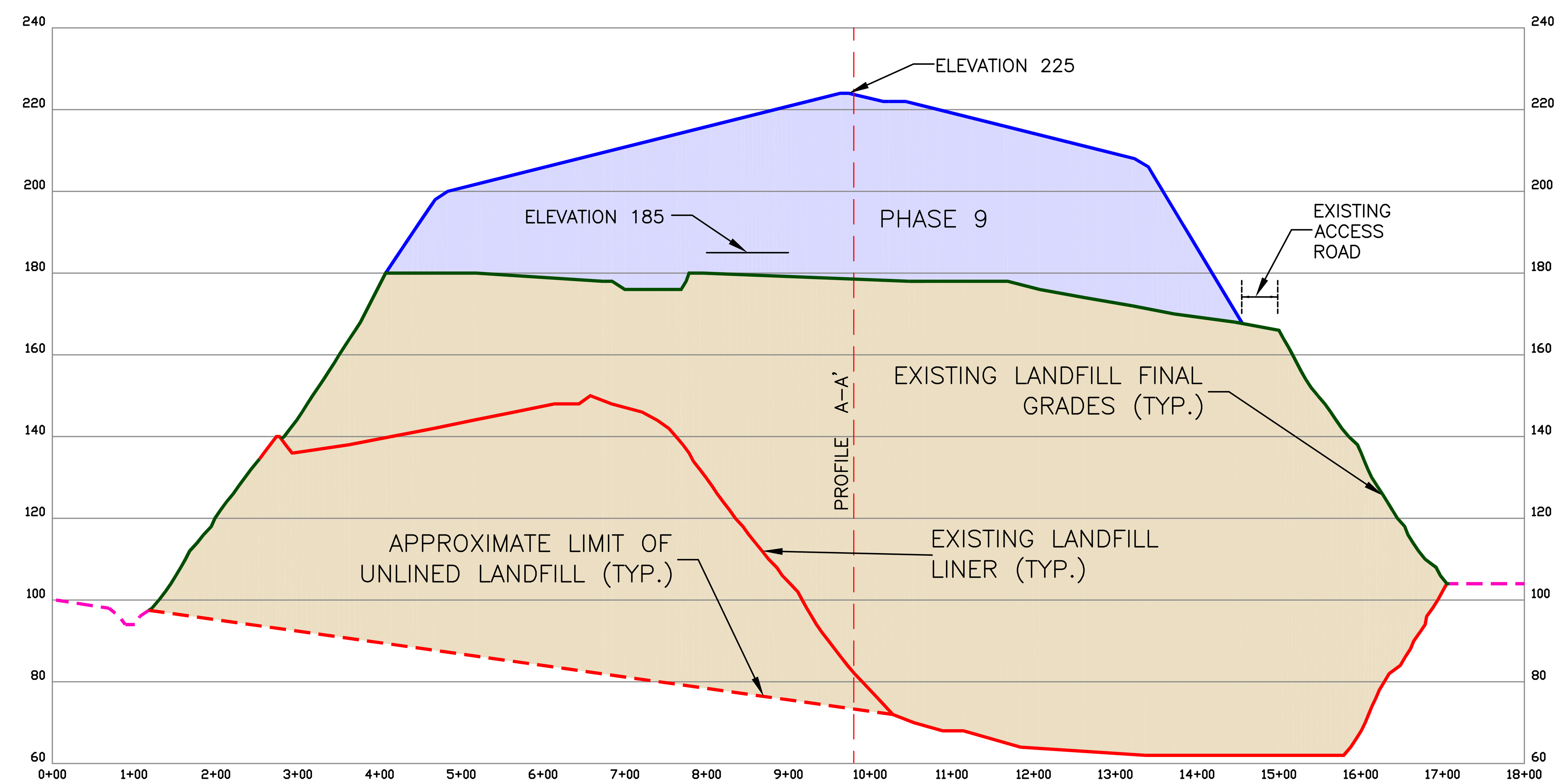
SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants

Acad No.
SSEIR SITE PLAN–SOLAR ARRAY.dwg
SE01–456–12



PROFILE A–A'

HORIZONTAL SCALE: 1" = 120'
VERTICAL SCALE: 1" = 24'



PROFILE B–B'

HORIZONTAL SCALE: 1" = 120'
VERTICAL SCALE: 1" = 24'

scale: AS SHOWN
date: JULY 27, 2020
drawn:
checked: KWR
approved: KWR
drawing number:

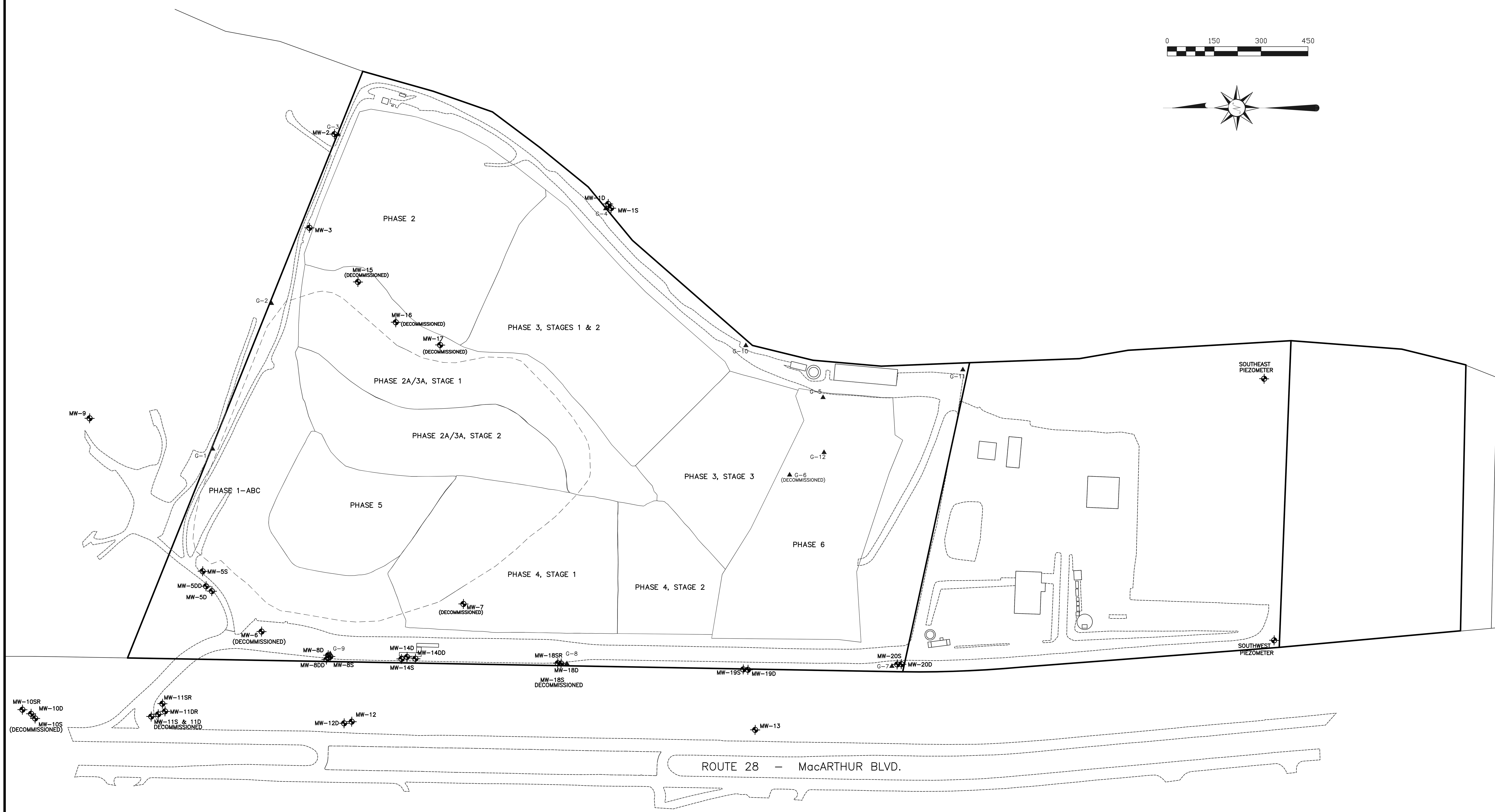
BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: FIGURE 7 SITE BUILDOUT PROFILES

SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319-0100
FAX (781) 834-4783

Acad No.
LANDFILL PROFILE PLAN.dwg
SE01-456-12



scale: AS SHOWN
date: JULY 27 2020
drawn:
checked: ARQ
approved: ARQ
drawing number:

project: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

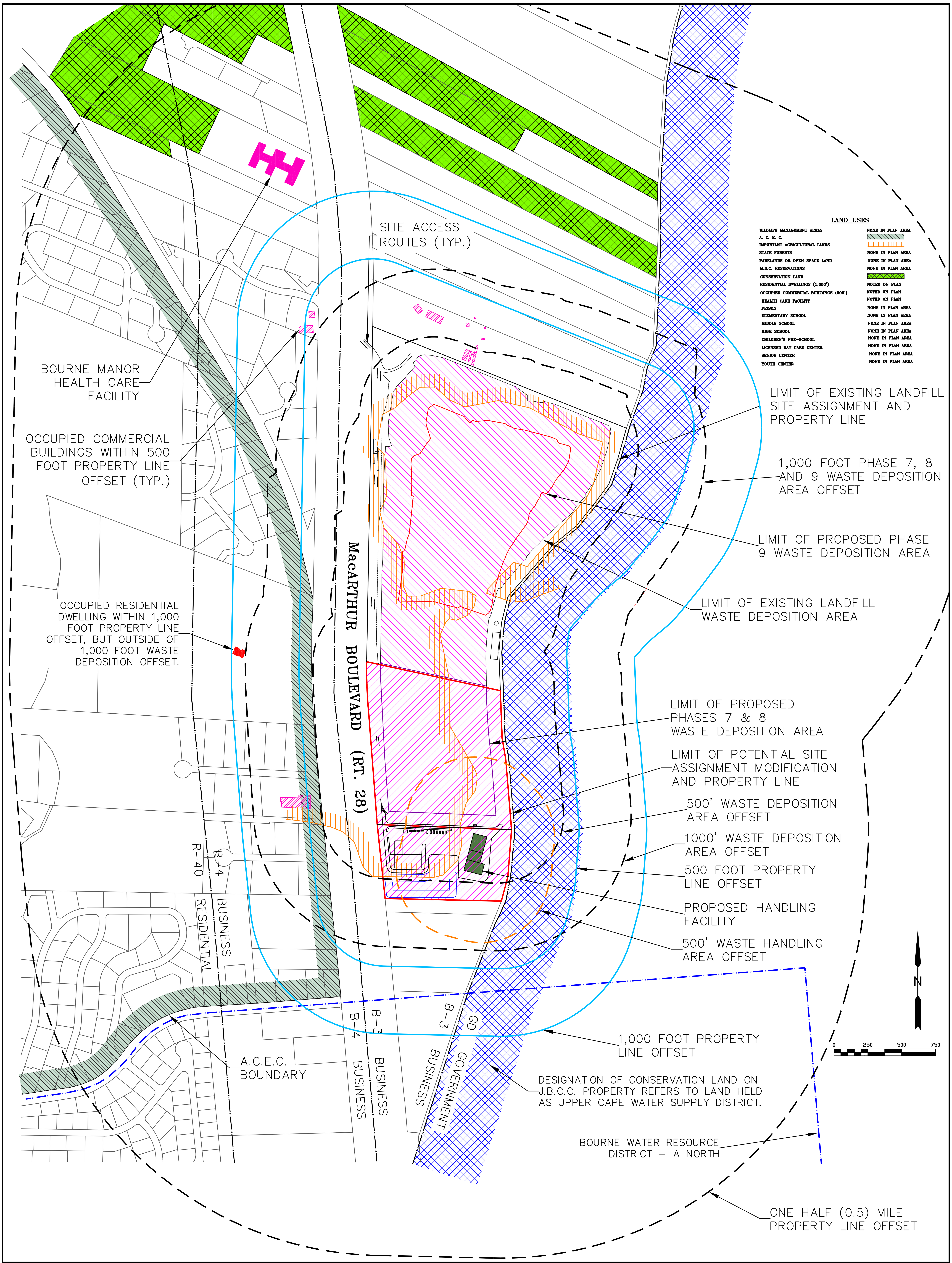
drawing title: FIGURE 8
EXISTING ENVIRONMENTAL MONITORING SYSTEMS

SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319-0100
FAX (781) 834-4783

SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants

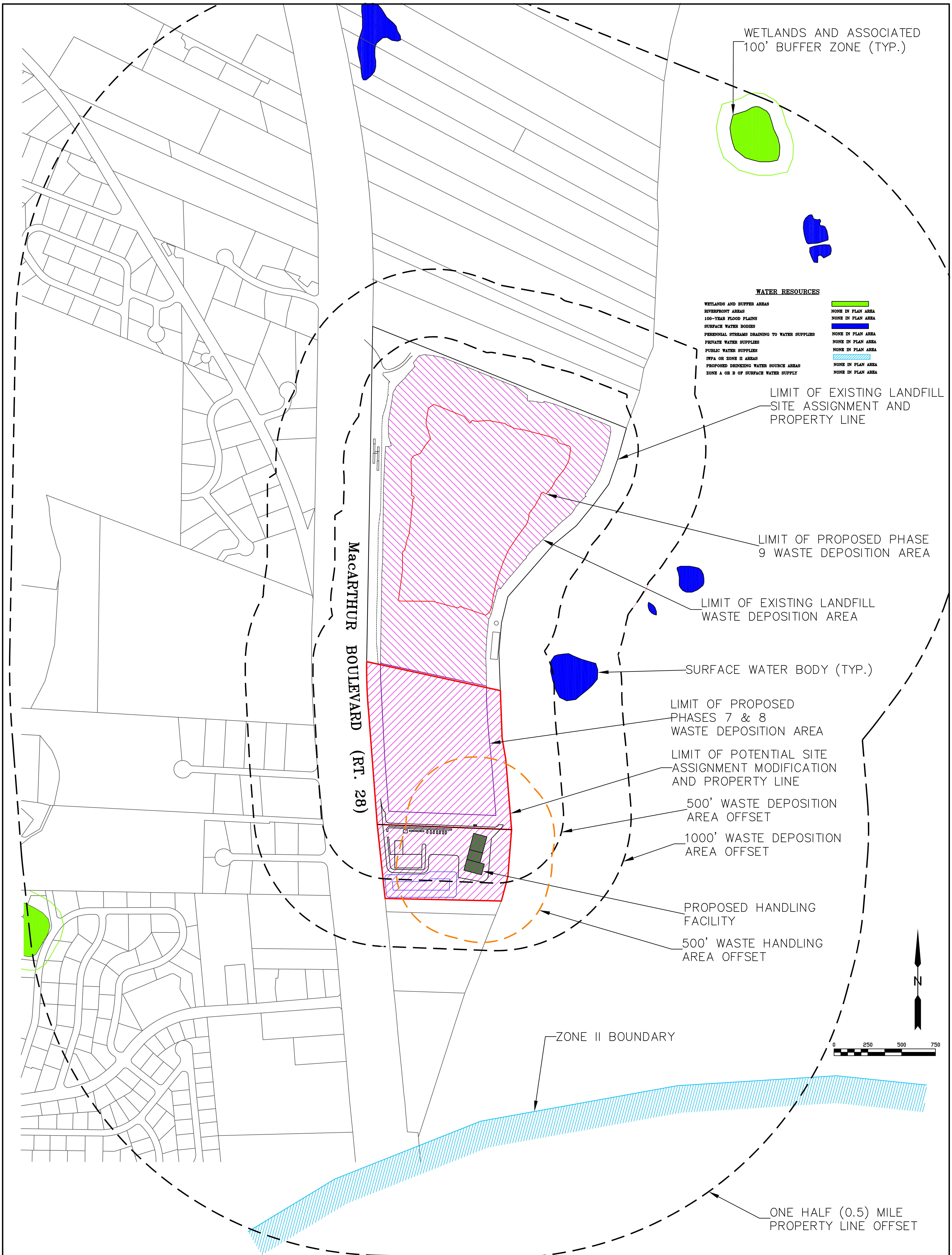
Acad No.
ENV MONITOR SYS-07-22-2020.dwg

SE01-456-12



Acad No.	File No. SE01-456-12	
SITEC ENVIRONMENTAL Hazardous and Solid Waste Consultants	SITEC Environmental, Inc. 769 Plain Street, Unit C Marshfield, MA 02050 (781) 319-0100 FAX (781) 834-4783	
project:	BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY	
client:	BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT	
drawing title:	FIGURE 9 LAND USE PLAN	
scale:	AS SHOWN	
date:	JULY 27, 2020	
drawn:		
checked:	ARQ	
approved:	ARQ	
sheet ___ of ___ drawing number:		

No.	Date	Revision Description	Chkd. by	Appvd. by



File No. SE01-456-12

Acad No.

SITEC ENVIRONMENTAL
Hazardous and Solid Waste Consultants

SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
(781) 319-0100
FAX (781) 834-4783

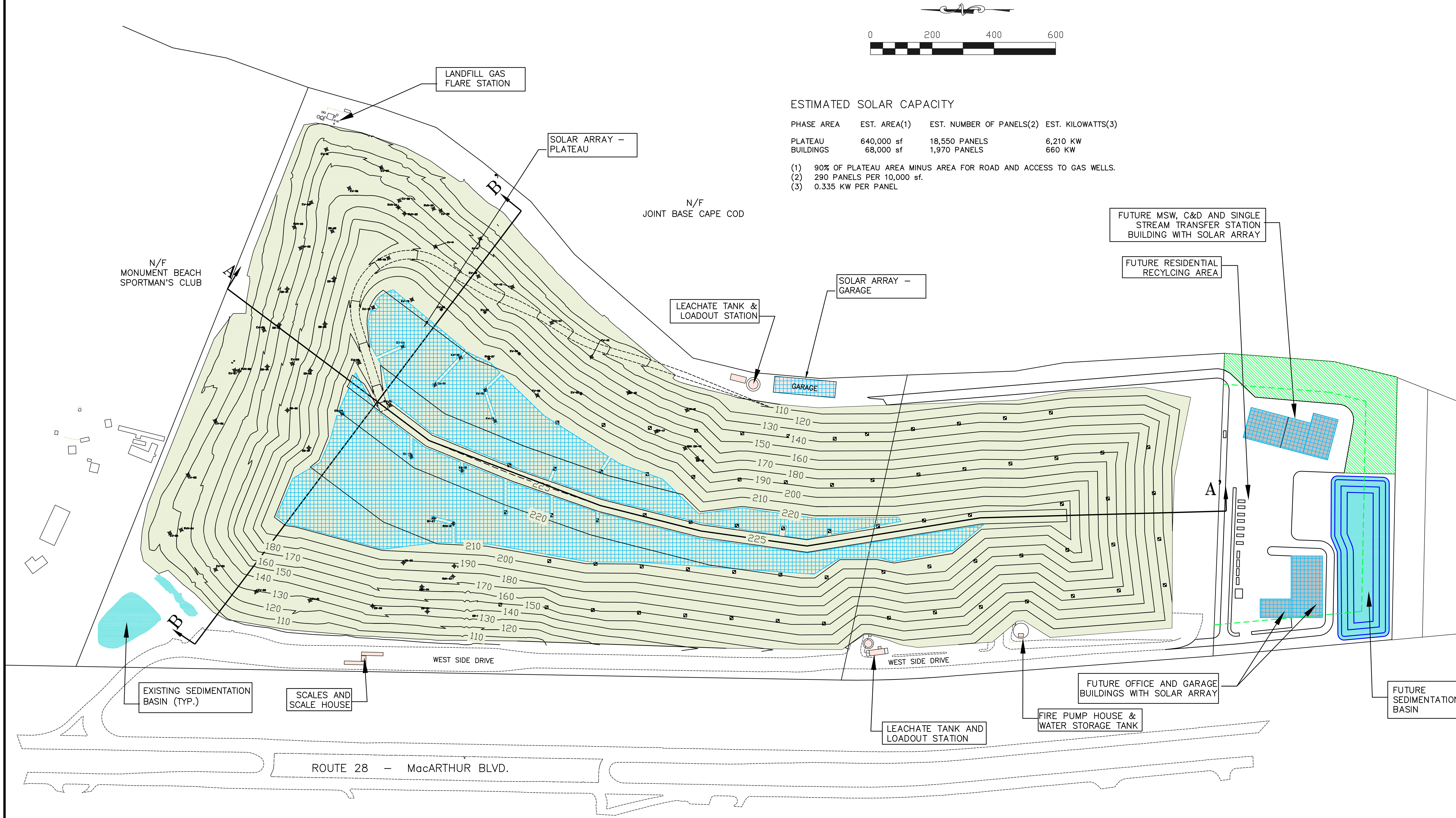
project: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: FIGURE 10
WATER RESOURCES PLAN

scale:	AS SHOWN
date:	JULY 27, 2020
drawn:	
checked:	ARQ
approved:	ARQ
sheet ___ of ___	
drawing number:	

No.	Date	Revision Description	Chkd. by	Appvd. by



ESTIMATED SOLAR CAPACITY

PHASE AREA	EST. AREA(1)	EST. NUMBER OF PANELS(2)	EST. KILOWATTS(3)
PLATEAU	640,000 sf	18,550 PANELS	6,210 KW
BUILDINGS	68,000 sf	1,970 PANELS	660 KW

(1) 90% OF PLATEAU AREA MINUS AREA FOR ROAD AND ACCESS TO GAS WELLS.
(2) 290 PANELS PER 10,000 sf.
(3) 0.335 KW PER PANEL

scale: AS SHOWN
date: JULY 27, 2020
drawn: ARQ
checked: ARQ
approved:
drawing number:

project: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: FIGURE 11 SOLAR ARRAY PLAN

SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319-0100
FAX (781) 834-4783

SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants

Acad No.
SSEIR SITE PLAN-SOLAR ARRAY.dwg
SE01-456-12

12-ACRE PARCEL
NEW SITE ASSIGNMENT
TO ALLOW SOLID WASTE HANDLING
25-ACRE PARCEL
SITE ASSIGNMENT MODIFICATION
TO ALLOW LANDFILLING
74-ACRE PARCEL
EXISTING LANDFILL
BALER DRIVE
TRANSFER LANE
RECYCLE PLACE
WEST SIDE DRIVE
"FARMLAND OF STATEWIDE IMPORTANCE"
100' OFFSET FROM THE LIMIT OF "FARMLAND OF STATEWIDE IMPORTANCE"
0
200
400
600
LEGEND
MODIFY FOR LANDFILLING
NEW SITE ASSIGNMENT FOR SOLID WASTE HANDLING
NO PROPOSED CHANGES
scale: AS SHOWN
date: JULY 27, 2020
drawn:
checked: KWR
approved: KWR
drawing number:
BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY
client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT
drawing title: FIGURE 12
PROPOSED SITE ASSIGNMENT MODIFICATIONS
SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319-0100
FAX (781) 834-4783
SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants
Acad No.
SITE SCHEMATIC OCT 19-R1.dwg
SE01-456-04

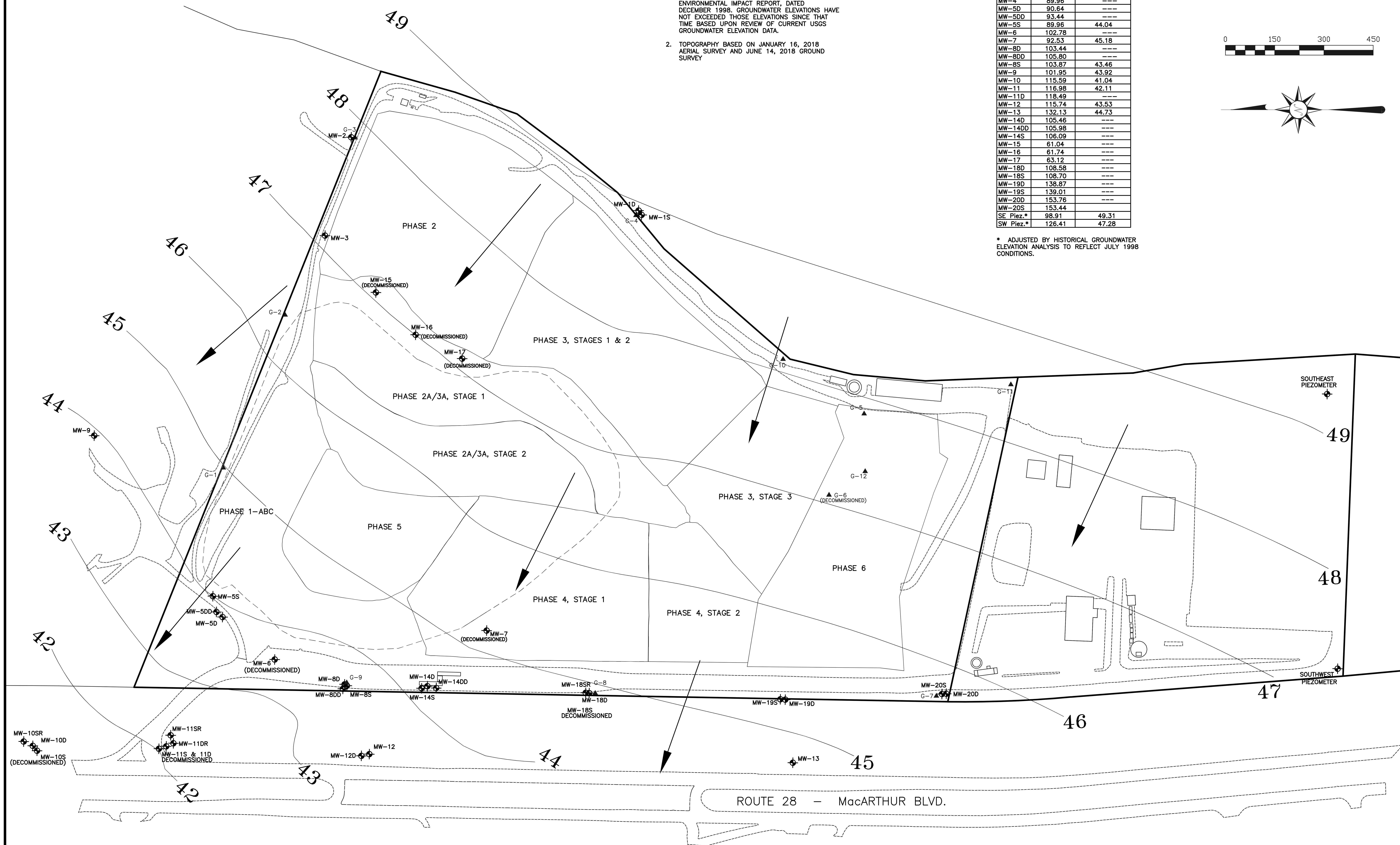
NOTES:

1. GROUNDWATER ELEVATIONS TAKEN FROM FIGURE 17 – GROUNDWATER HIGH CONTOUR MAP, JULY 1998, IN THE TOWN OF BOURNE DRAFT ENVIRONMENTAL IMPACT REPORT, DATED DECEMBER 1998. GROUNDWATER ELEVATIONS HAVE NOT EXCEEDED THOSE ELEVATIONS SINCE THAT TIME BASED UPON REVIEW OF CURRENT USGS GROUNDWATER ELEVATION DATA.
2. TOPOGRAPHY BASED ON JANUARY 16, 2018 AERIAL SURVEY AND JUNE 14, 2018 GROUND SURVEY

BOURNE MONITORING WELL
TOP OF CASING ELEVATIONS

WELL ID	ELEVATION (FT–NGVD)	JULY 1998 HIGH GROUNDWATER (FT–NGVD)
MW–1D	107.55	---
MW–1S	108.30	48.96
MW–2	116.25	47.90
MW–3		47.14
MW–4	89.96	---
MW–5D	90.64	---
MW–5DD	93.44	---
MW–5S	89.96	44.04
MW–6	102.78	---
MW–7	92.53	45.18
MW–8D	103.44	---
MW–8DD	105.80	---
MW–8S	103.87	43.46
MW–9	101.95	43.92
MW–10	115.59	41.04
MW–11	116.98	42.11
MW–11D	118.49	---
MW–12	115.74	43.53
MW–13	132.13	44.73
MW–14D	105.46	---
MW–14DD	105.98	---
MW–14S	106.09	---
MW–15	61.04	---
MW–16	61.74	---
MW–17	63.12	---
MW–18D	108.58	---
MW–18S	108.70	---
MW–19D	138.87	---
MW–19S	139.01	---
MW–20D	153.76	---
MW–20S	153.44	
SE Piez.*	98.91	49.31
SW Piez.*	126.41	47.28

* ADJUSTED BY HISTORICAL GROUNDWATER ELEVATION ANALYSIS TO REFLECT JULY 1998 CONDITIONS.



scale: AS SHOWN
date: JULY 27, 2020
drawn:
checked: ARQ
approved: ARQ
drawing number:

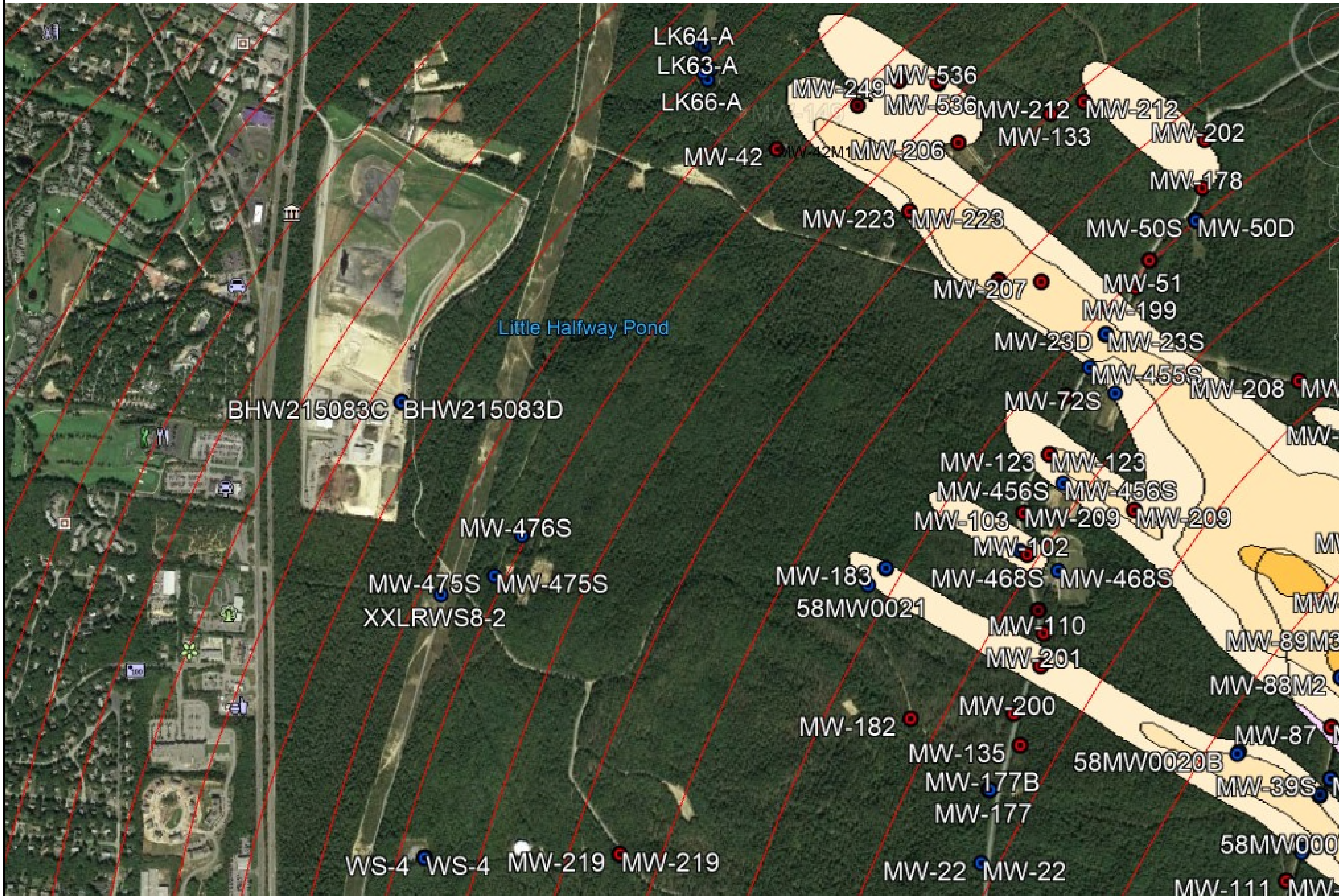
project: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: FIGURE 13
GROUNDWATER CONTOUR PLAN

SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants
SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319–0100
FAX (781) 834–4783

Acad No.
ENV MONITOR SYS–07–22–2020.dwg
SE01–456–12



scale: NO SCALE
date: JULY 27, 2020
drawn:
checked: ARQ
approved: ARQ
drawing number:

project: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

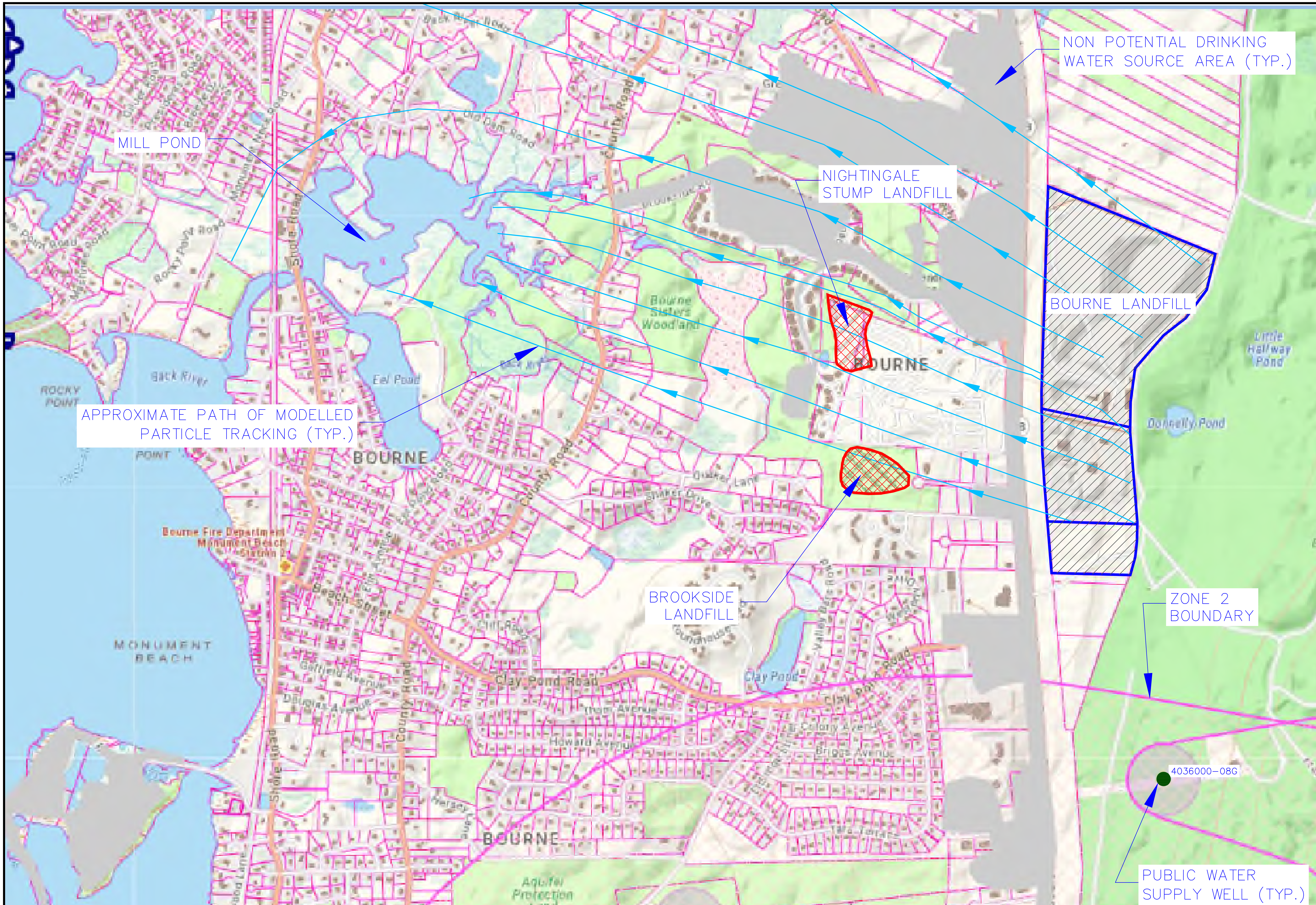
client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: FIGURE 14 USACE GROUNDWATER FLOW AND CONTAMINANT PLUME

SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants

SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319-0100
FAX (781) 834-4783

Acad No. SSEIR SITE PLAN-EXIST COND.dwg
SE01-456-12



project: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: FIGURE 15 MA DEP WATER RESOURCES MAP

scale: NO SCALE
date: JULY 27, 2020
drawn:
checked: ARQ
approved: ARQ
drawing number:

SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants

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Acad No.
SSEIR SITE PLAN-EXIST COND.dwg
SE01-456-12

ATTACHMENT 4

DIVISION OF FISHERIES AND WILDLIFE CORRESPONDENCE

Natural Heritage & Endangered Species Program

www.mass.gov/nhesp

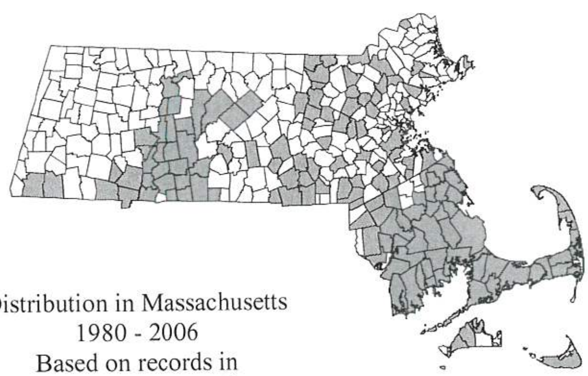
Massachusetts Division of Fisheries & Wildlife

Eastern Box Turtle
Terrapene carolina

State Status: **Special Concern**
Federal Status: **None**

DESCRIPTION: The Eastern Box Turtle is a small terrestrial turtle ranging from 11.4–16.5 cm (4.5–6.6 in.) in length. It is so named because a hinge on the lower shell (plastron) allows it to enclose head, legs, and tail completely within the upper (carapace) and lower shells. The adult box turtle has an oval, high-domed shell with variable coloration and markings. The carapace is usually dark brown or black with numerous irregular yellow, orange, or reddish blotches. The plastron typically has a light and dark variable pattern, but some may be completely tan, brown, or black. The head, neck, and legs also vary in color and markings, but are generally dark with orange or yellow mottling. The Eastern Box Turtle has a short tail and an upper jaw ending in a down-turned beak. The male box turtle almost always has red eyes, and females have yellowish-brown or sometimes dark red eyes. Males have a moderately concave plastron (females' are flat), the claws on the hind legs are longer, and the tail is both longer and thicker than the females. Hatchlings have a brownish-gray carapace with a yellow spot on each scute (scale or plate), and a distinct light-colored mid-dorsal keel (ridge). The plastron is yellow with a black central blotch, and the hinge is poorly developed.

Photo by Liz Willey



Distribution in Massachusetts
1980 - 2006
Based on records in
Natural Heritage Database

SIMILAR SPECIES: The Blanding's Turtle (*Emydoidea blandingii*) may be confused with the Eastern Box Turtle. Often referred to as the "semi-box turtle," the Blanding's Turtle has a hinged plastron enabling the turtle to pull into its shell, but with less closure than in the Eastern Box Turtle. Both may have yellow markings on the carapace; however, the markings on a Blanding's Turtle are spots or flecks rather than blotches. An adult Blanding's Turtle is larger than the box turtle (15-23 cm; 6-9 in. in shell length). While both will be found nesting in similar habitat, the Blanding's Turtle is essentially aquatic whereas the Eastern Box Turtle is terrestrial. Eastern Box Turtle hatchlings could be confused with Spotted Turtle hatchlings, because both have spots on each scute. However, the Spotted Turtle lacks a mid-dorsal keel.

RANGE: The range of the Eastern Box Turtle is from southeastern Maine; south to northern Florida; and west to Michigan, Illinois, and Tennessee. Although Eastern Box Turtles occur in many towns in Massachusetts, they are more heavily concentrated in the southeastern section of the state.

HABITAT IN MASSACHUSETTS: The Eastern Box Turtle is a terrestrial turtle, inhabiting many types of habitats. It is found in both dry and moist woodlands, brushy fields, thickets, marsh edges, bogs, swales, fens, stream banks, and well-drained bottomland.

LIFE CYCLE & BEHAVIOR: The Eastern Box Turtle hibernates in the northern parts of its range from late October or November until mid-March or April depending on the weather. Box turtles overwinter in upland forest, a few inches under the soil surface, typically covered by leaf litter or woody debris. As soil temperatures drop, the turtles burrow into soft ground. Overwintering is usually not communal, although several may overwinter within close proximity of one another. Some individuals may emerge prematurely during warm spells in winter and early spring. When this occurs, they may perish from exposure if there is a sudden cold snap. During the spring, Box Turtles start to forage and mate in the forest and fields.

In summer, adult Box Turtles are most active in the morning and evening, particularly after a rainfall. To avoid the heat of the day, they often seek shelter under rotting logs or masses of decaying leaves, in mammal burrows, or in mud. They often scoop out a "form" (a small domelike space) in leaf litter, grasses, ferns, or mosses where they spend the night. These forms may be used on more than one occasion over a period of weeks. Though known as "land turtles", in the hottest weather they frequently enter shaded shallow pools and puddles and remain there for periods varying from a few hours to a few days. In the cooler temperatures of spring and fall, box turtles forage at any daylight hour.

The Eastern Box Turtle is omnivorous, feeding on animal matter such as slugs, insects, earthworms, snails, and even carrion. Box Turtles also have a fondness for mushrooms, berries, fruits, leafy vegetables, roots, leaves, and seeds.

Females reach sexual maturity at approximately 13 years of age. Mating is opportunistic and may take place anytime between April and October. Courtship begins with the male circling, biting, and shoving the female. Afterward, the premounting and copulatory phases take place. Females can store sperm and lay fertile eggs up to four years after mating.

Females nest in June or early July and can travel great distances to find appropriate nesting habitat. They may travel up to approximately 1600 m (1 mile), many of them crossing roads during their journey. Nesting areas may be in early successional fields, meadows, utility right of ways, woodland openings, roadsides, cultivated gardens, residential lawns, mulch piles, beach dunes, and abandoned gravel pits. Females sometimes exhibit nest site fidelity, laying eggs in close proximity to the previous years' nest. Females typically start nesting in the late afternoon or early evening and continue for up to five hours.

THREATS: There are several reasons the Eastern Box Turtle is under threat in Massachusetts: habitat destruction resulting from residential and industrial development; road mortality; collection by individuals for pets; mowing of fields and early successional habitat during the active season; unnaturally inflated rates of predation in suburban and urban areas; disturbance of nest sites by ATVs; and genetic degradation due to the release of non-native (pet store) turtles. The release of non-native species could also transmit disease, which may become an issue in Massachusetts, but is not currently a problem.

MANAGEMENT RECOMMENDATIONS:
Using NHESP records, Eastern Box Turtle habitat needs to be assessed and prioritized for protection based on the extent, quality, and juxtaposition of habitats and their predicted ability to support self-sustaining populations of box turtles. Other considerations should include the size and lack of fragmentation of habitat and proximity and connectivity to other relatively unfragmented habitats, especially within existing protected open space.

Given limited conservation funds, alternatives to outright purchase of conservation land is an important component to the conservation strategy. These can include Conservation Restrictions (CRs) and Agricultural Preservation Restrictions (APRs).

Habitat management and restoration guidelines should be developed and implemented in order to create and/or maintain consistent access to nesting habitat at key sites. This is most practical on state-owned conservation lands (i.e. DFW, DCR). However, educational materials should be made available to guide private landowners on the best management practices for box turtle habitat.

Alternative wildlife corridor structures should be considered at strategic sites on existing roads. In particular, appropriate wildlife corridor structures should be considered for bridge and culvert upgrades and road-widening projects within box turtle habitat. Efforts should be made to inform local regulatory agencies of key locations where these measures would be most effective for turtle conservation.

Educational materials need to be developed and distributed to the public in reference to the detrimental effects of keeping our native box turtles as pets (an illegal activity that slows reproduction in the population), releasing pet store turtles (which could spread disease), leaving cats and dogs outdoors unattended (particularly during the nesting season), mowing of fields and shrubby areas, feeding suburban wildlife (which increases numbers of natural predators on turtles), and driving ATVs in nesting areas from June to October. People should be encouraged, when safe to do so, to help box turtles cross roads (always in the direction the animal was heading); however, turtles should never be transported to "better" locations. They will naturally want to return to their original location and likely need to traverse roads to do so.

Increased law enforcement is needed to protect our wild populations, particularly during the nesting season when poaching is most frequent and ATV use is common and most damaging.

Forestry Conservation Management Practices should be applied on state and private lands to avoid direct turtle mortality. Motorized vehicle access to timber harvesting sites in box turtle habitat should be restricted to the times when box turtles are inactive during the winter, preferably when the ground is frozen. Motorized vehicles should not be used for soil scarification.

Finally, a statewide monitoring program is needed to track long-term population trends in Eastern Box Turtles.

Active Period

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

REFERENCES:

Babcock, H.L. 1971. *Turtles of the Northeastern United States*. New York: Dover Publications.

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DeGraaf, R.M., and D.D. Rudis. 1983. *Amphibians and Reptiles of New England.* Amherst, Massachusetts: The University of Massachusetts.

DeGraaf, R.M.. and D.D. Rudis. 1986. New England Wildlife: Habitat, Natural History, and Distribution. General Technical Report NE-108. Broomall, Pennsylvania: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.

Ernst, C.H., J.E. Lovich, and R.W. Barbour. 1994. *Turtles of the United States and Canada.* Smithsonian Institution Press, Washington and London.

Hunter, M.L., Jr., J. Albright, and J.E. Arbuckle. 1992. *The Amphibians and Reptiles of Maine.* Bulletin 838, The Maine Amphibian and Reptile Atlas Project. Orono, Maine: University of Maine, Maine Agricultural Experiment Station.

Lazell, J. 1974. *Reptiles and Amphibians of Massachusetts.* Lincoln, Massachusetts: Massachusetts Audubon Society.

Lazell, J. 1969. Nantucket Herpetology. *Massachusetts Audubon* 54 (2): 32-34.

Shiffer, C.N. 1990. Turtle in a Box. *Pennsylvania Angler*, pp. 23-24.

Simmons, T. 1988. All Outdoors. *Vineyard Gazette*.

Tyning, T.F. 1990. *A Guide to Amphibians and Reptiles*. Boston: Little, Brown and Company.

Willey, L. 2006. Personal communication. M.S. student at the University of Massachusetts, Amherst.

Updated 2015

A Species of Greatest Conservation Need in the Massachusetts State Wildlife Action Plan

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

1 Rabbit Hill Road, Westborough, MA 01581
p: (508) 389-6300 | f: (508) 389-7890
MASS.GOV/MASSWILDLIFE

February 5, 2020

Town of Bourne, ISWM Department
c/o Phil Goddard, Manager of Facility Compliance and Technology Development
24 Perry Avenue
Buzzards Bay, MA 02532

RE: Project Location: 201 MacArthur Boulevard, Bourne, MA
Project Description: Phases 7-9 Landfill Expansion
NHESP Tracking No.: 17-36534

Dear Applicant:

Thank you for submitting the project plans entitled "Schematic Site Buildout Plan" (dated February 4, 2020) and supporting documentation to the Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife (the "Division") for review pursuant to the Massachusetts Endangered Species Act (MESA) (MGL c.131A) and its implementing regulations (321 CMR 10.00).

The project, as currently proposed, includes the expansion of an existing landfill in three phases (Phases 7, 8 and 9). All work associated with Phases 7-9 of the project shall occur within areas already disturbed by existing landfill operations and, in particular, shall occur outside of the "Limit of Box Turtle Habitat" shown on the project plans. Any future work proposed within the "Limit of Box Turtle Habitat" shown on the project plans shall require a direct filing with the Division for compliance with the MESA.

Based on a review of the information that was provided, the Division has determined that Phases 7, 8 and 9 of this project, as currently proposed, appear to be **exempt from a MESA review** pursuant to 321 CMR 10.14. Any changes to the proposed project or any additional work beyond that provided may require a filing with the Division pursuant to the MESA regulations. If the project site is within Estimated Habitat and a Notice of Intent (NOI) is required, then a copy of the NOI must be submitted to the Division so that it is received at the same time as the local conservation commission.

Please note that this determination addresses only the matter of state-listed species and their habitats. If you have any questions about this letter, please contact Melany Cheeseman, Endangered Species Review Assistant, at melany.cheeseman@mass.gov or 508-389-6357.

Sincerely,

Everose Schlüter

Everose Schlüter, Ph.D.
Assistant Director

cc: Amy Ball, Horsley Witten Group, Inc.

ATTACHMENT 5

BOURNE BOARD OF SELECTMEN CERTIFICATE OF VOTE

TOWN OF BOURNE
BOARD OF SELECTMEN
24 Perry Avenue
Buzzards Bay, MA 02532
Phone 508-759-0600 ext. 1503 – Fax 508-759-0620

CERTIFICATE OF VOTE

At a meeting of the Board of Selectmen of the Town of Bourne, held on November 5, 2019, at the Bourne Veterans' Memorial Community Center a quorum being present and voting throughout, upon a Motion duly made by Selectman Jared MacDonald, Seconded by Selectman Peter Meier, and unanimously voted 5-0-0.

VOTED:

To allow ISWM to pursue the expansion of Bourne's landfill facility as presented at the Joint meeting of the Board of Selectmen, Board of Health, Finance Committee and the Energy Advisory Committee on August 12, 2019.

BOARD OF SELECTMEN

Judith MacLeod Froman, Chair

James L. Potter, Vice Chair

George G. Slade, Jr., Clerk

Peter J. Meier

Jared P. MacDonald

A True Copy,
Attest:
Town Clerk

ATTACHMENT 6

LANDFILL VOLUME SUMMARY

LANDFILL PHASES	PERMITTED VOLUME (CY)	POTENTIAL VOLUME (CY)	UTILIZED VOLUME (CY) (JANUARY 2020)	SCENARIO 1 TIME TO FILL	SCENARIO 2 TIME TO FILL
PHASE 1-A-B-C	1,071,000		1,071,000		
PHASE 2	618,000		618,000		
PHASE 3, STAGES 1 & 2	692,000		692,000		
PHASE, STAGE 3	320,000		320,000		
PHASE 2A/3A, STAGE 1	1,266,000		1,266,000		
PHASE 2A/3A, STAGE 2	558,000		558,000		
PHASE 4	1,470,000		1,470,000		
PHASE 5	200,000		200,000		
PHASE 6 (Preferred)	920,000			April-23	November-22
PHASE 9		1,255,000		September-27	January-26
PHASE 7		1,380,000		August-32	July-29
PHASE 8		2,540,000		September-41	January-36
TOTALS	7,115,000	5,175,000	6,195,000		

	cubic yards	
TOTAL COMBINED VOLUME	12,290,000	100.0%
LESS UTILIZED VOLUME	6,195,000	50.4%
NET REMAINING VOLUME	**6,095,000**	**49.6%**

NOTES:

SCENARIO 1 BASED ON PERMITTED FILLING RATE WITH ASH AND MSW

SCENARIO 2 BASED ON PERMITTED FILLING RATE WITH MSW ONLY AFTER 2021

ATTACHMENT 7

STORMWATER MANAGEMENT PLAN

STORMWATER MANAGEMENT PLAN
FULL BUILDOUT LANDFILL EXPANSION

BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY
BOURNE, MASSACHUSETTS

Prepared For:

TOWN OF BOURNE
DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT
24 Perry Avenue
Bourne, Massachusetts 02532

Prepared By

SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, Massachusetts 02050

July 21, 2020

TABLE OF CONTENTS

STORMWATER MANAGEMENT PLAN
FULL BUILDOUT LANDFILL EXPANSION

BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY
BOURNE, MASSACHUSETTS

APPENDICES

STORMWATER MANAGEMENT PLAN
FULL SITE BUILDOUT

BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY
BOURNE, MASSACHUSETTS

1.0 INTRODUCTION

1.1 Purpose

This Stormwater Management Plan (SMP) addresses the construction of the proposed full site buildout of the Bourne Landfill located in Bourne, Massachusetts. The proposed full buildout includes the development of Phase 7, Phase 8 and Phase 9 landfill expansions and relocation of the Large Handling Facility (LHF) that includes a C&D Transfer Station, a Residential Recycling Center and a Single Stream Recyclables Transfer Station, which will result in the full utilization of the site's acreage, including land that has been acquired since 2001, which now totals 111 acres. The construction of Phases 7 and 8 will occur on the 25-acre parcel that is immediately south of the existing Phase 6 Landfill. Phase 9 will be a vertical expansion over the area of the existing landfill. The existing LHF will be relocated from the 25-acre parcel to the immediate south, on the currently undisturbed 12-acre parcel.

This SMP addresses the proposed full buildout condition, which is foreseen to occur in the 2040s. The stormwater management for intermediate conditions will be addressed in the phased site permitting (ATCs and ATOs) for those development stages.

2.0 STORMWATER MANAGEMENT SYSTEM

2.1 General

The Town of Bourne Department of Integrated Solid Waste Management (ISWM or Proponent or Town) is proposing a vertical and horizontal landfill expansion and the relocation of the solid waste handling facility and other offices and facilities on the property. The proposed vertical expansion, designated as Phase 9, involves placing waste vertically over previously landfilled areas including Phase 2, 2A/3A, 3, 4, 5, and 6. Phase 9 would increase the maximum height of the landfill from elevation 185 ft MSL to elevation 225 ft MSL and would provide approximately 1,255,000 cubic yards of additional air space. The proposed horizontal expansion, designated as Phase 7 and Phase 8, involves the development of new landfill cells in an area located south of the existing Phase 6 landfill, within the 25-acre parcel that is currently site-assigned for solid waste handling. The Phase 7 and Phase 8 expansions would provide approximately 3,920,000 cubic yards of additional airspace. The development of

Phase 7 and Phase 8 requires the relocation of the existing solid waste handling facility and other offices and facilities, including the existing Stormwater Basin No. 2, currently located on the 25-acre parcel. The Town has acquired a 12-acre parcel of undeveloped land, located south of the existing facility, and is proposing to use the land to develop a solid waste transfer station, residential recycling area, and other facilities, including the construction of a replacement for Stormwater Basin No. 2, which will be designated herein as Stormwater Basin No. 3.

The existing stormwater management facilities have been designed and constructed for conditions that will occur through the Phase 6 No Further Expansion scenario. The sub-catchment or tributary areas, along with reaches and ponds for these existing conditions are shown on the attached sketch titled *No Further Expansion Drainage Areas*. Also attached is a sketch titled *Full Buildout Drainage Areas,* which identifies the proposed tributary areas, reaches and ponds for the Full Buildout scenario.

The future development of Phase 7 and Phase 8 will result in the abandonment of Sedimentation Basin No. 2, the extension of the existing drainage interceptor along the eastern edge of the Landfill to the south, and the construction of a new sedimentation basin on the currently undeveloped 12-acre parcel, located immediately to the south of the 25-acre parcel (Sedimentation Basin No. 3), which will be dedicated to flows from the tributary area of the Landfill. The stormwater flows tributary to the 12-acre LHF portion of the site will be tributary to a chambered infiltration field (Infiltration Field 4) located under the pavement in that area. Control of stormwater runoff along the western side of the Landfill will be managed by existing facilities that discharge to Stormwater Basin No. 1, located in the northwest corner of the property. The construction of Phase 9 and the increase in maximum elevation to 225 will divert a relatively small area between the two basin's tributary areas.

In its February 17, 2000 Development of Regional Impact (DRI) the Cape Cod Commission (CCC) evaluated the compliance of the facility to the CCC's then Regional Policy Plan standards for water resources and determined, that as conditioned, the Application for the Bourne Landfill was approved. Since that time site development has provided an approved, continuous, environmental monitoring plan for groundwater quality and improved structural stormwater management facilities. In addition, the May 2006 Massachusetts Estuaries Project Report on nitrogen loading threshold modeling for the Phinney's Harbor area in Bourne, noted that "the Landfill is contributing negligible nitrogen to the Phinney's Harbor System". It also noted that the flow path of nitrogen enriched groundwater was from the historic septage lagoons, which flows toward the Cape Cod Canal. These lagoons excavated and taken out of service over twenty years ago and groundwater monitoring has shown an improvement in groundwater quality downgradient from the former lagoons' locations.

The following sections describe the proposed Full Buildout stormwater management controls, including the two stormwater retention basins considered in this SMP. The referenced drainage area sketches are included in Appendix 1. The design buildout stormwater flow rates have been analyzed for the stormwater retention basins utilizing the HydroCAD Stormwater Modeling program. The program utilizes the TR-20 method for run-off calculations. Storm rainfall, run-off curve numbers and other site characteristics are input into the program. Results of calculations are output into tables for each drainage area and control structure. The Full Buildout Conditions Stormwater Calculations for the 25-year and 100-year storm events are included in Appendix 2.

2.2 Stormwater Basin No. 1

Stormwater Basin No. 1 is an existing retention/infiltration pond located in the northwest corner of the property. This basin currently, and under Full Buildout conditions, will receive stormwater runoff from the northerly and westerly sideslopes and plateau areas of the Landfill. Stormwater run-off from the site's access road areas also drain into Stormwater Basin No. 1. The two Drainage Areas sketches included in Appendix 1 show the contributing areas from the Phase 6 No Further Expansion and the Full Buildout scenarios that will discharge to this retention pond. The construction of the Full Buildout scenario will increase the contributory area and consequently the volume of stormwater discharging into Stormwater Basin No. 1. This increase in contributory area generally corresponds to the area that will be diverted from the west sides and plateau of the proposed Phase 7 and Phase 8 landfills when they have reached their final grades. Stormwater Basin No. 1 was enlarged as part of the Phase 4 Landfill construction project, taking into account the flows that will be diverted by the final buildout of the site. A perimeter drainage channel, or swale, has been constructed along the western toe of the Phase 4 and most of the Phase 6 sideslope, as part of the Phase 4 and Phase 6 site construction work. A series of water quality swales that cross the closed sideslopes conveys run-off from the sideslopes and plateaus of the Landfill to let-down channels that discharge into the perimeter drainage channel. The perimeter drainage channel then conveys the run-off from these tributary areas to Stormwater Basin No. 1.

Stormwater Basin No. 1 has been designed to accommodate the run-off from the 25 year-24 hour rainfall event for the Full Buildout scenario. Stormwater run-off discharging to this basin will infiltrate to groundwater. Existing soils throughout this site area are comprised of highly permeable sands and gravels. The design capacity of the stormwater basins is based on an infiltration rate of 8.27 inches per hour which is an average rate for Hydrologic Group A soils, which are the soil types that occur throughout the Landfill, according to the Massachusetts Stormwater Handbook (Volume 3, Table 2.3.3). Basin No. 1 provides approximately 613,000 cubic feet of storage capacity, between elevations 70 and 94. This available storage volume exceeds the storage volume required for the 25 year-24 hour storm, which is approximately 234,000 cubic feet, for the Full Buildout scenario. This basin will also accommodate the run-off from greater magnitude storms (a 100-year storm will require approximately 393,000 cubic feet of storage) or from back-to-back rainfall events and for the containment of run-off during winter weather and frost conditions.

Stormwater Basin No. 1 is a two stage pond with a forebay and a large infiltration basin. Potential improvements that could be made include the modification of the forebay and the lower portion of the large drainage channel that enters the forebay, to allow for additional bioretention capacity.

2.3 Stormwater Basin No. 2 and Stormwater Basin 3

Stormwater Basin No. 2 is an existing retention basin located at the southwestern corner of the 25-acre parcel that is site assigned for solid waste handling. Currently, drainage from that 25-acre area, including the C&D Transfer Station, the Residential Recycling Center, the Single Stream Recycling facility and the surrounding materials storage and staging areas, flow into Stormwater Basin No. 2 through a constructed drainage system. Runoff from the eastern sides and plateau areas of Phase 2, Phase 3, Phase 2A/3A and Phase 6 have been diverted to Stormwater Basin No. 2 by the construction of a drainage interceptor line along the eastern toe of the landfill area. The interceptor has been constructed and is fully operational.

The proposed Phase 7 and Phase 8 Landfill expansions will eliminate the existing Stormwater Basin No. 2, which will be replaced by Stormwater Basin No. 3. The proposed Stormwater Basin No. 3 will be located on the 12-acre parcel and will received runoff from the tributary landfill area and overflow from Infiltration Field 4, as described below, through the extended drainage interceptor pipe. Stormwater Basin No. 3 will be designed with adequate volume and surface area to accommodate a 25 year-24 hour design condition storm event based on an infiltration rate of 8.27 inches per hour which is an average rate for Hydrologic Group A soils, which are the soil types that occur throughout the Landfill area, according to the Massachusetts Stormwater Handbook (Volume 3, Table 2.3.3). The design will provide about 1,575,000 cubic feet of storage capacity from the bottom of the basin at elevation 80 to the top of the basin, which is at elevation 106. The available capacity within the basin exceeds the storage volume required to accommodate the run-off from a 25 year-24 hour storm event, which has been calculated to be approximately 302,000 cubic feet. The excess capacity will be sufficient for managing the stormwater run-off from a greater magnitude event (a 100-year storm will require approximately 512,000 cubic feet of storage) or from back-to-back rainfall events and for the containment of run-off during winter weather and frost conditions.

2.4 Infiltration Field 4

Runoff from the 12-acre LHF will discharge to a separate subsurface infiltration system

(Infiltration Field 4), located under the LHF's pavement area. Surface runoff in the LHF area will be collected by catch basins or curbing. First flush flows and as much of the subsequent flow as possible will discharge through and receive treatment from rain gardens for sediment and nutrient removal prior to discharge to Infiltration Field 4. This structure will be a chambered, stone backfilled, drainage infiltration field. It will be sized to fully contain, as a minimum, the 10-year storm (4.85 Inches), with the excess volume overflowing to Stormwater Basin 3. As conceptually designed, Infiltration Field 4 will hold about 58,000 cubic feet of stormwater before it overflows, with about 18,000 cubic feet discharging to Sedimentation Basin 3 in a 25-year storm and about 60,000 cubic feet discharging to Sedimentation Basin 3 in a 100-year storm. The design discharge capacity of Infiltration Field 4 is based on an infiltration rate of 8.27 inches per hour which is an average rate for Hydrologic Group A soils, which are the soil types that occur throughout the Landfill, according to the Massachusetts Stormwater Handbook (Volume 3, Table 2.3.3).

3.0 STORMWATER PERFORMANCE STANDARDS

3.1 MassDEP Stormwater Management Standards

The MassDEP Stormwater Management Policy includes ten Stormwater Management Standards. The Standards were established to provide clear and consistent guidelines for stormwater management projects. The Standards address water quality (pollutants) and water quantity (flooding, low base flow and recharge) by establishing standards that require the implementation of a wide variety of stormwater management strategies. These strategies include environmentally sensitive site design and low impact development (LID) techniques to minimize impervious surface and land disturbance, source control and pollution prevention, structural BMPs, construction period erosion and sedimentation control, and the long-term operation and maintenance of stormwater management systems.

Each of the standards were evaluated for their applicability to the Bourne Landfill taking into consideration the proposed Full Buildout scenario, which includes the Phase 7, Phase 8 and Phase 9 Landfill Expansions along with the relocation of the Large Handling Facility (LHF). The site-wide stormwater and sediment control facilities were designed to conform to these standards. Each of the ten Standards are addressed below.

1. **No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.**

   All stormwater discharges from the Bourne Landfill site shall be treated by the existing and proposed on-site facilities, which will not allow any off-site discharge of stormwater. Storm flows from the landfill area, as well as the LHF, the perimeter access roads and facilities are and will be collected by a system of drainage pipes, channels and swales which will direct all site runoff to either one of two stormwater basins or an infiltration field. The stormwater basins have been sized to contain stomrwater runoff for design condition storm events and will infiltrate runoff to the groundwater table and not allow discharge to wetlands or surface waters.

2. **Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.**

A comparison of pre-development to post-development peak discharge rates is not applicable because the proposed stormwater management system directs runoff to one of two on-site stormwater basins or an infiltration field and there will be no discharge of flows to surface waters or to off-site locations. Consequently, no pre-development peak discharge rates were calculated. SITEC Environmental has prepared stormwater discharge calculations for post-development Full Buildout conditions after the final capping system has been constructed. These calculations have been performed for 25-year and 100-year, 24 hour storm events. These calculations demonstrate that the proposed stormwater control facilities will be capable of handling the calculated storm conditions. The calculated peak discharge rates into the stormwater basins are summarized on the following table. Appendix 1 contains a Drainage Area sketch showing the tributary sub-basins and Appendix 2 contains HydroCAD Stormwater Calculations.

	PEAK STORMWATER DISCHARGE RATES INTO SEDIMENTATION BASINS (cfs)	
	25-Year, 24 Hour Storm Event (5.60")	100-Year, 24 Hour Storm Event (7.10")
Stormwater Basin No. 1 (Forebay)	113.9	173.2
Stormwater Basin No. 3	123.9	137.1
Infiltration Filed No. 4	53.0	72.5

3. **Loss of annual recharge to ground water should be eliminated or minimized through the use of infiltration measures including**

environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Existing and proposed stormwater control facilities at the Bourne Landfill site will convey stormwater runoff to stormwater basins and fields which will infiltrate, or recharge, all runoff to the groundwater table. This is consistent with the pre-construction conditions at the Landfill. During the operations life of the Landfill, runoff from the active area is contained on the Landfill. Any stormwater that contacts waste or daily cover materials is considered to be leachate and infiltrates to the leachate collection system and not the groundwater. As intermediate and final cover is applied to the Landfill, runoff will be diverted to the stormwater controls and the stormwater basin systems.

4. **Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:**
   - **(a) Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;**
   - **(b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and**
   - **(c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.**

The required water quality volume is calculated as:

- One inch of runoff times the total impervious area of the post-development project site for a discharge:
  1.from a land use with a higher potential pollutant load;
  2.within an area with a rapid infiltration rate (greater than 2.4 inches per hour);
  3.within a Zone II, or Interim Wellhead Protection Area;
  4.near to a critical area including outstanding resource waters, special resource waters, bathing beaches, shellfish growing areas, and cold water fisheries.

- 0.5 inches of runoff times the total impervious area of the post-development project site for all other discharges.

Based on the rapid infiltration rate of the existing on-site soils, which consist of sand and gravel deposits, the volume of stormwater that is to be treated will be calculated as 1.0 inches of runoff times the total impervious area of the project site. The stormwater basins have been designed to contain all of the runoff from their respective tributary areas. No runoff will be discharged off-site or to any wetland resource areas.

BMPs that will be incorporated into facilities and their operations include water quality swales, potential sediment forebays and infiltration basins and fields. MassDEP has developed a standard methodology for calculating TSS removal rates. This methodology has been applied to the proposed Full Buildout Stormwater Management Plan that will be incorporated into the facilities, with a resultant calculated TSS removal rate of approximately 95.5 % for Stormwater Basin No. 1, 94.0% for Stormwater Basin No. 3 and 98.0% for Infiltration Field 4. These calculations are presented on MassDEP'S "TSS Removal Calculation Worksheet", which is included in Appendix 3.

5. **For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.**

Areas where solid waste handling and disposal operations are conducted are considered to be "hot spots" and relevant BMPs should be used for source reduction and adequate treatment of stormwater runoff from these areas. Since all handling and disposal of solid waste is to be conducted within the lined landfill area and all runoff that contacts the solid waste is to be retained within the landfill and leachate collection systems, source reduction will effectively be implemented. Also, the BMPs that are to be incorporated into the project, as described above, are appropriate to the application of sites with higher potential pollutant loadings and as pretreatment to the infiltration basins and field, thus compliance with this Standard will be achieved. Additionally, the facility will be regularly inspected by an independent engineer, in accordance with MassDEP's Solid Waste Regulations. These BMPs, which are specific to solid waste facility operations, along with the existing and proposed structural BMPs that control the site's runoff and sediment, demonstrate that the Full Buildout scenario will comply with this standard.

6. **Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.**

Since all stormwater will recharge the groundwater and not discharge to surface waters, this standard is not applicable. If surface water were to discharge from the Bourne Landfill, they would not be toward an Outstanding Resource Water (ORW) area. This aside, the structural BMPs which are proposed for the site conform to the requirements of this standard.

7. **A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.**

The proposed construction and operation of the Full Buildout scenario does not constitute a redevelopment project, thus this standard does not apply to this project.

8. A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

"Construction phase" activities of the Full Buildout scenario will include site grading and construction of the Landfill. During the construction phase non-structural BMPs will be utilized to mitigate possible short term sedimentation. These temporary non-structural BMPs will include the use of haybales and silt fences around construction areas. These measures are intended to reduce sediment loadings to the structural BMPs. As part of the construction contract documents, the Contractor will be required to submit an Erosion Control Plan to the Town of Bourne, for review and approval prior to the start of construction.

9. A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

A stormwater management system operation and maintenance plan is part of the Facility's overall Operation & Maintenance Plan, which is part of its Operating Permit, as approved by MassDEP. The relevant portion (Section 6.0 - Storm Water Management) of the Operation & Maintenance Plan is included as Appendix 4.

10. All illicit discharges to the stormwater management system are prohibited.

To the best of our professional knowledge and belief, no illicit discharges exist on or are proposed on the site.

3.2 Cape Cod Commission Minimum Performance Standards

The Cape Cod Commission's *Cape Cod Regional Policy Plan* (2012) includes twelve Stormwater Quality Minimum Performance Standards. The Standards were established to provide guidelines for stormwater management projects within the Commission's jurisdiction. The Standards address water quality standards that require the implementation of a wide variety of stormwater management strategies. These strategies include elimination of untreated discharges of stormwater, requirements for on-site infiltration, promotion of biofiltration practices, environmentally sensitive site design to minimize impervious surface and land disturbance, source control and pollution prevention, structural BMPs, construction period erosion and sedimentation control, and the long-term operation and maintenance of stormwater management systems.

Each of the standards were evaluated for their applicability to the Bourne Landfill taking into consideration the proposed Full Buildout scenario. The site-wide stormwater and sediment control facilities were designed to conform to these standards. Each of the twelve Standards are addressed below.

WR7.1 - No New Direct Discharges of Untreated Stormwater: ***New direct discharge of untreated stormwater, parking-lot runoff, and/or wastewater into marine and fresh surface water and natural wetlands shall not be permitted.***

All stormwater discharges from the Bourne Landfill site receive treatment and are retained on site by the existing and proposed facilities. Storm flows from the landfill area as well as the perimeter access roads and facilities are and will be collected by a system of water quality swales, drainage pipes and channels which direct all of the site's runoff to one of two stormwater basins or an infiltration field. The stormwater basins have been sized to contain stormwater runoff for major storm events and will infiltrate all runoff to the groundwater table and not allow any discharge to wetlands or surface waters.

WR7.2 - On-Site Infiltration: ***Stormwater for all roadways and parking areas shall be managed and infiltrated on site, close to the source, to minimize runoff and maximize water quality treatment. Stormwater water quality treatment shall be provided for the first inch of rainfall (25-year 24-hour storm) consistent with 310 CMR 10 and the Massachusetts Stormwater Management Handbook to attain 80-percent total suspended solids removal and to reduce nutrients. All designs shall provide for at least 44-percent total suspended solids removal shall be designed prior to discharge into structured infiltration systems.***

All stormwater generated on the site is managed and infiltrates on site to minimize runoff and maximize water quality treatment. Stormwater water quality treatment does provide for the first inch of rainfall (25-year 24-hour storm) consistent with 310 CMR 10 and the Massachusetts Stormwater Management Handbook to attain 80-percent total suspended solids removal and to reduce nutrients. The existing and future conditions provide for at least 44-percent total suspended solids removal prior to discharge into the structured infiltration systems. See the attached Total Suspended Solid Removal Calculation Worksheets in Appendix 3, which is consistent with 310 CMR 10 and the Massachusetts Stormwater Management Handbook. The Worksheet demonstrates that initial treatment on the landfill with water quality swales provides a total suspended solids (TSS) removal rate of 70% and that rain gardens in the LHF provide a 90% removal rate, with the the final TSS removal rates being between 98.0 % and 94.0%. While it has been demonstrated that the proposed design will meet required performance criteria, additional BMPs, such as rain gardens, will be incorporated into the LHF design to enhance TSS and nutrient removal efficiency, before flows from this area are discharged to its dedicated subsurface infiltration system (Infiltration Field No. 4).

WR7.3 - Roof Runoff: ***Roof runoff shall be managed separately and directly infiltrated unless there is an identified rooftop water quality concern that requires additional treatment or management.***

There will be new buildings, which are replacing existing buildings. Roof drainage will be either directed to individual infiltration structures located in the vicinity of the buildings or to Infiltration Field No. 4. As a third alternative, roof drainage can be directed to the proposed Sedimentation Basin No. 3 through an area drainage system. Either way all roof drainage will be infiltrated to the groundwater.

WR7.4 - Biofiltration Practices: ***Stormwater design for the first inch of stormwater flow from development parking and roadways shall use biofiltration practices including, but not limited to, vegetated swales and filter strips, constructed wetlands, tree box filters, bio-retention basins and rain gardens for treatment of stormwater runoff. Bioretention areas shall be constructed in accordance with the Massachusetts Storm Water Management Volume One: Stormwater Policy Handbook, March 1997. Approved biofiltration areas may be counted as open space within Wellhead Protection Areas.***

Existing and future conditions will provide vegetated water quality swales that collect the majority of the stormwater runoff from the closed landfill sideslopes and plateau areas. That runoff is transported through a system of pipes, or drainage channels and forebay systems to one of the stormwater basins. The facilities, as they relate to the western side of the Landfill will continue to discharge through existing structures and to Sedimentation Basin No.1, which have been previously approved, therefore this Standard may not be applicable to this area. The facilities for Phase 7 and 8 and the relocated LHF will be new and be subject to additional review. Future improvements can include adding bioretention capacity to the drainage channel and forebay of Stormwater Basin No. 1 and will include bioretention features, such as rain gardens for runoff generated in the LHF area, prior to discharge into Infiltration Field No. 4 for sediment and nutrient removal.

WR7.5 - Structured Infiltration Devices: ***Structured infiltration devices shall be used to accommodate frozen flow conditions and storms that exceed 25-year 24-hour storm and designed to be consistent with the Massachusetts Stormwater Standards under 310 CMR 10 and the Massachusetts Storm Water Management Handbook.***

The Stormwater Basin Nos. 1 and 3 and Infiltration Field No. 4 (infiltration devices) as a site wide system, can accommodate frozen flow conditions and storms that exceed 25-year 24-hour storm, as described above and demonstrated in Appendix 2 – Stormwater Calculations. They are designed to be consistent with the Massachusetts Stormwater Standards under 310 CMR 10 and the Massachusetts Storm Water Management Handbook.

WR7.6 - Impervious Surfaces: ***Roadway and parking design shall limit impervious surfaces. Parking lots shall be designed for the minimum required by the town in accordance with MPS TR2.9. Overflow peak parking design shall be constructed from pervious materials such as porous pavement, permeable pavers, or biomaterial such as grass pavers unless inconsistent with local bylaws. Bioretention shall be incorporated into parking islands and roadway perimeters. Permeable paving shall be encouraged where appropriate.***

Because of the industrial nature of site activities and the use of heavy equipment on site, access roads and parking areas are limited to impervious asphalt paving. Permeable paving is not appropriate for much of the site's operations activities. The Full Buildout scenario operations will utilize the existing and replacement impervious surfaces, which will be designed to be the minimum needed for those operations, and will utilize pervious surfaces, where possible.

WR7.7 - Structured Infiltration Devices in Designated Mapped Areas: ***Structured detention basins, infiltration basins and galleries may be used for redevelopment in Impaired Areas, Economic Centers, Industrial and Service Trade Areas, Villages, and Growth Incentive Zones. In towns without a Land Use Vision Map, this MPS shall only apply to redevelopment in Impaired Areas.***

Stormwater Basin Nos. 1 and 3 and Infiltration Field No. 4 (infiltration devices) are used in this "Industrial and Service Trade Area".

WR7.8 - Minimum Two-foot Separation to Groundwater: ***New infiltration basins or other stormwater leaching structures shall maintain a minimum two-foot separation between points of infiltration and maximum high water table except as required under MPS CR3.4. Guidance on the high groundwater adjustment methodology can be found in Estimation of High Groundwater Levels for Construction and Land Use Planning, Technical Bulletin 92-001, as amended.***

Stormwater Basin Nos. 1 and 2 are existing and have been previously approved. The replacement basins, Stormwater Basin No. 3 and Infiltration Field No. 4, will meet this Standard. Historically high groundwater elevations in the area of the replacement basins are projected to be in the range of 47 to 48 feet. The ground surface elevations in the area of Stormwater Basin No. 3 and Infiltration Field No. 4 are in the range of 90 feet to 110 feet, with a design low point bottom elevation of 80 feet. There is more than sufficient depth to maintain a minimum two feet separation between the bottom of future Stormwater Basin No. 3 and Infiltration Field No. 4 and maximum high groundwater elevations.

WR7.9 - Best Management Practices during Construction: ***Construction best management practices for erosion and sedimentation controls shall be specified on project plans to prevent erosion, control sediment movement and stabilize exposed soils.***

"Construction phase" activities for the Full Buildout scenario will include site grading and construction of the Landfill and the relocated LHF. During the construction phase non-structural BMPs will be utilized to mitigate possible short term sedimentation. These temporary non-structural BMPs will include the use of haybales and silt fences around construction areas. These measures are intended to reduce sediment loadings to the structural BMPs. As part of all construction contract documents, the Contractor is required to submit an Erosion Control Plan to the Town of Bourne, for review and approval prior to the start of construction. In addition the contract documents have erosion control requirements that the Contractor must meet.

WR7.10 - Stormwater Maintenance and Operation Plan: ***Development and redevelopment shall submit a Professional Engineer-certified stormwater maintenance and operation plan demonstrating compliance with the Massachusetts Stormwater Guidelines including a schedule for inspection, monitoring, and maintenance. The plan shall identify the parties responsible for plan implementation, operation and maintenance. The identified responsible party shall keep documentation of the maintenance and inspection records and make these available to the Commission or local board of health upon request. One year from completion of the system, a Professional Engineer shall inspect the system and submit a letter certifying that the system was installed and functions as designed.***

A stormwater management system operation and maintenance plan is part of the Facility's overall Operation & Maintenance Plan, which is part of its Operating Permit, as approved by MassDEP. The relevant portion (Section 6.0 - Storm Water Management) of the current Operation & Maintenance Plan is included as Appendix 4.

WR7.11 - Shut-off Valve in Wellhead Protection Areas: ***In Wellhead Protection Areas, stormwater Systems for land uses that have a high risk of contaminating***

groundwater, such as vehicle maintenance areas and loading docks, shall install a mechanical shut-off valve or other flow-arresting device between the catch basin or other stormwater-capture structure draining this area and the leaching structures.

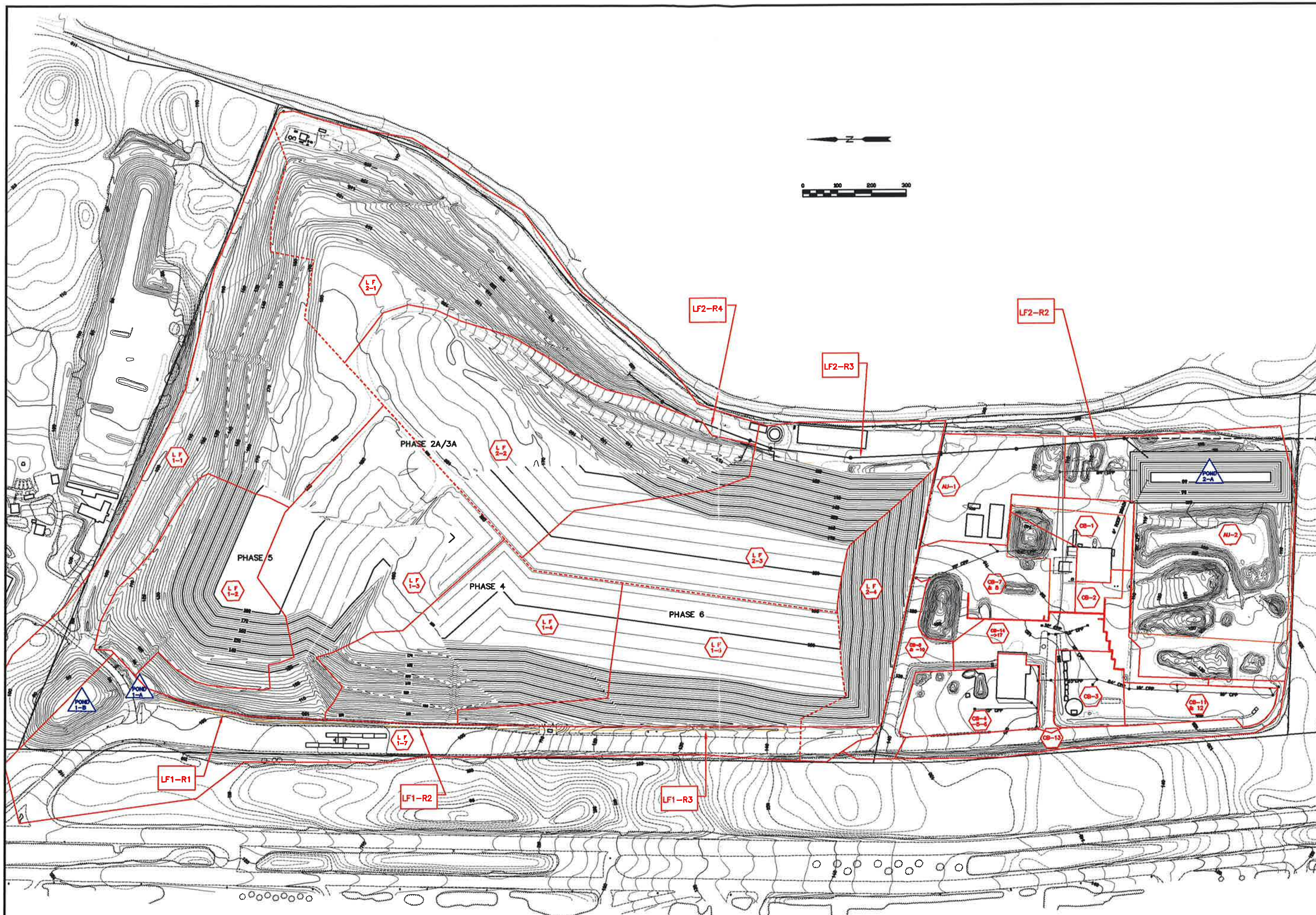
This Standard is not applicable, since the site is not in a Wellhead Protection Area.

WR7.12 - Road Widths: ***DRIs are encouraged to limit roadway lane widths to 9 feet (18 feet total for two-lane roadways) to minimize runoff from impervious surfaces.***

Road widths cannot be limited to 18 feet because of the industrial nature of site activities, the relatively frequent public use and the heavy equipment that operates on the site's access roads. This Standard is aimed at residential roads.

APPENDIX 1

DRAINAGE AREA SKETCHES



project: BOURNE LANDFILL
FULL SITE BUILDOUT

client: TOWN OF BOURNE
DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: NO FURTHER EXPANSION DRAINAGE AREAS

scale: AS SHOWN
date: JUNE 18, 2020
drawn:
checked: ARQ
approved: ARQ
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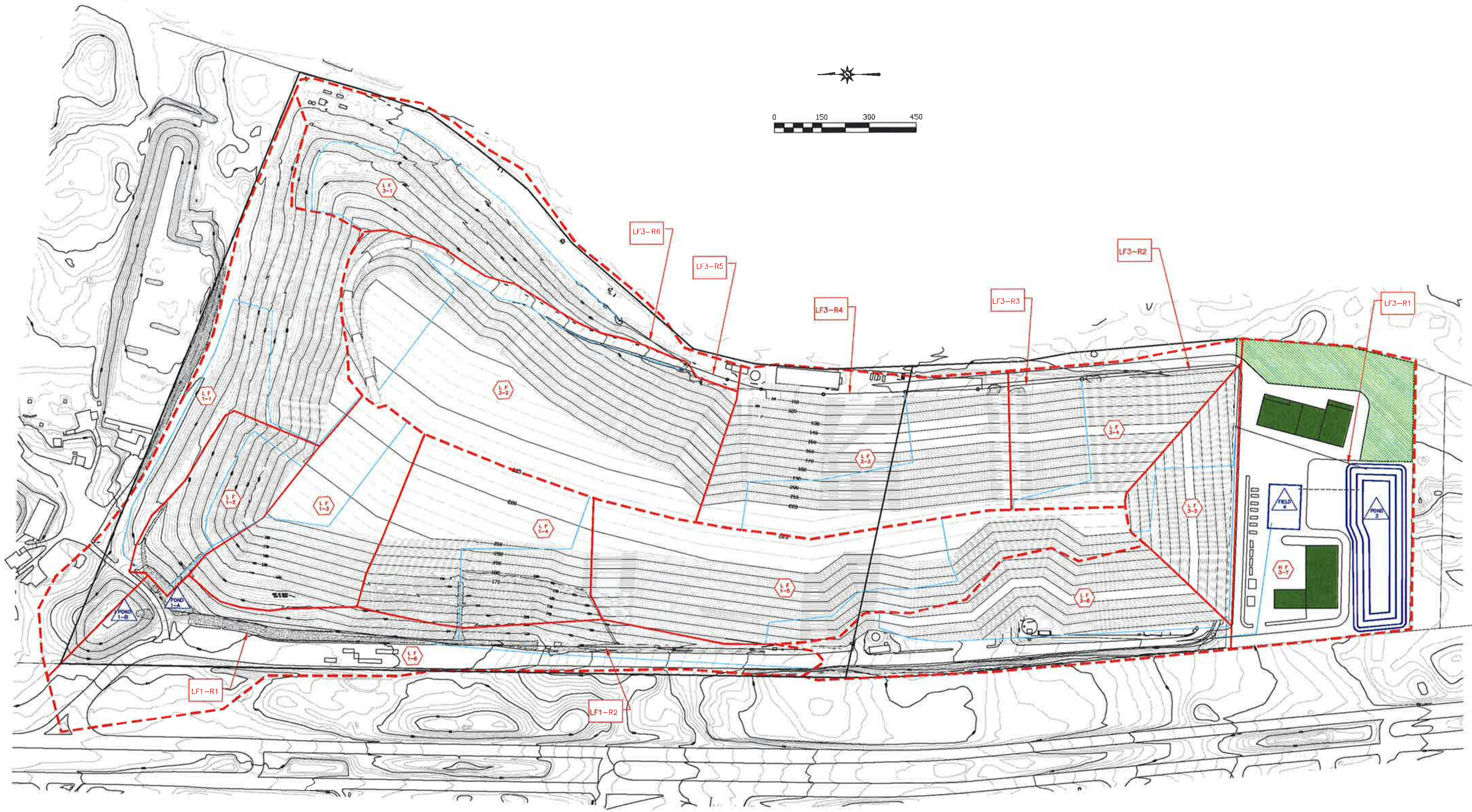
Acad No. PHASE 6-ATC Drainage Site Plan.dwg
File No. SE01-456-11



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date: JULY 20, 2020
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project:
BOURNE LANDFILL
FULL SITE BUILDOUT

client:
TOWN OF BOURNE
DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title:
FULL BUILDOUT DRAINAGE AREAS

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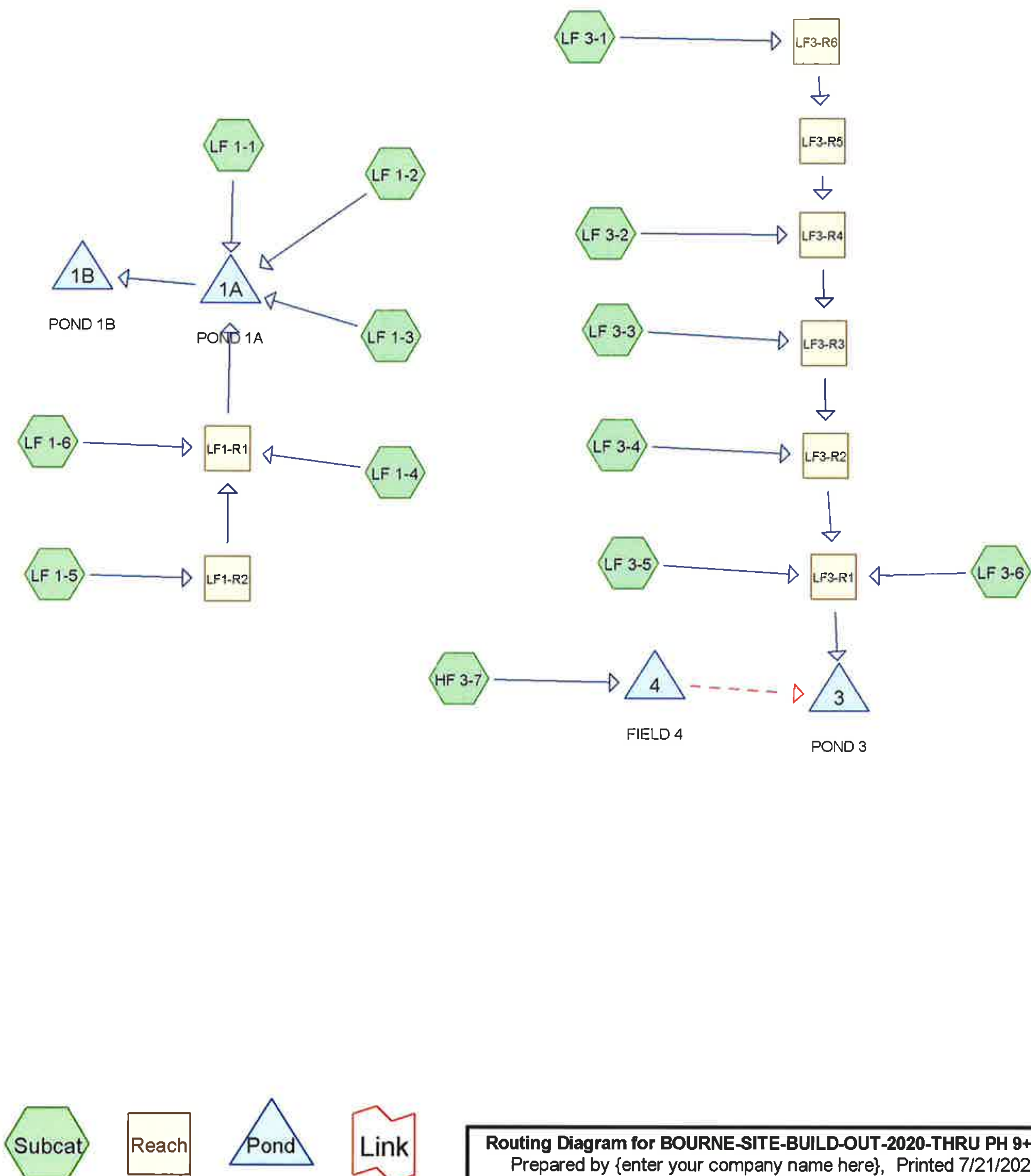
Acad No. Full Buildout Stormwater Plan.dwg
File No. SE01-456-12

APPENDIX 2

DRAINAGE CALCULATIONS

25 YEAR STORM EVENT



Routing Diagram for BOURNE-SITE-BUILD-OUT-2020-THRU PH 9+LHF
Prepared by {enter your company name here}, Printed 7/21/2020
HydroCAD® 10.00-22 s/n 07502 © 2018 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment HF 3-7: Runoff Area=522,700 sf 46.53% Impervious Runoff Depth>3.62"
Flow Length=500' Slope=0.0100 '/' Tc=4.1 min CN=82 Runoff=52.94 cfs 3.619 af

Subcatchment LF 1-1: Runoff Area=451,000 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=1,800' Tc=9.9 min CN=69 Runoff=24.93 cfs 2.070 af

Subcatchment LF 1-2: Runoff Area=152,500 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=795' Tc=1.6 min CN=69 Runoff=10.71 cfs 0.701 af

Subcatchment LF 1-3: Runoff Area=253,000 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=990' Tc=9.2 min CN=69 Runoff=14.23 cfs 1.162 af

Subcatchment LF 1-4: Runoff Area=331,400 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=810' Tc=6.9 min CN=69 Runoff=20.26 cfs 1.522 af

Subcatchment LF 1-5: Runoff Area=475,600 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=940' Tc=7.7 min CN=69 Runoff=28.27 cfs 2.184 af

Subcatchment LF 1-6: Runoff Area=486,400 sf 31.87% Impervious Runoff Depth>3.23"
Flow Length=1,200' Slope=0.0375 '/' Tc=5.1 min CN=78 Runoff=42.18 cfs 3.002 af

Subcatchment LF 3-1: Runoff Area=418,600 sf 0.00% Impervious Runoff Depth>2.49"
Flow Length=1,625' Tc=3.0 min CN=70 Runoff=30.30 cfs 1.995 af

Subcatchment LF 3-2: Runoff Area=646,400 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=1,550' Tc=9.6 min CN=69 Runoff=36.01 cfs 2.967 af

Subcatchment LF 3-3: Runoff Area=451,200 sf 2.22% Impervious Runoff Depth>2.49"
Flow Length=855' Tc=6.2 min CN=70 Runoff=29.29 cfs 2.148 af

Subcatchment LF 3-4: Runoff Area=257,600 sf 0.00% Impervious Runoff Depth>2.49"
Flow Length=1,080' Tc=4.6 min CN=70 Runoff=17.49 cfs 1.227 af

Subcatchment LF 3-5: Runoff Area=526,700 sf 16.39% Impervious Runoff Depth>2.85"
Flow Length=625' Tc=0.7 min CN=74 Runoff=45.52 cfs 2.873 af

Subcatchment LF 3-6: Runoff Area=346,000 sf 41.42% Impervious Runoff Depth>3.52"
Flow Length=1,805' Tc=4.3 min CN=81 Runoff=33.85 cfs 2.330 af

Reach LF1-R1: Avg. Flow Depth=1.94' Max Vel=4.82 fps Inflow=78.37 cfs 6.700 af
n=0.033 L=900.0' S=0.0089 '/' Capacity=343.97 cfs Outflow=73.74 cfs 6.677 af

Reach LF1-R2: Avg. Flow Depth=0.76' Max Vel=6.36 fps Inflow=28.27 cfs 2.184 af
n=0.033 L=1,080.0' S=0.0426 '/' Capacity=752.94 cfs Outflow=26.50 cfs 2.176 af

Reach LF3-R1: Avg. Flow Depth=3.90' Max Vel=7.57 fps Inflow=125.35 cfs 13.502 af
60.0" Round Pipe n=0.010 L=430.0' S=0.0015 '/' Capacity=130.62 cfs Outflow=123.87 cfs 13.490 af

Reach LF3-R2: Avg. Flow Depth=3.08' Max Vel=7.22 fps Inflow=95.34 cfs 8.322 af
60.0" Round Pipe n=0.010 L=1,125.0' S=0.0015 '/' Capacity=131.23 cfs Outflow=91.28 cfs 8.299 af

Reach LF3-R3: Avg. Flow Depth=2.72' Max Vel=9.32 fps Inflow=85.62 cfs 7.103 af
48.0" Round Pipe n=0.010 L=540.0' S=0.0032 '/' Capacity=105.39 cfs Outflow=83.20 cfs 7.095 af

Reach LF3-R4: Avg. Flow Depth=2.29' Max Vel=9.00 fps Inflow=61.02 cfs 4.960 af
42.0" Round Pipe n=0.010 L=570.0' S=0.0036 '/' Capacity=79.01 cfs Outflow=58.67 cfs 4.954 af

Reach LF3-R5: Avg. Flow Depth=1.56' Max Vel=7.67 fps Inflow=28.82 cfs 1.993 af
36.0" Round Pipe n=0.010 L=140.0' S=0.0039 '/' Capacity=53.85 cfs Outflow=28.04 cfs 1.993 af

Reach LF3-R6: Avg. Flow Depth=1.63' Max Vel=7.61 fps Inflow=30.30 cfs 1.995 af
36.0" Round Pipe n=0.010 L=247.0' S=0.0036 '/' Capacity=52.05 cfs Outflow=28.82 cfs 1.993 af

Pond 1A: POND 1A Peak Elev=92.61' Storage=81,347 cf Inflow=113.93 cfs 10.610 af
Outflow=75.02 cfs 10.050 af

Pond 1B: POND 1B Peak Elev=85.52' Storage=271,029 cf Inflow=75.02 cfs 10.050 af
Outflow=5.62 cfs 6.081 af

Pond 3: POND 3 Peak Elev=87.84' Storage=349,497 cf Inflow=123.87 cfs 13.904 af
Outflow=8.94 cfs 9.541 af

Pond 4: FIELD 4 Peak Elev=98.65' Storage=61,738 cf Inflow=52.94 cfs 3.619 af
Discarded=2.68 cfs 3.151 af Secondary=8.27 cfs 0.414 af Outflow=10.95 cfs 3.565 af

Total Runoff Area = 122.110 ac Runoff Volume = 27.800 af Average Runoff Depth = 2.73"
88.01% Pervious = 107.468 ac 11.99% Impervious = 14.642 ac

Summary for Subcatchment HF 3-7:

Runoff = 52.94 cfs @ 12.06 hrs, Volume= 3.619 af, Depth> 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
243,200	98	Paved roads w/curbs & sewers, HSG B
279,500	69	50-75% Grass cover, Fair, HSG B
522,700	82	Weighted Average
279,500		53.47% Pervious Area
243,200		46.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	500	0.0100	2.03		**Shallow Concentrated Flow, PAVED SURFACE** Paved Kv= 20.3 fps

Summary for Subcatchment LF 1-1:

Runoff = 24.93 cfs @ 12.15 hrs, Volume= 2.070 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
405,100	69	50-75% Grass cover, Fair, HSG B
45,900	72	Dirt roads, HSG A
451,000	69	Weighted Average
451,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
1.6	150	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.7	165	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.5	355	0.0620	12.39	266.47	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.033
0.1	130	0.3300	23.27	488.59	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.028
2.1	950	0.0150	7.61	91.34	**Channel Flow, DRAINAGE SWALE** Area= 12.0 sf Perim= 10.0' r= 1.20' n= 0.027
9.9	1,800	Total			

Summary for Subcatchment LF 1-2:

Runoff = 10.71 cfs @ 12.03 hrs, Volume= 0.701 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
152,500	69	50-75% Grass cover, Fair, HSG B
152,500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	190	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.6	410	0.0300	10.54	226.55	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.2	195	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
1.6	795	Total			

Summary for Subcatchment LF 1-3:

Runoff = 14.23 cfs @ 12.14 hrs, Volume= 1.162 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
253,000	69	50-75% Grass cover, Fair, HSG B
253,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
3.8	360	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	200	0.0500	13.60	292.48	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.3	380	0.2900	18.51	388.62	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
9.2	990	Total			

Summary for Subcatchment LF 1-4:

Runoff = 20.26 cfs @ 12.11 hrs, Volume= 1.522 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
331,400	69	50-75% Grass cover, Fair, HSG B
331,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW**
					Grass: Short n= 0.150 P2= 2.00"
1.4	130	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW**
					Short Grass Pasture Kv= 7.0 fps
0.4	340	0.0500	13.60	292.48	**Channel Flow, DIVERSION BERM**
					Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.2	290	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL**
					Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
6.9	810	Total			

Summary for Subcatchment LF 1-5:

Runoff = 28.27 cfs @ 12.12 hrs, Volume= 2.184 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
475,600	69	50-75% Grass cover, Fair, HSG B
475,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW**
					Grass: Short n= 0.150 P2= 2.00"
1.5	145	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW**
					Short Grass Pasture Kv= 7.0 fps
0.3	75	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW**
					Short Grass Pasture Kv= 7.0 fps
0.9	600	0.0500	11.13	239.30	**Channel Flow, DIVERSION BERM**
					Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.033
0.1	70	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL**
					Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
7.7	940	Total			

Summary for Subcatchment LF 1-6:

Runoff = 42.18 cfs @ 12.08 hrs, Volume= 3.002 af, Depth> 3.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
331,400	69	50-75% Grass cover, Fair, HSG B
155,000	98	Paved parking, HSG A
486,400	78	Weighted Average
331,400		68.13% Pervious Area
155,000		31.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	1,200	0.0375	3.93		**Shallow Concentrated Flow, ACCESS ROAD** Paved Kv= 20.3 fps

Summary for Subcatchment LF 3-1:

Runoff = 30.30 cfs @ 12.05 hrs, Volume= 1.995 af, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
268,600	69	50-75% Grass cover, Fair, HSG B
150,000	72	Dirt roads, HSG A
418,600	70	Weighted Average
418,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	180	0.2400	3.43		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.5	440	0.0540	14.14	303.95	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.1	90	0.2330	16.59	348.34	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
1.5	915	0.0076	9.98	479.05	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
3.0	1,625	Total			

Summary for Subcatchment LF 3-2:

Runoff = 36.01 cfs @ 12.14 hrs, Volume= 2.967 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
586,000	69	50-75% Grass cover, Fair, HSG B
60,400	72	Dirt roads, HSG A
646,400	69	Weighted Average
646,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
3.7	350	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.3	80	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	155	0.0500	13.60	292.48	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.5	900	0.0710	30.50	1,464.22	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
0.0	15	0.2000	20.29	15.93	**Pipe Channel, DRAIN PIPE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
9.6	1,550	Total			

Summary for Subcatchment LF 3-3:

Runoff = 29.29 cfs @ 12.10 hrs, Volume= 2.148 af, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
388,200	69	50-75% Grass cover, Fair, HSG B
53,000	72	Dirt roads, HSG A
10,000	98	Paved parking & roofs
451,200	70	Weighted Average
441,200		97.78% Pervious Area
10,000		2.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW**
					Grass: Short n= 0.150 P2= 2.00"
0.5	50	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW**
					Short Grass Pasture Kv= 7.0 fps
0.6	530	0.0500	13.60	292.48	**Channel Flow, DIVERSION BERM**
					Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.2	225	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL**
					Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
6.2	855	Total			

Summary for Subcatchment LF 3-4:

Runoff = 17.49 cfs @ 12.07 hrs, Volume= 1.227 af, Depth> 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
211,400	69	50-75% Grass cover, Fair, HSG B
46,200	72	Dirt roads, HSG A
257,600	70	Weighted Average
257,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	30	0.0500	0.15		**Sheet Flow, PLATEAU FLOW**
					Grass: Short n= 0.150 P2= 2.00"
0.5	400	0.0500	13.60	292.48	**Channel Flow, DIVERSION BERM**
					Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.3	300	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL**
					Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
0.5	350	0.0110	12.01	576.33	**Channel Flow, DRAINAGE SWALE**
					Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
4.6	1,080	Total			

Summary for Subcatchment LF 3-5:

Runoff = 45.52 cfs @ 12.01 hrs, Volume= 2.873 af, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
440,400	69	50-75% Grass cover, Fair, HSG B
86,300	98	Paved parking, HSG A
526,700	74	Weighted Average
440,400		83.61% Pervious Area
86,300		16.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	60	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	200	0.0500	13.57	298.54	**Channel Flow, DIVERSION BERM** Area= 22.0 sf Perim= 19.0' r= 1.16' n= 0.027
0.2	245	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
0.1	120	0.0330	20.80	998.24	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
0.7	625	Total			

Summary for Subcatchment LF 3-6:

Runoff = 33.85 cfs @ 12.06 hrs, Volume= 2.330 af, Depth> 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=5.60"

Area (sf)	CN	Description
202,700	69	50-75% Grass cover, Fair, HSG B
143,300	98	Paved parking & roofs
346,000	81	Weighted Average
202,700		58.58% Pervious Area
143,300		41.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	50	0.3300	0.36		**Sheet Flow, SIDESLOPE FLOW** Grass: Short n= 0.150 P2= 2.00"
0.3	205	0.0500	13.57	298.54	**Channel Flow, DIVERSION BERM** Area= 22.0 sf Perim= 19.0' r= 1.16' n= 0.027
1.1	910	0.0150	14.02	673.01	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
0.6	640	0.0220	16.98	815.06	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
4.3	1,805	Total			

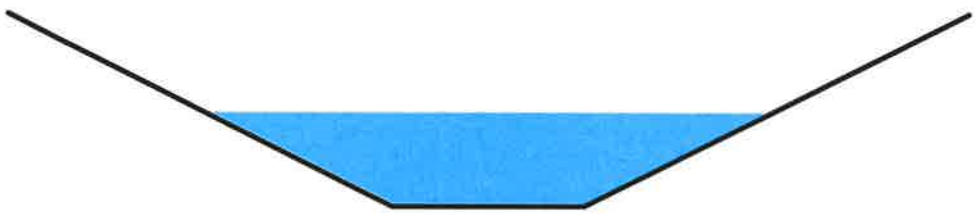
Summary for Reach LF1-R1:

Inflow Area = 29.692 ac, 11.98% Impervious, Inflow Depth > 2.71" for 25 Year Storm event
Inflow = 78.37 cfs @ 12.11 hrs, Volume= 6.700 af
Outflow = 73.74 cfs @ 12.20 hrs, Volume= 6.677 af, Atten= 6%, Lag= 5.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.82 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 1.78 fps, Avg. Travel Time= 8.4 min

Peak Storage= 13,811 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.94'
Bank-Full Depth= 4.00' Flow Area= 48.0 sf, Capacity= 343.97 cfs

4.00' x 4.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 20.00'
Length= 900.0' Slope= 0.0089 '/'
Inlet Invert= 98.00', Outlet Invert= 90.00'



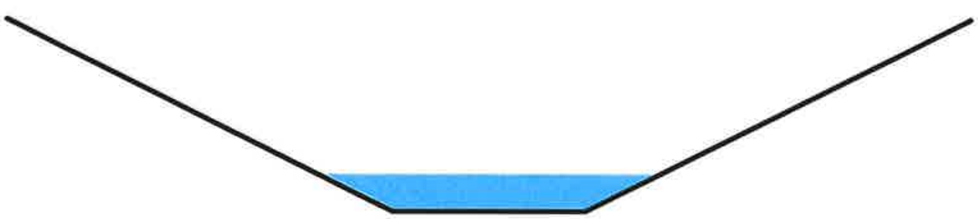
Summary for Reach LF1-R2:

Inflow Area = 10.918 ac, 0.00% Impervious, Inflow Depth > 2.40" for 25 Year Storm event
Inflow = 28.27 cfs @ 12.12 hrs, Volume= 2.184 af
Outflow = 26.50 cfs @ 12.20 hrs, Volume= 2.176 af, Atten= 6%, Lag= 5.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.36 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 2.19 fps, Avg. Travel Time= 8.2 min

Peak Storage= 4,524 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.76'
Bank-Full Depth= 4.00' Flow Area= 48.0 sf, Capacity= 752.94 cfs

4.00' x 4.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 20.00'
Length= 1,080.0' Slope= 0.0426 '/'
Inlet Invert= 144.00', Outlet Invert= 98.00'



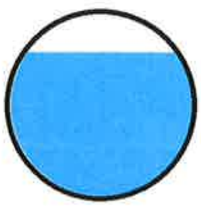
Summary for Reach LF3-R1:

Inflow Area = 60.755 ac, 9.05% Impervious, Inflow Depth > 2.67" for 25 Year Storm event
Inflow = 125.35 cfs @ 12.20 hrs, Volume= 13.502 af
Outflow = 123.87 cfs @ 12.23 hrs, Volume= 13.490 af, Atten= 1%, Lag= 1.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.57 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 3.13 fps, Avg. Travel Time= 2.3 min

Peak Storage= 7,066 cf @ 12.22 hrs
Average Depth at Peak Storage= 3.90'
Bank-Full Depth= 5.00' Flow Area= 19.6 sf, Capacity= 130.62 cfs

60.0" Round Pipe
n= 0.010
Length= 430.0' Slope= 0.0015 '/'
Inlet Invert= 90.60', Outlet Invert= 89.96'



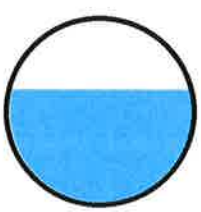
Summary for Reach LF3-R2:

Inflow Area =	40.721 ac,	0.56% Impervious, Inflow Depth >	2.45"	for 25 Year Storm event
Inflow =	95.34 cfs @	12.15 hrs, Volume=	8.322 af	
Outflow =	91.28 cfs @	12.23 hrs, Volume=	8.299 af,	Atten= 4%, Lag= 4.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.22 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 2.98 fps, Avg. Travel Time= 6.3 min

Peak Storage= 14,302 cf @ 12.18 hrs
Average Depth at Peak Storage= 3.08'
Bank-Full Depth= 5.00' Flow Area= 19.6 sf, Capacity= 131.23 cfs

60.0" Round Pipe
n= 0.010
Length= 1,125.0' Slope= 0.0015 '/'
Inlet Invert= 92.33', Outlet Invert= 90.64'



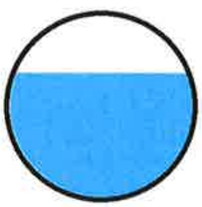
Summary for Reach LF3-R3:

Inflow Area = 34.807 ac, 0.66% Impervious, Inflow Depth > 2.45" for 25 Year Storm event
Inflow = 85.62 cfs @ 12.12 hrs, Volume= 7.103 af
Outflow = 83.20 cfs @ 12.16 hrs, Volume= 7.095 af, Atten= 3%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.32 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 3.82 fps, Avg. Travel Time= 2.4 min

Peak Storage= 4,907 cf @ 12.14 hrs
Average Depth at Peak Storage= 2.72'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 105.39 cfs

48.0" Round Pipe
n= 0.010
Length= 540.0' Slope= 0.0032 '/'
Inlet Invert= 95.05', Outlet Invert= 93.33'



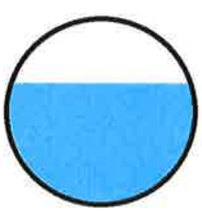
Summary for Reach LF3-R4:

Inflow Area = 24.449 ac, 0.00% Impervious, Inflow Depth > 2.43" for 25 Year Storm event
Inflow = 61.02 cfs @ 12.11 hrs, Volume= 4.960 af
Outflow = 58.67 cfs @ 12.15 hrs, Volume= 4.954 af, Atten= 4%, Lag= 2.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.00 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 3.67 fps, Avg. Travel Time= 2.6 min

Peak Storage= 3,799 cf @ 12.12 hrs
Average Depth at Peak Storage= 2.29'
Bank-Full Depth= 3.50' Flow Area= 9.6 sf, Capacity= 79.01 cfs

42.0" Round Pipe
n= 0.010
Length= 570.0' Slope= 0.0036 '/'
Inlet Invert= 97.56', Outlet Invert= 95.48'



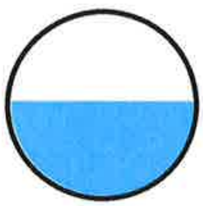
Summary for Reach LF3-R5:

Inflow Area = 9.610 ac, 0.00% Impervious, Inflow Depth > 2.49" for 25 Year Storm event
Inflow = 28.82 cfs @ 12.07 hrs, Volume= 1.993 af
Outflow = 28.04 cfs @ 12.08 hrs, Volume= 1.993 af, Atten= 3%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.67 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.92 fps, Avg. Travel Time= 0.8 min

Peak Storage= 519 cf @ 12.07 hrs
Average Depth at Peak Storage= 1.56'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 53.85 cfs

36.0" Round Pipe
n= 0.010
Length= 140.0' Slope= 0.0039 '/'
Inlet Invert= 98.55', Outlet Invert= 98.01'



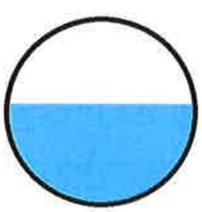
Summary for Reach LF3-R6:

Inflow Area = 9.610 ac, 0.00% Impervious, Inflow Depth > 2.49" for 25 Year Storm event
Inflow = 30.30 cfs @ 12.05 hrs, Volume= 1.995 af
Outflow = 28.82 cfs @ 12.07 hrs, Volume= 1.993 af, Atten= 5%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.61 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.85 fps, Avg. Travel Time= 1.4 min

Peak Storage= 971 cf @ 12.06 hrs
Average Depth at Peak Storage= 1.63'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 52.05 cfs

36.0" Round Pipe
n= 0.010
Length= 247.0' Slope= 0.0036 '/'
Inlet Invert= 99.34', Outlet Invert= 98.45'



Summary for Pond 1A: POND 1A

Inflow Area = 49.355 ac, 7.21% Impervious, Inflow Depth > 2.58" for 25 Year Storm event
Inflow = 113.93 cfs @ 12.18 hrs, Volume= 10.610 af
Outflow = 75.02 cfs @ 12.37 hrs, Volume= 10.050 af, Atten= 34%, Lag= 11.6 min
Primary = 75.02 cfs @ 12.37 hrs, Volume= 10.050 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Starting Elev= 82.00' Surf.Area= 2,000 sf Storage= 3,000 cf
Peak Elev= 92.61' @ 12.37 hrs Surf.Area= 14,219 sf Storage= 81,347 cf (78,347 cf above start)
Flood Elev= 93.50' Surf.Area= 16,300 sf Storage= 94,325 cf (91,325 cf above start)

Plug-Flow detention time= 49.9 min calculated for 9.981 af (94% of inflow)
Center-of-Mass det. time= 17.2 min (860.9 - 843.7)

Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	115,875 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
80.00	1,000	0	0
82.00	2,000	3,000	3,000
84.00	3,850	5,850	8,850
86.00	5,800	9,650	18,500
88.00	7,850	13,650	32,150
90.00	9,850	17,700	49,850
92.00	12,800	22,650	72,500
93.50	16,300	21,825	94,325
94.00	69,900	21,550	115,875

Device	Routing	Invert	Outlet Devices
#1	Primary	87.00'	**18.0" Round Culvert X 4.00** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 87.00' / 86.00' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Primary	93.50'	**170.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=74.88 cfs @ 12.37 hrs HW=92.59' (Free Discharge)
1=Culvert (Inlet Controls 74.88 cfs @ 10.59 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 1B: POND 1B

Inflow Area = 49.355 ac, 7.21% Impervious, Inflow Depth > 2.44" for 25 Year Storm event
Inflow = 75.02 cfs @ 12.37 hrs, Volume= 10.050 af
Outflow = 5.62 cfs @ 16.28 hrs, Volume= 6.081 af, Atten= 93%, Lag= 234.1 min
Discarded = 5.62 cfs @ 16.28 hrs, Volume= 6.081 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Starting Elev= 74.00' Surf.Area= 12,000 sf Storage= 36,600 cf
Peak Elev= 85.52' @ 16.28 hrs Surf.Area= 29,349 sf Storage= 271,029 cf (234,429 cf above start)
Flood Elev= 93.50' Surf.Area= 63,075 sf Storage= 585,175 cf (548,575 cf above start)

Plug-Flow detention time= 337.7 min calculated for 5.229 af (52% of inflow)
Center-of-Mass det. time= 92.7 min (953.6 - 860.9)

Volume	Invert	Avail.Storage	Storage Description
#1	70.00'	613,300 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.00	5,900	0	0
72.00	9,350	15,250	15,250
74.00	12,000	21,350	36,600
76.00	14,750	26,750	63,350
78.00	17,500	32,250	95,600
80.00	20,400	37,900	133,500
82.00	23,500	43,900	177,400
84.00	26,800	50,300	227,700
86.00	30,150	56,950	284,650
88.00	33,750	63,900	348,550
90.00	37,950	71,700	420,250
92.00	42,600	80,550	500,800
94.00	69,900	112,500	613,300

Device	Routing	Invert	Outlet Devices
#1	Discarded	70.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=5.62 cfs @ 16.28 hrs HW=85.52' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 5.62 cfs)

Summary for Pond 3: POND 3

Inflow Area =	60.755 ac,	9.05% Impervious,	Inflow Depth > 2.75"	for 25 Year Storm event	
Inflow =	123.87 cfs @	12.23 hrs,	Volume=	13.904 af	
Outflow =	8.94 cfs @	15.50 hrs,	Volume=	9.541 af,	Atten= 93%, Lag= 196.0 min
Discarded =	8.94 cfs @	15.50 hrs,	Volume=	9.541 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Starting Elev= 80.00' Surf.Area= 30,000 sf Storage= 31,000 cf
Peak Elev= 87.84' @ 15.50 hrs Surf.Area= 46,689 sf Storage= 349,497 cf (318,497 cf above start)
Flood Elev= 106.00' Surf.Area= 92,000 sf Storage= 1,576,400 cf (1,545,400 cf above start)

Plug-Flow detention time= 320.2 min calculated for 8.830 af (64% of inflow)
Center-of-Mass det. time= 142.2 min (981.7 - 839.5)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	1,576,400 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.00	1,000	0	0
80.00	30,000	31,000	31,000
90.00	51,300	406,500	437,500
100.00	75,800	635,500	1,073,000
106.00	92,000	503,400	1,576,400

Device	Routing	Invert	Outlet Devices
#1	Discarded	78.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=8.94 cfs @ 15.50 hrs HW=87.84' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 8.94 cfs)

Summary for Pond 4: FIELD 4

Inflow Area = 12.000 ac, 46.53% Impervious, Inflow Depth > 3.62" for 25 Year Storm event
Inflow = 52.94 cfs @ 12.06 hrs, Volume= 3.619 af
Outflow = 10.95 cfs @ 12.49 hrs, Volume= 3.565 af, Atten= 79%, Lag= 25.5 min
Discarded = 2.68 cfs @ 11.15 hrs, Volume= 3.151 af
Secondary = 8.27 cfs @ 12.49 hrs, Volume= 0.414 af 18,030 cF

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 98.65' @ 12.49 hrs Surf.Area= 14,000 sf Storage= 61,738 cf

Plug-Flow detention time= 184.0 min calculated for 3.565 af (99% of inflow)
Center-of-Mass det. time= 174.9 min (984.6 - 809.6)

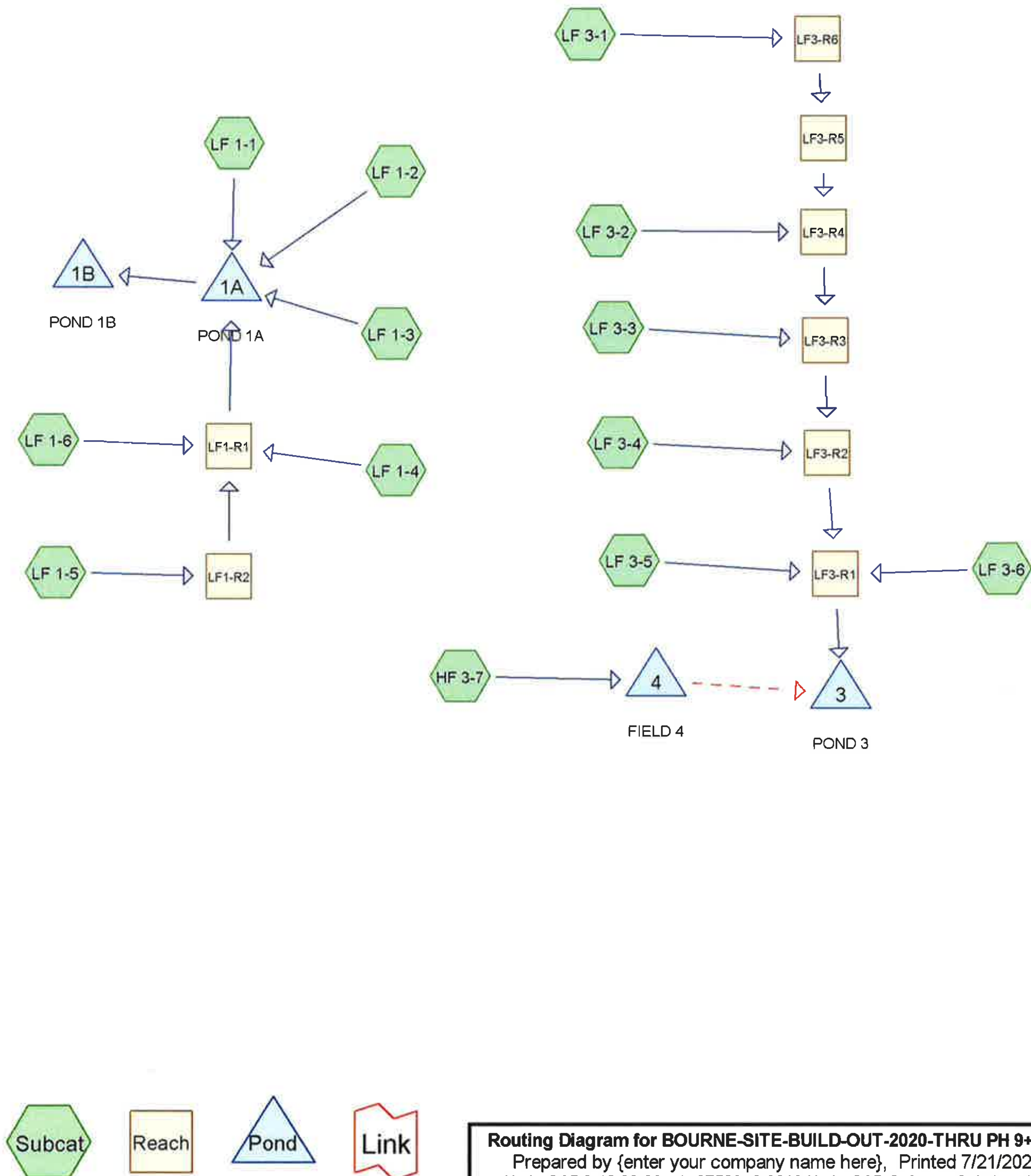
Volume	Invert	Avail.Storage	Storage Description
#1	90.00'	40,362 cf	**100.00'W x 140.00'L x 10.00'H Drainage Field**
			140,000 cf Overall - 39,095 cf Embedded = 100,905 cf x 40.0% Voids
#2	92.00'	31,667 cf	**6.00'D x 8.00'H Vertical Cone/Cylinder** x 140 Inside #1
			39,095 cf Overall - 4.0" Wall Thickness = 31,667 cf
		72,029 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	90.00'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Secondary	98.00'	**18.0" Round Culvert X 4.00**
			L= 300.0' RCP, groove end projecting, Ke= 0.200
			Inlet / Outlet Invert= 98.00' / 96.50' S= 0.0050 '/' Cc= 0.900
			n= 0.010, Flow Area= 1.77 sf

Discarded OutFlow Max=2.68 cfs @ 11.15 hrs HW=90.10' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 2.68 cfs)

Secondary OutFlow Max=8.13 cfs @ 12.49 hrs HW=98.64' (Free Discharge)
↑—**2=Culvert** (Barrel Controls 8.13 cfs @ 4.15 fps)

100 YEAR STORM EVENT



Routing Diagram for BOURNE-SITE-BUILD-OUT-2020-THRU PH 9+LHF
Prepared by {enter your company name here}, Printed 7/21/2020
HydroCAD® 10.00-22 s/n 07502 © 2018 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment HF 3-7: Runoff Area=522,700 sf 46.53% Impervious Runoff Depth>5.01"
Flow Length=500' Slope=0.0100 '/' Tc=4.1 min CN=82 Runoff=72.48 cfs 5.008 af

Subcatchment LF 1-1: Runoff Area=451,000 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=1,800' Tc=9.9 min CN=69 Runoff=37.72 cfs 3.097 af

Subcatchment LF 1-2: Runoff Area=152,500 sf 0.00% Impervious Runoff Depth>3.60"
Flow Length=795' Tc=1.6 min CN=69 Runoff=16.14 cfs 1.049 af

Subcatchment LF 1-3: Runoff Area=253,000 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=990' Tc=9.2 min CN=69 Runoff=21.53 cfs 1.738 af

Subcatchment LF 1-4: Runoff Area=331,400 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=810' Tc=6.9 min CN=69 Runoff=30.65 cfs 2.277 af

Subcatchment LF 1-5: Runoff Area=475,600 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=940' Tc=7.7 min CN=69 Runoff=42.79 cfs 3.268 af

Subcatchment LF 1-6: Runoff Area=486,400 sf 31.87% Impervious Runoff Depth>4.56"
Flow Length=1,200' Slope=0.0375 '/' Tc=5.1 min CN=78 Runoff=59.27 cfs 4.246 af

Subcatchment LF 3-1: Runoff Area=418,600 sf 0.00% Impervious Runoff Depth>3.70"
Flow Length=1,625' Tc=3.0 min CN=70 Runoff=45.35 cfs 2.963 af

Subcatchment LF 3-2: Runoff Area=646,400 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=1,550' Tc=9.6 min CN=69 Runoff=54.48 cfs 4.439 af

Subcatchment LF 3-3: Runoff Area=451,200 sf 2.22% Impervious Runoff Depth>3.70"
Flow Length=855' Tc=6.2 min CN=70 Runoff=43.85 cfs 3.192 af

Subcatchment LF 3-4: Runoff Area=257,600 sf 0.00% Impervious Runoff Depth>3.70"
Flow Length=1,080' Tc=4.6 min CN=70 Runoff=26.22 cfs 1.823 af

Subcatchment LF 3-5: Runoff Area=526,700 sf 16.39% Impervious Runoff Depth>4.13"
Flow Length=625' Tc=0.7 min CN=74 Runoff=66.01 cfs 4.161 af

Subcatchment LF 3-6: Runoff Area=346,000 sf 41.42% Impervious Runoff Depth>4.90"
Flow Length=1,805' Tc=4.3 min CN=81 Runoff=46.66 cfs 3.241 af

Reach LF1-R1: Avg. Flow Depth=2.37' Max Vel=5.36 fps Inflow=116.54 cfs 9.780 af
n=0.033 L=900.0' S=0.0089 '/' Capacity=343.97 cfs Outflow=110.14 cfs 9.752 af

Reach LF1-R2: Avg. Flow Depth=0.96' Max Vel=7.20 fps Inflow=42.79 cfs 3.268 af
n=0.033 L=1,080.0' S=0.0426 '/' Capacity=752.94 cfs Outflow=40.00 cfs 3.257 af

Reach LF3-R1: Avg. Flow Depth=5.00' Max Vel=7.58 fps Inflow=173.23 cfs 19.771 af
60.0" Round Pipe n=0.010 L=430.0' S=0.0015 '/' Capacity=130.62 cfs Outflow=133.13 cfs 19.756 af

Reach LF3-R2: Avg. Flow Depth=3.86' Max Vel=7.60 fps Inflow=127.58 cfs 12.399 af
60.0" Round Pipe n=0.010 L=1,125.0' S=0.0015 '/' Capacity=131.23 cfs Outflow=123.14 cfs 12.370 af

Reach LF3-R3: Avg. Flow Depth=4.00' Max Vel=9.56 fps Inflow=121.16 cfs 10.585 af
48.0" Round Pipe n=0.010 L=540.0' S=0.0032 '/' Capacity=105.39 cfs Outflow=105.39 cfs 10.576 af

Reach LF3-R4: Avg. Flow Depth=3.50' Max Vel=9.30 fps Inflow=91.91 cfs 7.400 af
42.0" Round Pipe n=0.010 L=570.0' S=0.0036 '/' Capacity=79.01 cfs Outflow=82.94 cfs 7.393 af

Reach LF3-R5: Avg. Flow Depth=2.03' Max Vel=8.42 fps Inflow=43.30 cfs 2.962 af
36.0" Round Pipe n=0.010 L=140.0' S=0.0039 '/' Capacity=53.85 cfs Outflow=42.28 cfs 2.961 af

Reach LF3-R6: Avg. Flow Depth=2.15' Max Vel=8.28 fps Inflow=45.35 cfs 2.963 af
36.0" Round Pipe n=0.010 L=247.0' S=0.0036 '/' Capacity=52.05 cfs Outflow=43.30 cfs 2.962 af

Pond 1A: POND 1A Peak Elev=93.78' Storage=106,280 cf Inflow=173.18 cfs 15.636 af
Outflow=150.73 cfs 15.069 af

Pond 1B: POND 1B Peak Elev=90.23' Storage=429,511 cf Inflow=150.73 cfs 15.069 af
Outflow=7.37 cfs 7.821 af

Pond 3: POND 3 Peak Elev=92.27' Storage=581,596 cf Inflow=161.26 cfs 21.139 af
Outflow=10.88 cfs 11.850 af

Pond 4: FIELD 4 Peak Elev=99.43' Storage=67,729 cf Inflow=72.48 cfs 5.008 af
Discarded=2.68 cfs 3.334 af Secondary=30.64 cfs 1.383 af Outflow=33.32 cfs 4.717 af

Total Runoff Area = 122.110 ac Runoff Volume = 40.502 af Average Runoff Depth = 3.98"
88.01% Pervious = 107.468 ac 11.99% Impervious = 14.642 ac

Summary for Subcatchment HF 3-7:

Runoff = 72.48 cfs @ 12.06 hrs, Volume= 5.008 af, Depth> 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
243,200	98	Paved roads w/curbs & sewers, HSG B
279,500	69	50-75% Grass cover, Fair, HSG B
522,700	82	Weighted Average
279,500		53.47% Pervious Area
243,200		46.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	500	0.0100	2.03		**Shallow Concentrated Flow, PAVED SURFACE** Paved Kv= 20.3 fps

Summary for Subcatchment LF 1-1:

Runoff = 37.72 cfs @ 12.14 hrs, Volume= 3.097 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
405,100	69	50-75% Grass cover, Fair, HSG B
45,900	72	Dirt roads, HSG A
451,000	69	Weighted Average
451,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
1.6	150	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.7	165	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.5	355	0.0620	12.39	266.47	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.033
0.1	130	0.3300	23.27	488.59	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.028
2.1	950	0.0150	7.61	91.34	**Channel Flow, DRAINAGE SWALE** Area= 12.0 sf Perim= 10.0' r= 1.20' n= 0.027
9.9	1,800	Total			

Summary for Subcatchment LF 1-2:

Runoff = 16.14 cfs @ 12.03 hrs, Volume= 1.049 af, Depth> 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
152,500	69	50-75% Grass cover, Fair, HSG B
152,500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	190	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.6	410	0.0300	10.54	226.55	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.2	195	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
1.6	795	Total			

Summary for Subcatchment LF 1-3:

Runoff = 21.53 cfs @ 12.14 hrs, Volume= 1.738 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
253,000	69	50-75% Grass cover, Fair, HSG B
253,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
3.8	360	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	200	0.0500	13.60	292.48	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.3	380	0.2900	18.51	388.62	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
9.2	990	Total			

Summary for Subcatchment LF 1-4:

Runoff = 30.65 cfs @ 12.10 hrs, Volume= 2.277 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
331,400	69	50-75% Grass cover, Fair, HSG B
331,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
1.4	130	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.4	340	0.0500	13.60	292.48	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.2	290	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
6.9	810	Total			

Summary for Subcatchment LF 1-5:

Runoff = 42.79 cfs @ 12.11 hrs, Volume= 3.268 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
475,600	69	50-75% Grass cover, Fair, HSG B
475,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
1.5	145	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.3	75	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.9	600	0.0500	11.13	239.30	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.033
0.1	70	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
7.7	940	Total			

Summary for Subcatchment LF 1-6:

Runoff = 59.27 cfs @ 12.08 hrs, Volume= 4.246 af, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
331,400	69	50-75% Grass cover, Fair, HSG B
155,000	98	Paved parking, HSG A
486,400	78	Weighted Average
331,400		68.13% Pervious Area
155,000		31.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	1,200	0.0375	3.93		**Shallow Concentrated Flow, ACCESS ROAD** Paved Kv= 20.3 fps

Summary for Subcatchment LF 3-1:

Runoff = 45.35 cfs @ 12.05 hrs, Volume= 2.963 af, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
268,600	69	50-75% Grass cover, Fair, HSG B
150,000	72	Dirt roads, HSG A
418,600	70	Weighted Average
418,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	180	0.2400	3.43		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.5	440	0.0540	14.14	303.95	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.1	90	0.2330	16.59	348.34	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
1.5	915	0.0076	9.98	479.05	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
3.0	1,625	Total			

Summary for Subcatchment LF 3-2:

Runoff = 54.48 cfs @ 12.14 hrs, Volume= 4.439 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
586,000	69	50-75% Grass cover, Fair, HSG B
60,400	72	Dirt roads, HSG A
646,400	69	Weighted Average
646,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
3.7	350	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.3	80	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	155	0.0500	13.60	292.48	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.5	900	0.0710	30.50	1,464.22	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
0.0	15	0.2000	20.29	15.93	**Pipe Channel, DRAIN PIPE** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
9.6	1,550	Total			

Summary for Subcatchment LF 3-3:

Runoff = 43.85 cfs @ 12.10 hrs, Volume= 3.192 af, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
388,200	69	50-75% Grass cover, Fair, HSG B
53,000	72	Dirt roads, HSG A
10,000	98	Paved parking & roofs
451,200	70	Weighted Average
441,200		97.78% Pervious Area
10,000		2.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.0500	0.17		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
0.5	50	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.6	530	0.0500	13.60	292.48	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.2	225	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
6.2	855	Total			

Summary for Subcatchment LF 3-4:

Runoff = 26.22 cfs @ 12.07 hrs, Volume= 1.823 af, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
211,400	69	50-75% Grass cover, Fair, HSG B
46,200	72	Dirt roads, HSG A
257,600	70	Weighted Average
257,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	30	0.0500	0.15		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
0.5	400	0.0500	13.60	292.48	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.3	300	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
0.5	350	0.0110	12.01	576.33	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
4.6	1,080	Total			

Summary for Subcatchment LF 3-5:

Runoff = 66.01 cfs @ 12.01 hrs, Volume= 4.161 af, Depth> 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
440,400	69	50-75% Grass cover, Fair, HSG B
86,300	98	Paved parking, HSG A
526,700	74	Weighted Average
440,400		83.61% Pervious Area
86,300		16.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	60	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	200	0.0500	13.57	298.54	**Channel Flow, DIVERSION BERM** Area= 22.0 sf Perim= 19.0' r= 1.16' n= 0.027
0.2	245	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
0.1	120	0.0330	20.80	998.24	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
0.7	625	Total			

Summary for Subcatchment LF 3-6:

Runoff = 46.66 cfs @ 12.06 hrs, Volume= 3.241 af, Depth> 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.10"

Area (sf)	CN	Description
202,700	69	50-75% Grass cover, Fair, HSG B
143,300	98	Paved parking & roofs
346,000	81	Weighted Average
202,700		58.58% Pervious Area
143,300		41.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	50	0.3300	0.36		**Sheet Flow, SIDESLOPE FLOW** Grass: Short n= 0.150 P2= 2.00"
0.3	205	0.0500	13.57	298.54	**Channel Flow, DIVERSION BERM** Area= 22.0 sf Perim= 19.0' r= 1.16' n= 0.027
1.1	910	0.0150	14.02	673.01	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
0.6	640	0.0220	16.98	815.06	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
4.3	1,805	Total			

Summary for Reach LF1-R1:

Inflow Area = 29.692 ac, 11.98% Impervious, Inflow Depth > 3.95" for 100 Year Storm event
Inflow = 116.54 cfs @ 12.11 hrs, Volume= 9.780 af
Outflow = 110.14 cfs @ 12.19 hrs, Volume= 9.752 af, Atten= 5%, Lag= 5.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.36 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.94 fps, Avg. Travel Time= 7.7 min

Peak Storage= 18,594 cf @ 12.15 hrs
Average Depth at Peak Storage= 2.37'
Bank-Full Depth= 4.00' Flow Area= 48.0 sf, Capacity= 343.97 cfs

4.00' x 4.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 20.00'
Length= 900.0' Slope= 0.0089 '/'
Inlet Invert= 98.00', Outlet Invert= 90.00'

Summary for Reach LF1-R2:

Inflow Area = 10.918 ac, 0.00% Impervious, Inflow Depth > 3.59" for 100 Year Storm event
Inflow = 42.79 cfs @ 12.11 hrs, Volume= 3.268 af
Outflow = 40.00 cfs @ 12.19 hrs, Volume= 3.257 af, Atten= 7%, Lag= 4.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.20 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 2.45 fps, Avg. Travel Time= 7.4 min

Peak Storage= 6,096 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.96'
Bank-Full Depth= 4.00' Flow Area= 48.0 sf, Capacity= 752.94 cfs

4.00' x 4.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 20.00'
Length= 1,080.0' Slope= 0.0426 '/'
Inlet Invert= 144.00', Outlet Invert= 98.00'

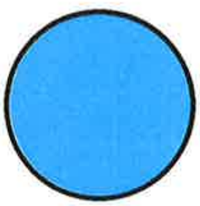
Summary for Reach LF3-R1:

Inflow Area = 60.755 ac, 9.05% Impervious, Inflow Depth > 3.91" for 100 Year Storm event
Inflow = 173.23 cfs @ 12.15 hrs, Volume= 19.771 af
Outflow = 133.13 cfs @ 12.06 hrs, Volume= 19.756 af, Atten= 23%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.58 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 3.36 fps, Avg. Travel Time= 2.1 min

Peak Storage= 8,443 cf @ 12.05 hrs
Average Depth at Peak Storage= 5.00'
Bank-Full Depth= 5.00' Flow Area= 19.6 sf, Capacity= 130.62 cfs

60.0" Round Pipe
n= 0.010
Length= 430.0' Slope= 0.0015 '/'
Inlet Invert= 90.60', Outlet Invert= 89.96'



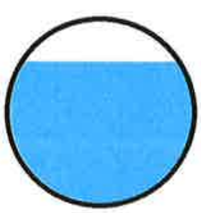
Summary for Reach LF3-R2:

Inflow Area =	40.721 ac,	0.56% Impervious, Inflow Depth >	3.65"	for 100 Year Storm event
Inflow =	127.58 cfs @	12.12 hrs, Volume=	12.399 af	
Outflow =	123.14 cfs @	12.22 hrs, Volume=	12.370 af,	Atten= 3%, Lag= 6.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.60 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 3.26 fps, Avg. Travel Time= 5.7 min

Peak Storage= 18,295 cf @ 12.17 hrs
Average Depth at Peak Storage= 3.86'
Bank-Full Depth= 5.00' Flow Area= 19.6 sf, Capacity= 131.23 cfs

60.0" Round Pipe
n= 0.010
Length= 1,125.0' Slope= 0.0015 '/'
Inlet Invert= 92.33', Outlet Invert= 90.64'



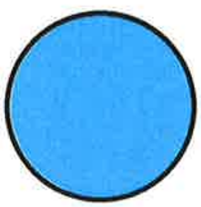
Summary for Reach LF3-R3:

Inflow Area = 34.807 ac, 0.66% Impervious, Inflow Depth > 3.65" for 100 Year Storm event
Inflow = 121.16 cfs @ 12.11 hrs, Volume= 10.585 af
Outflow = 105.39 cfs @ 12.15 hrs, Volume= 10.576 af, Atten= 13%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.56 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 4.16 fps, Avg. Travel Time= 2.2 min

Peak Storage= 6,786 cf @ 12.10 hrs
Average Depth at Peak Storage= 4.00'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 105.39 cfs

48.0" Round Pipe
n= 0.010
Length= 540.0' Slope= 0.0032 '/'
Inlet Invert= 95.05', Outlet Invert= 93.33'



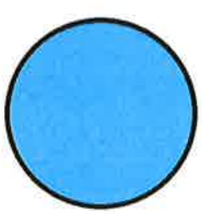
Summary for Reach LF3-R4:

Inflow Area = 24.449 ac, 0.00% Impervious, Inflow Depth > 3.63" for 100 Year Storm event
Inflow = 91.91 cfs @ 12.11 hrs, Volume= 7.400 af
Outflow = 82.94 cfs @ 12.19 hrs, Volume= 7.393 af, Atten= 10%, Lag= 5.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.30 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 4.00 fps, Avg. Travel Time= 2.4 min

Peak Storage= 5,622 cf @ 12.13 hrs
Average Depth at Peak Storage= 3.50'
Bank-Full Depth= 3.50' Flow Area= 9.6 sf, Capacity= 79.01 cfs

42.0" Round Pipe
n= 0.010
Length= 570.0' Slope= 0.0036 '/'
Inlet Invert= 97.56', Outlet Invert= 95.48'



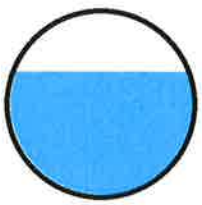
Summary for Reach LF3-R5:

Inflow Area = 9.610 ac, 0.00% Impervious, Inflow Depth > 3.70" for 100 Year Storm event
Inflow = 43.30 cfs @ 12.07 hrs, Volume= 2.962 af
Outflow = 42.28 cfs @ 12.07 hrs, Volume= 2.961 af, Atten= 2%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.42 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.19 fps, Avg. Travel Time= 0.7 min

Peak Storage= 712 cf @ 12.07 hrs
Average Depth at Peak Storage= 2.03'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 53.85 cfs

36.0" Round Pipe
n= 0.010
Length= 140.0' Slope= 0.0039 '/'
Inlet Invert= 98.55', Outlet Invert= 98.01'



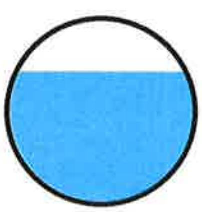
Summary for Reach LF3-R6:

Inflow Area = 9.610 ac, 0.00% Impervious, Inflow Depth > 3.70" for 100 Year Storm event
Inflow = 45.35 cfs @ 12.05 hrs, Volume= 2.963 af
Outflow = 43.30 cfs @ 12.07 hrs, Volume= 2.962 af, Atten= 5%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.28 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.12 fps, Avg. Travel Time= 1.3 min

Peak Storage= 1,337 cf @ 12.06 hrs
Average Depth at Peak Storage= 2.15'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 52.05 cfs

36.0" Round Pipe
n= 0.010
Length= 247.0' Slope= 0.0036 '/'
Inlet Invert= 99.34', Outlet Invert= 98.45'



Summary for Pond 1A: POND 1A

Inflow Area = 49.355 ac, 7.21% Impervious, Inflow Depth > 3.80" for 100 Year Storm event
Inflow = 173.18 cfs @ 12.17 hrs, Volume= 15.636 af
Outflow = 150.73 cfs @ 12.27 hrs, Volume= 15.069 af, Atten= 13%, Lag= 5.9 min
Primary = 150.73 cfs @ 12.27 hrs, Volume= 15.069 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Starting Elev= 82.00' Surf.Area= 2,000 sf Storage= 3,000 cf
Peak Elev= 93.78' @ 12.27 hrs Surf.Area= 46,036 sf Storage= 106,280 cf (103,280 cf above start)
Flood Elev= 93.50' Surf.Area= 16,300 sf Storage= 94,325 cf (91,325 cf above start)

Plug-Flow detention time= 39.4 min calculated for 15.000 af (96% of inflow)
Center-of-Mass det. time= 15.6 min (847.9 - 832.3)

Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	115,875 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
80.00	1,000	0	0
82.00	2,000	3,000	3,000
84.00	3,850	5,850	8,850
86.00	5,800	9,650	18,500
88.00	7,850	13,650	32,150
90.00	9,850	17,700	49,850
92.00	12,800	22,650	72,500
93.50	16,300	21,825	94,325
94.00	69,900	21,550	115,875

Device	Routing	Invert	Outlet Devices
#1	Primary	87.00'	**18.0" Round Culvert X 4.00** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 87.00' / 86.00' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Primary	93.50'	**170.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=143.78 cfs @ 12.27 hrs HW=93.76' (Free Discharge)
1=Culvert (Inlet Controls 83.43 cfs @ 11.80 fps)
2=Broad-Crested Rectangular Weir (Weir Controls 60.35 cfs @ 1.37 fps)

Summary for Pond 1B: POND 1B

Inflow Area = 49.355 ac, 7.21% Impervious, Inflow Depth > 3.66" for 100 Year Storm event
Inflow = 150.73 cfs @ 12.27 hrs, Volume= 15.069 af
Outflow = 7.37 cfs @ 16.42 hrs, Volume= 7.821 af, Atten= 95%, Lag= 249.2 min
Discarded = 7.37 cfs @ 16.42 hrs, Volume= 7.821 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Starting Elev= 74.00' Surf.Area= 12,000 sf Storage= 36,600 cf
Peak Elev= 90.23' @ 16.42 hrs Surf.Area= 38,485 sf Storage= 429,511 cf (392,911 cf above start)
Flood Elev= 93.50' Surf.Area= 63,075 sf Storage= 585,175 cf (548,575 cf above start)

Plug-Flow detention time= 344.4 min calculated for 6.966 af (46% of inflow)
Center-of-Mass det. time= 130.1 min (977.9 - 847.9)

Volume	Invert	Avail.Storage	Storage Description
#1	70.00'	613,300 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.00	5,900	0	0
72.00	9,350	15,250	15,250
74.00	12,000	21,350	36,600
76.00	14,750	26,750	63,350
78.00	17,500	32,250	95,600
80.00	20,400	37,900	133,500
82.00	23,500	43,900	177,400
84.00	26,800	50,300	227,700
86.00	30,150	56,950	284,650
88.00	33,750	63,900	348,550
90.00	37,950	71,700	420,250
92.00	42,600	80,550	500,800
94.00	69,900	112,500	613,300

Device	Routing	Invert	Outlet Devices
#1	Discarded	70.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=7.37 cfs @ 16.42 hrs HW=90.23' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 7.37 cfs)

Summary for Pond 3: POND 3

Inflow Area = 60.755 ac, 9.05% Impervious, Inflow Depth > 4.18" for 100 Year Storm event
Inflow = 161.26 cfs @ 12.22 hrs, Volume= 21.139 af
Outflow = 10.88 cfs @ 15.86 hrs, Volume= 11.850 af, Atten= 93%, Lag= 217.9 min
Discarded = 10.88 cfs @ 15.86 hrs, Volume= 11.850 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Starting Elev= 80.00' Surf.Area= 30,000 sf Storage= 31,000 cf
Peak Elev= 92.27' @ 15.86 hrs Surf.Area= 56,855 sf Storage= 581,596 cf (550,596 cf above start)
Flood Elev= 106.00' Surf.Area= 92,000 sf Storage= 1,576,400 cf (1,545,400 cf above start)

Plug-Flow detention time= 329.1 min calculated for 11.138 af (53% of inflow)
Center-of-Mass det. time= 163.1 min (990.5 - 827.3)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	1,576,400 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.00	1,000	0	0
80.00	30,000	31,000	31,000
90.00	51,300	406,500	437,500
100.00	75,800	635,500	1,073,000
106.00	92,000	503,400	1,576,400

Device	Routing	Invert	Outlet Devices
#1	Discarded	78.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=10.88 cfs @ 15.86 hrs HW=92.27' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 10.88 cfs)

Summary for Pond 4: FIELD 4

Inflow Area = 12.000 ac, 46.53% Impervious, Inflow Depth > 5.01" for 100 Year Storm event
Inflow = 72.48 cfs @ 12.06 hrs, Volume= 5.008 af
Outflow = 33.32 cfs @ 12.22 hrs, Volume= 4.717 af, Atten= 54%, Lag= 9.8 min
Discarded = 2.68 cfs @ 10.50 hrs, Volume= 3.334 af
Secondary = 30.64 cfs @ 12.22 hrs, Volume= 1.383 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 99.43' @ 12.22 hrs Surf.Area= 14,000 sf Storage= 67,729 cf

Plug-Flow detention time= 152.4 min calculated for 4.707 af (94% of inflow)
Center-of-Mass det. time= 121.1 min (921.5 - 800.4)

Volume	Invert	Avail.Storage	Storage Description
#1	90.00'	40,362 cf	**100.00'W x 140.00'L x 10.00'H Drainage Field** 140,000 cf Overall - 39,095 cf Embedded = 100,905 cf x 40.0% Voids
#2	92.00'	31,667 cf	**6.00'D x 8.00'H Vertical Cone/Cylinder** x 140 Inside #1 39,095 cf Overall - 4.0" Wall Thickness = 31,667 cf
		72,029 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	90.00'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Secondary	98.00'	**18.0" Round Culvert X 4.00** L= 300.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 98.00' / 96.50' S= 0.0050 '/' Cc= 0.900 n= 0.010, Flow Area= 1.77 sf

Discarded OutFlow Max=2.68 cfs @ 10.50 hrs HW=90.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.68 cfs)

Secondary OutFlow Max=29.70 cfs @ 12.22 hrs HW=99.40' (Free Discharge)
└─**2=Culvert** (Barrel Controls 29.70 cfs @ 5.61 fps)

APPENDIX 3

TOTAL SUSPENDED SOLIDS REMOVAL CALCULATION WORKSHEET

TSS Removal Calculation Worksheet

Total Suspended Solid Removal Calculation Worksheet
Stormwater Basin No. 1

Location: *Town of Bourne ISWM - Bourne Landfill*
Bourne, MA

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BxC)	E Remaining Load (C-D)
Water Quality Swale	70%	1.00*	0.700	0.300
Fore Bay	25%	0.300	0.075	0.225
Infiltration Basin (Pre-Treatment)	80%	0.225	0.180	0.045

Total TSS Removal= 95.5%

Project: Full Buildout Scenario Landfill Expansion

Prepared By: ARQ

Date: 7/21/2020

* Equals remaining load from previous BMP (E) which enters the BMP

TSS Removal Calculation Worksheet

Total Suspended Solid Removal Calculation Worksheet
Stormwater Basin No. 3

Location: *Town of Bourne ISWM - Bourne Landfill*
Bourne, MA

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BxC)	E Remaining Load (C-D)
Water Quality Swale	70%	1.00*	0.700	0.300
Infiltration Basin (Pre-Treatment)	80%	0.300	0.240	0.060

Total TSS Removal= 94.0%

Project: Full Buildout Scenario Landfill Expansion

Prepared By: ARQ

Date: 7/21/2020

* Equals remaining load from previous BMP (E) which enters the BMP

Total Suspended Solid Removal Calculation Worksheet
Infiltration Basin No. 4

Location: *Town of Bourne ISWM - Bourne Landfill*
Bourne, MA

TSS Removal Calculation Worksheet

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BxC)	E Remaining Load (C-D)
Rain Garden	90%	1.00*	0.900	0.100
Infiltration Basin (Pre-Treatment)	80%	0.100	0.080	0.020

Total TSS Removal= 98.0%

Project: Full Buildout Scenario Landfill Expansion

Prepared By: ARQ

Date: 7/21/2020

* Equals remaining load from previous BMP (E) which enters the BMP

APPENDIX 4

STORMWATER MANAGEMENT EXCERPTS FROM THE FACILITY'S OPERATION & MAINTENANCE PLAN

6.0 STORM WATER MANAGEMENT

6.1 Active Area Controls

Storm water management in active landfill areas requires that intermediate operations ensure that run-off, which has contacted solid waste (contact run-off), does not mix with non-contact run-off. The following are the storm water management measures that are to be taken in landfill areas that have not been furnished with final cover.

Non-Contact Run-off
Non-contact run-off is the storm water run-off from the active portion of the Landfill, which has had no contact with landfilled waste or daily cover materials. This run-off should be directed away from the active landfill face by grading the surfaces of the Landfill to direct runoff away from uncovered waste. Active areas in the central portion of the Landfill should be provided with temporary surface swales to allow non-contact run-off to move to the perimeter of the Landfill. Runoff will then be directed to the stormwater retention basins via drainage swales around the Landfill perimeter.

Side Slope Drainage
Landfill side slopes will have intermediate cover placed as they reach their subgrade elevations. Storm water runoff from side slopes will flow to drainage swales (constructed along the side slopes), that direct the runoff to let-down channels. The let-down channels empty into swales at the base of the side slopes, which carry the water to retention basins. As landfill operations get progressively higher in elevation, side slopes will be provided with a quick-growing vegetative cover to slow run-off and minimize erosion. Areas experiencing repeated erosion problems will be covered with mulch and/or provided with hay bales and/or siltation fences installed perpendicular to the slope to further slow run-off and reduce erosion.

Top Slope Drainage
Top slope areas in the active portion of the Landfill will be graded to drain away from the active landfill face. Normally, intermediate grades of two to five percent are adequate to ensure that ponding and excess infiltration of storm water into the Landfill is avoided. Top slopes that have reached final elevations will be graded at a minimum of five percent. Intermediate and final top slopes will be shaped and groomed to prevent the concentrated flow of run-off to one location, unless a means is available to prevent erosion.

Contact Run-off
Contact run-off is the fraction of run-off that has had direct contact with waste or daily cover materials. This runoff will be collected in the Landfill leachate collection and removal system. The active face is graded to direct run-off to a central location, near the active face, where the run-off can infiltrate to the leachate collection system

6.2 Completed Area Controls

Once landfilled areas have reached final grades, the final cover system will be constructed to serve as an infiltration barrier to minimize further leachate production from the Landfill. The final cover system for the Landfill includes the following storm water control components:

- Permanent vegetative cover will be established on all surfaces of the final cover. A seed mixture of grasses suitable for the application should be used.
- Permanent earthen diversion berms, lined with erosion mat, will be installed on the final cover to divert slope run-off to let-down channels. The berms will be used to reduce unmanaged sheet flow and, thereby, minimize slope erosion. Sub-drains will be constructed beneath the berm within the drainage layer to intercept flow and discharge it into the let-down channels.
- Permanent stone-lined, side slope let-down channels will be constructed to capture run-off from several diversion berms and subdrains and direct the run-off to the existing swales and sedimentation basins along the perimeter of the landfill.

All final cover runoff will be diverted, via drainage swales and interceptor drainage piping, into the two main storm water sedimentation basins. The storm water control system will be constructed prior to the operation of the Landfill.

ATTACHMENT 8

GREENHOUSE GAS CALCULATIONS

Figure 1
Measured and Predicted Quantities of LFG Collected from the Landfill

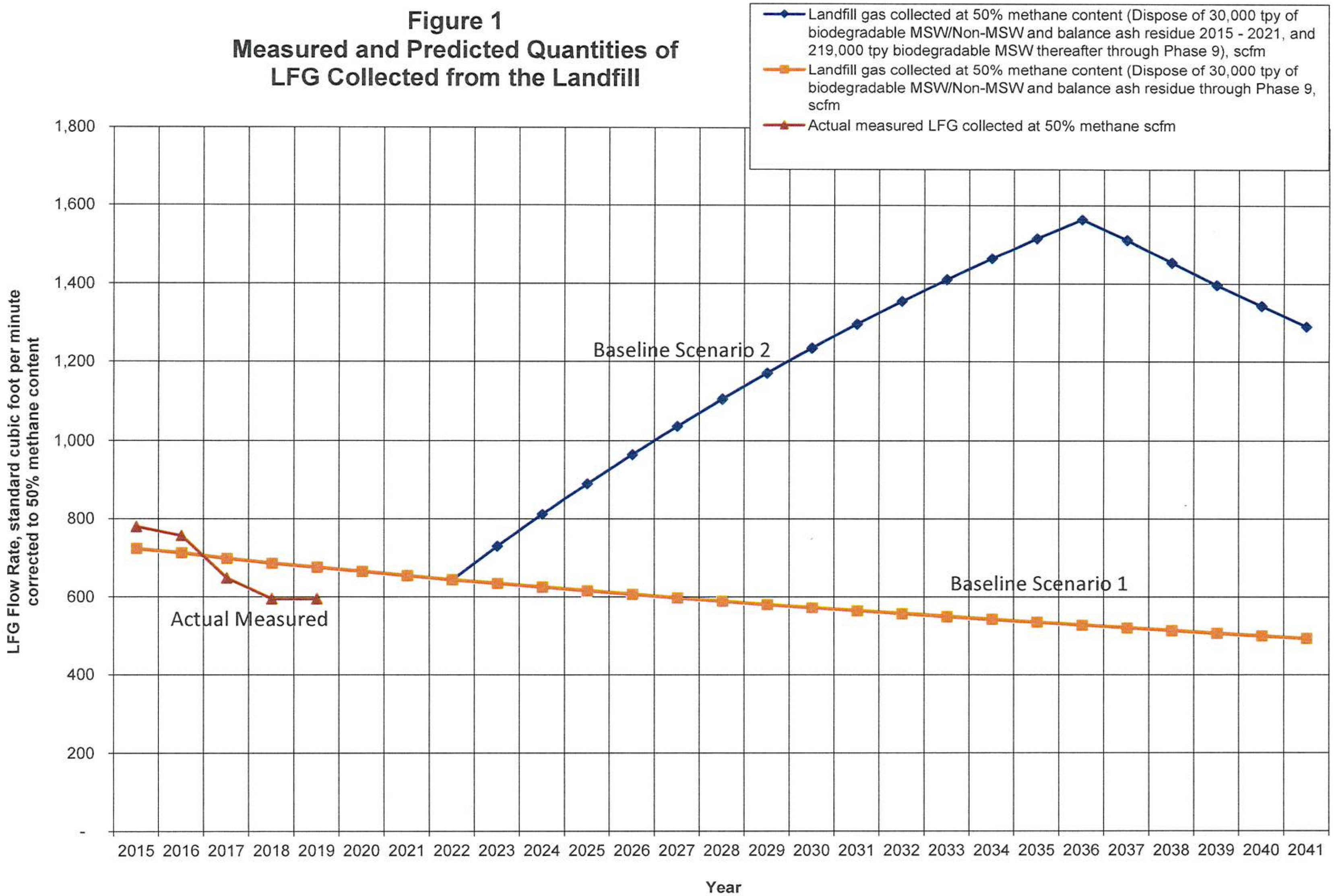
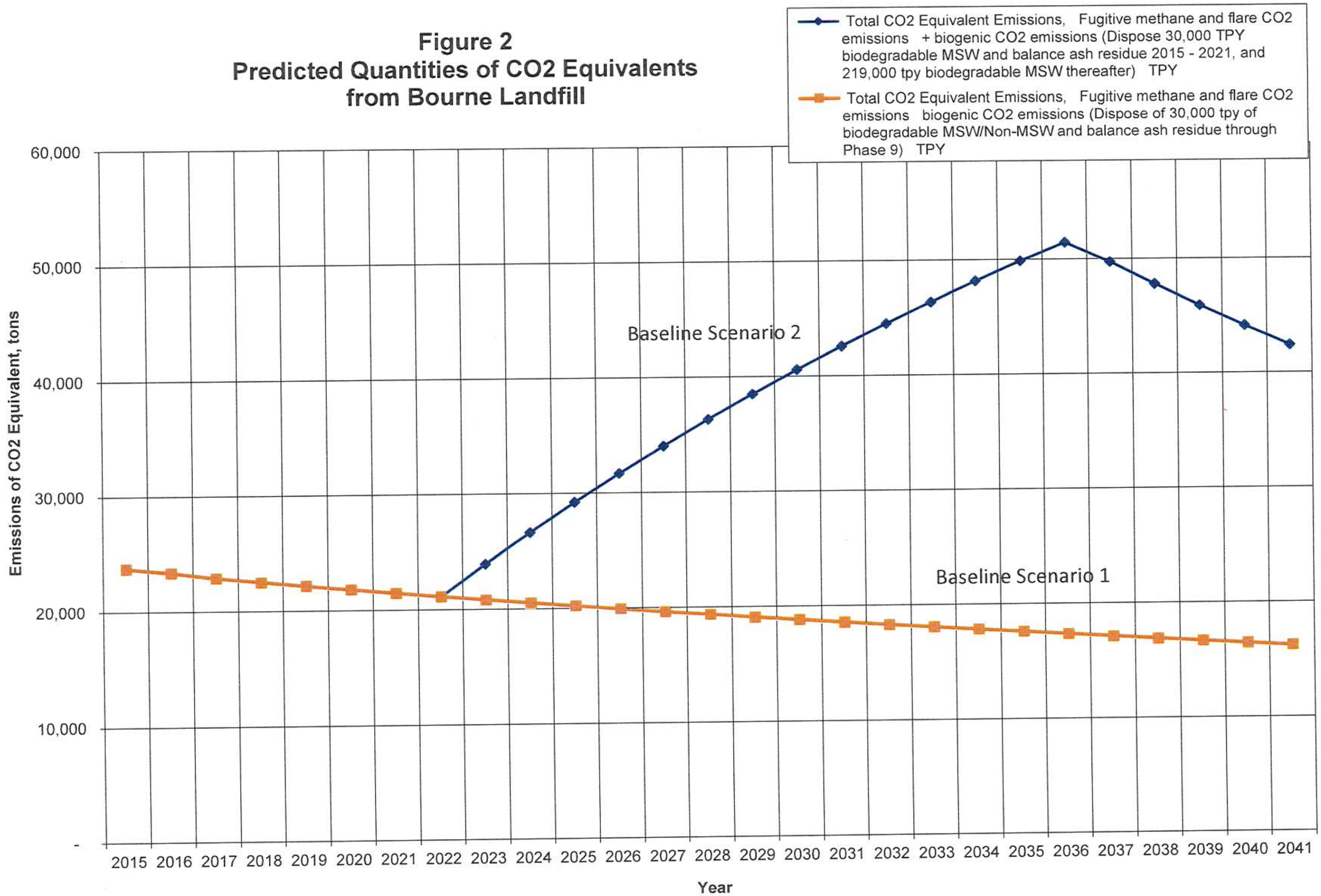


Figure 2
Predicted Quantities of CO2 Equivalents from Bourne Landfill



GHG Emissions CO2e, tons

Year	Scenario 1		Scenario 2
2021	21,444		21,444
2022	21,108		21,108
2023	20,785		23,920
2024	20,474		26,618
2025	20,175		29,208
2026	19,865		31,671
2027	19,566		34,034
2028	19,278		36,302
2029	19,000		38,478
2030	18,732		40,565
2031	18,474		42,568
2032	18,225		44,490
2033	17,984		46,333
2034	17,752		48,102
2035	17,528		49,799
2036	17,283		51,397
2037	17,047		49,687
2038	16,819		47,749
2039	16,599		45,888
2040	16,386		44,100
2041	16,182		42,383
	390,706		**815,844**

BOURNE LANDFILL
BASELINE SCENARIO 1 GHG EMISSIONS

					A.			B.	A + B	Proposed Case
	LFG Produced		Fugitive Emissions @ 5% loss			Emissions from flare combustion				Harvest Power
	Methane	CO2	Methane	CO2	CO2e	CO2 from methane combustion	CO2 in LFG	CO2e	GHG Emissions CO2e	GHG Emissions CO2e reductions
Year	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons *
2015	4,247	8,184	212	409	4,868	11,095	7,775	18,870	23,738	
2016	4,180	8,055	209	403	4,792	10,921	7,653	18,573	23,365	
2017	4,095	7,891	205	395	4,694	10,698	7,497	18,195	22,890	
2018	4,022	7,750	201	388	4,610	10,507	7,363	17,869	22,479	(27,663)
2019	3,964	7,639	198	382	4,544	10,356	7,257	17,612	22,156	(27,663)
2020	3,899	7,514	195	376	4,470	10,186	7,138	17,324	21,793	(27,663)
2021	3,836	7,393	192	370	4,398	10,023	7,023	17,046	21,444	(27,663)
2022	3,776	7,277	189	364	4,329	9,866	6,913	16,779	21,108	(27,663)
2023	3,719	7,166	186	358	4,263	9,715	6,808	16,522	20,785	(27,663)
2024	3,663	7,059	183	353	4,199	9,570	6,706	16,275	20,474	(27,663)
2025	3,609	6,956	180	348	4,138	9,430	6,608	16,038	20,175	(27,663)
2026	3,554	6,849	178	342	4,074	9,285	6,506	15,791	19,865	(27,663)
2027	3,501	6,746	175	337	4,013	9,145	6,408	15,553	19,566	(27,663)
2028	3,449	6,646	172	332	3,954	9,010	6,314	15,324	19,278	(27,663)
2029	3,399	6,551	170	328	3,897	8,881	6,223	15,104	19,000	(27,663)
2030	3,351	6,458	168	323	3,842	8,755	6,135	14,890	18,732	(27,663)
2031	3,305	6,369	165	318	3,789	8,634	6,051	14,685	18,474	(27,663)
2032	3,260	6,283	163	314	3,738	8,518	5,969	14,487	18,225	(27,663)
2033	3,217	6,200	161	310	3,688	8,406	5,890	14,296	17,984	(27,663)
2034	3,176	6,120	159	306	3,641	8,297	5,814	14,111	17,752	(27,663)
2035	3,136	6,043	157	302	3,595	8,193	5,741	13,934	17,528	(27,663)
2036	3,092	5,959	155	298	3,545	8,078	5,661	13,739	17,283	(27,663)
2037	3,050	5,877	152	294	3,496	7,967	5,583	13,551	17,047	(27,663)
2038	3,009	5,798	150	290	3,449	7,861	5,508	13,369	16,819	(27,663)
2039	2,970	5,723	148	286	3,404	7,758	5,436	13,194	16,599	(27,663)
2040	2,932	5,649	147	282	3,361	7,659	5,367	13,026	16,386	(27,663)
2041	2,895	5,579	145	279	3,319	7,563	5,300	12,863	16,182	(27,663)

Dispose of 30,000 tpy of biodegradable MSW/Non-MSW and balance ash residue 2015 - 2041 at the permit limits.

* - 2015 Locational Marginal Unit (LMU) Marginal CO2 Emission Rate was 1,036 lb/MWhr. Annual renewable power output projected of 53,261 MWhr.

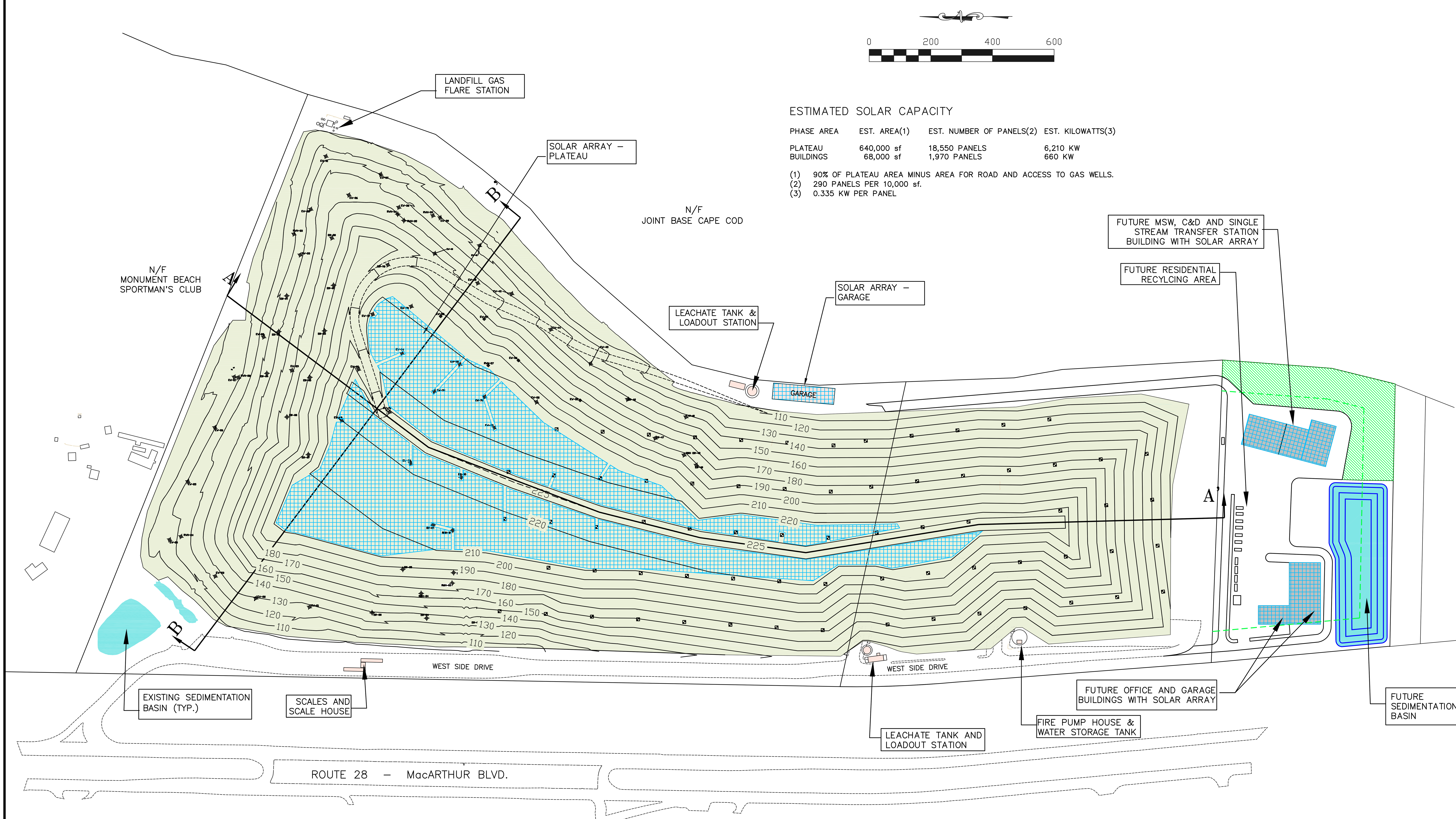
BOURNE LANDFILL

BASELINE SCENARIO 2 GHG EMISSIONS

					A.			B.	A + B	Proposed Case
	LFG Produced		Fugitive Emissions @ 5% loss			Emissions from flare combustion				Harvest Power
	Methane	CO2	Methane	CO2	CO2e	CO2 from methane combustion	CO2 in LFG	CO2e	GHG Emissions CO2e	GHG Emissions CO2e reductions
Year	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons *
2015	4,247	8,184	212	409	4,868	11,095	7,775	18,870	23,738	
2016	4,180	8,055	209	403	4,792	10,921	7,653	18,573	23,365	
2017	4,095	7,891	205	395	4,694	10,698	7,497	18,195	22,890	
2018	4,022	7,750	201	388	4,610	10,507	7,363	17,869	22,479	(27,663)
2019	3,964	7,639	198	382	4,544	10,356	7,257	17,612	22,156	(27,663)
2020	3,899	7,514	195	376	4,470	10,186	7,138	17,324	21,793	(27,663)
2021	3,836	7,393	192	370	4,398	10,023	7,023	17,046	21,444	(27,663)
2022	3,776	7,277	189	364	4,329	9,866	6,913	16,779	21,108	(27,663)
2023	4,279	8,247	214	412	4,906	11,180	7,834	19,014	23,920	(27,663)
2024	4,762	9,177	238	459	5,459	12,441	8,718	21,159	26,618	(27,663)
2025	5,225	10,070	261	503	5,990	13,651	9,566	23,218	29,208	(27,663)
2026	5,666	10,919	283	546	6,495	14,803	10,373	25,176	31,671	(27,663)
2027	6,089	11,734	304	587	6,980	15,907	11,147	27,054	34,034	(27,663)
2028	6,495	12,516	325	626	7,445	16,967	11,890	28,857	36,302	(27,663)
2029	6,884	13,266	344	663	7,891	17,984	12,602	30,586	38,478	(27,663)
2030	7,257	13,985	363	699	8,319	18,960	13,286	32,246	40,565	(27,663)
2031	7,616	14,676	381	734	8,730	19,896	13,942	33,838	42,568	(27,663)
2032	7,959	15,338	398	767	9,124	20,794	14,571	35,365	44,490	(27,663)
2033	8,289	15,974	414	799	9,502	21,656	15,175	36,831	46,333	(27,663)
2034	8,606	16,584	430	829	9,865	22,482	15,754	38,237	48,102	(27,663)
2035	8,909	17,169	445	858	10,213	23,275	16,310	39,585	49,799	(27,663)
2036	9,195	17,720	460	886	10,541	24,022	16,834	40,856	51,397	(27,663)
2037	8,889	17,130	444	857	10,190	23,223	16,274	39,497	49,687	(27,663)
2038	8,543	16,462	427	823	9,793	22,318	15,639	37,957	47,749	(27,663)
2039	8,210	15,820	410	791	9,411	21,448	15,029	36,477	45,888	(27,663)
2040	7,890	15,204	394	760	9,044	20,612	14,444	35,056	44,100	(27,663)
2041	7,583	14,612	379	731	8,692	19,809	13,881	33,691	42,383	(27,663)

Dispose of 30,000 tons per year of biodegradable MSW from 2015 to 2021 and 219,000 tons per year of biodegradable MSW thereafter until 2036 at the permit limits.

* - 2015 Locational Marginal Unit (LMU) Marginal CO2 Emission Rate was 1,036 lb/MWhr. Annual renewable power output projected of 53,261 MWhr.



ESTIMATED SOLAR CAPACITY

PHASE AREA	EST. AREA(1)	EST. NUMBER OF PANELS(2)	EST. KILOWATTS(3)
PLATEAU	640,000 sf	18,550 PANELS	6,210 KW
BUILDINGS	68,000 sf	1,970 PANELS	660 KW

(1) 90% OF PLATEAU AREA MINUS AREA FOR ROAD AND ACCESS TO GAS WELLS.
(2) 290 PANELS PER 10,000 sf.
(3) 0.335 KW PER PANEL

scale: AS SHOWN
date: JULY 27, 2020
drawn: ARQ
checked: ARQ
approved:
drawing number:

project: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY

client: BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: FIGURE 11 SOLAR ARRAY PLAN

SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319-0100
FAX (781) 834-4783

SITEC ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants

Acad No.
SSEIR SITE PLAN-SOLAR ARRAY.dwg
SE01-456-12

ATTACHMENT 9

CONSTRUCTION BEST MANAGEMENT SPECIFICATIONS

SECTION 01036

HEALTH AND SAFETY

PART 1 - GENERAL

1.01 SCOPE

A. The Contractor shall submit to the Owner prior to beginning the work a written "Health and Safety Plan" for review. Partial payments will not be made to the Contractor by the Owner until the "Health and Safety Plan" has been submitted.

B. The Contractor shall provide such equipment and medical facilities as are necessary to supply first aid to anyone who may be injured in connection with the Work and shall provide for the capability for immediate removal and hospitalization if required.

C. The Owner may stop the Work if in his sole judgement safety laws, or safe work practices are not being observed; provided, however, that none of the foregoing shall relieve the Contractor from being fully responsible and liable for meeting all safety laws and safe work practices in connection with the Work, nor should the failure of such persons to stop the Work be construed to mean that all safety laws and safe work practices are being met. Notwithstanding the above, the Contractor is solely responsible for the compliance with safety laws and maintaining safe work practices.

1.02 HEALTH AND SAFETY PLAN

A. Prior to construction commencement, the Contractor shall prepare a site specific health and safety plan (the "HASP"). If the Contractor does not have the capability to prepare the HASP, the Contractor shall contract for the preparation of the HASP. The Contractor is solely responsible for the preparation, monitoring, management, and enforcement of the HASP.

B. The Contractor is encouraged to include any information that the Contractor believes is relevant. Contractor shall submit a copy of the HASP to the Owner prior to starting construction. Submission of the Contractor's HASP to the Owner is to inform the parties of the details of the program. Submission of the HASP does not, in any way, impose a responsibility on the Owner for adequacy of the program nor does it relieve the Contractor from full responsibility to comply with, and liability for, the appropriate laws, rules or regulations regarding health and safety of on-site personnel.

C. The Health and Safety Plan shall, as a minimum, address the following:

1. Description of work to be completed.

2. Identification of possible site chemical exposure hazards, including but not limited to gases and leachate typically found in landfills, refuse and ash.

3. Identification of possible explosion hazard from methane released from the landfill.

4. Monitoring equipment and procedures for use on site (eg. explosimeter, oxygen meter, photoionization detector).

5. Site operating procedures and safety guidelines.

6. Emergency procedures and information for personnel injury, fire, explosion, or equipment failure.

D. The Health and Safety Plan shall as a minimum be consistent with the requirements of the latest versions of:

1. Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926), including amendments, or current amendments at the time of contract performance as stated in Fed Reg December 19, 1986: 45654-45675 (Interim Final Rule, 29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response").

2. United States Environmental Protection Agency (USEPA) Standard Operating Safety Guidelines, Office of Emergency and Remedial Response, Hazardous Response Support Division, Edison, New Jersey.

3. Corps of Engineers Accident Prevention and Safety and Health Requirements Manual, EM 385-1-1.

4. NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Site Activities, October 1985, DHHS (NIOSH) Publ. No. 85-115.

1.03 GENERAL SAFETY CONSIDERATIONS

A. Workers shall be advised of the presence of methane or hydrogen sulfide gas emanating from the natural decomposition of refuse buried at or near the job site and take precautions to ensure the safety of workers and the public.

B. A person shall be designated as Safety Monitor who is trained in the use of gas detection instruments and safety equipment. He shall be present at all times with appropriate instruments to test for oxygen deficiency and the presence of methane or hydrogen sulfide gas. An Emmet CGS-10 Gas Detector, or similar unit, shall be available for this purpose. The Safety Monitor shall periodically test the excavation areas, utility vault, structure, etc., for safe working conditions and be responsible for the appropriate safety equipment being available at the site.

C. Workers shall not be allowed to work alone at any time in an excavation. Work parties of at least two shall be mandatory, with one worker outside of possible gas effects. Access to the open trench shall be via ladders spaced no further than 30 yards apart. Trenches shall be shelved to prevent possible caving in on workers.

D. No welding shall be permitted in trenches, enclosed areas, or over refuse filled areas unless performed over ground mats or in areas of the site approved by the Safety Monitor.

E. Workmen shall not be permitted to enter excavations where there is an oxygen deficiency or a combustible mixture of methane or other explosive gases, without taking precautionary measures.

F. As construction progresses, all valves, pipe and other conduit openings shall be closed as soon as installed to prevent the migration of gases through the pipeline system, unless they are so intended, and to prevent extraneous matter from entering the system.

G. Smoking shall be prohibited in or near open excavations and in the vicinity of excavation activities. No excavation or drilled hole greater than 2 feet deep shall be left unattended or left open overnight unless securely covered in a manner acceptable to the Owner. Precautions shall be taken to prevent open excavation from the introduction to stormwater.

H. Entrance into utility access manholes shall be done with extreme caution. Sparks can occur from metal manhole covers and rings. Always test the air in a manhole or enclosed space with a detector before entering. Positive ventilation should be considered when working in any underground structure. All enclosed entries will be performed under full mask and suit conditions (pursuant to OSHA requirements) by certified personnel.

I. Fire extinguishers shall be available and be rated at least A, B and C.

1.04 PRECAUTIONS WHEN WORKING ON OR NEAR REFUSE LANDFILLS

A. Workers shall be cautioned regarding the potential unstable soil and refuse material and the strong possibility of caving during excavation operations. All workers entering open excavations shall be secured with a safety belt, harness, or short rope to enhance rescue operations in the event of accidents.

B. Workers in the excavation area shall have access to acid vapor masks for temporary protection in the event hydrogen sulfide (H_2S) gas is present and triggers the H_2S alarm on the gas detector. Vacate the area immediately when H_2S is detected.

C. Construction equipment shall be equipped with vertical exhaust and spark arresters.

D. Motors utilized in refuse excavation areas shall be explosion-proof.

E. Start-up and shutdown of equipment shall not be done in areas of exposed refuse.

F. Soil shall be stockpiled adjacent to operations in areas of exposed refuse for fire fighting purposes. Probably the most effective way to extinguish landfill fires is to smother the fire with soil (which eliminates available combustion oxygen).

G. The use of explosives is not permitted.

H. Any refuse exposed during construction activities shall be covered as soon as possible after exposure with at least a 6-inch layer of earth or deposited into approved containers. In no event shall the refuse remain exposed overnight.

I. All refuse excavated during construction activities shall be disposed of in an appropriate disposal manner.

J. Inhalation of landfill gases shall be avoided as much as possible. Such gases (or oxygen deficient air) may cause nausea and dizziness, which could lead to accidents.

K. Workers shall avoid contact with exposed refuse where possible. Irritants or hazardous materials may be present.

L. Workers shall not leave open wells or excavations unattended. Open boreholes must be covered to prevent accidental entry. Wells must be barricaded, flagged, and protected sufficiently to prevent entry of dirt and run off water.

M. Landfill gas (LFG) is comprised of approximately equal portions of carbon dioxide (CO_2) and methane (CH_4) with other trace constituents. It is a product formed by the anaerobic decomposition of refuse. Methane gas is the primary component of natural gas, and is combustive when the methane concentration in air is between 5 and 15 percent by volume. The 5 percent level is called the lower explosive limit (LEL). Below 5 percent, there is insufficient methane for combustion. Above 15 percent, called the upper explosive limit (UEL), there is insufficient oxygen for combustion. However, it is important to note that a concentration of methane above 15 percent is considered at least as dangerous as a concentration between 5 and 15 percent, because as the methane dilutes with air, it will pass through the explosive range. When gas concentrations are low, it is common to express methane concentration as a percentage of the LEL. For example, 100 percent LEL is 5 percent methane in air, and 50 percent LEL is 2.5 percent methane in air.

N. Because the decomposition of buried refuse typically produces methane at concentrations ranging from 40 to 55 percent, methane will always pass through the combustible range as it vents to the atmosphere and dilutes with air. Methane is lighter than air, and will rise in the absence of typical barriers. LFG, being a mixture of methane and carbon dioxide, may be heavier than or lighter than air depending on the specific mixture. LFG may escape from the refuse, both vertically through the landfill cover, and laterally through surrounding soils. LFG moves in response to the pressure buildup within the landfill and through diffusion in the absence of a pressure differential. Diffusive movement nearly always produces explosive range concentrations of methane.

O. The Contractor shall consider any concentration of methane at or above 10% LEL as one to cease construction activities or operations.

END OF SECTION

SECTION 01560

MAINTENANCE OF WORK SITE

PART 1 - GENERAL

1.01 SAFETY AND PROTECTION

A. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. He shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1) All employees on the Work and other persons who may be affected thereby.

2) All the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site.

3) Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures utilities not designated for removal, relocation or replacement in the course of construction.

B. The Contractor shall notify owners of adjacent utilities when prosecution of the Work may affect them. All damage, injury or loss to any property referred to in paragraph A.3 above, directly or indirectly, in whole or in part, by a Contractor, shall be replaced or restored to at least original condition at Contractor's expense. Contractor's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor as described herein that Work is acceptable and for a period of twelve months thereafter.

C. The Contractor shall not load or permit any part of any structure to be loaded with a weight that would endanger its safety.

D. The Contractor shall provide protection of the work from freezing and from other elements which would be harmful to it. The Contractor shall furnish heat or protective shelters or temporary buildings as required for the prosecution and protection of the work.

E. The Contractor shall take all necessary precautions for the safety of employees on the Work, and shall comply with all applicable provisions of Federal, state and local safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed. He shall erect and properly maintain at all times, as required by the conditions and progress or the work, all necessary safeguards and barricades for the protection of employees on the work and the safety of others employed near the work and the public, and shall post danger signs and warning lights warning against the hazards created by such features of the construction as protruding nails, hoists, excavations, elevator hatchways, scaffolding, window openings, stairways and falling materials.

F. The Contractor shall designate a responsible member of its organization on the Work, whose duty shall be the prevention of accidents. The name and position of the person so designated shall be reported in writing to the Owner. No progress payments will be made until this information is reported to the Owner.

G. The Contractor shall immediately report in writing, giving full details, to the Owner all serious accidents which arise out of or in connection with the performance of the Work, whether on or adjacent to the site, which cause death, serious personal injury or substantial property damage. In addition, if death or serious injury or substantial property damage is caused, the accident shall be reported immediately by telephone or messenger to the Owner. If a claim is made or suit is filed by anyone against the Contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Owner, giving full details of the claim.

H. The Contractor shall assume all risks of loss or damage of any kind to any vehicles, machinery, equipment, materials or supplies which he shall provide in doing the Work.

I. The Contractor shall take all precautions to prevent damage to the work by the elements, storms or by water entering the site of the Work directly or through the ground. In case of damage by the elements, storm or water, the Contractor shall make such repairs or replacements or rebuild such parts of the Work as the Owner may require in order that the Work may be completed as required by the Contract Documents. If the Contractor believes that additional work done by him, which arose from causes beyond his control entitles him to an increase in the Contract Price or an extension of the Contract Time, he may make a claim thereof as provided herein.

J. The Contractor shall post illuminated warning and danger signs so as to warn all persons of any hazards created by the Work being done under his contract.

1.02 PROTECTION OF PUBLIC

A. The Contractor shall conduct his work so as to interfere as little as possible with the private, personal activities of residents, private business and public business and travel. Wherever necessary or required, and at his own expense, he shall maintain fences, furnish full-time or part-time watchmen, guards, flagmen and/or like protective personnel, maintain lights, and take such additional precautions as may be necessary to protect life and property.

1.03 MAINTENANCE OF TRAFFIC

A. The Contractor shall carry on his work so that traffic will be maintained as far as is reasonably possible in streets in which pipelines and/or other structures are to be built. Sidewalks and crossings shall be kept open for the passage of pedestrians, unless otherwise specifically authorized. Driveways to properties shall be kept open at all times except for daylight hours when pipe laying beneath them is in actual progress. Streets shall not be obstructed, unless the Owner shall authorize the complete closing of a street in writing. The Contractor shall submit each request for the complete closing of each and any street or driveway to the

Owner in writing at least 15 working days prior to the actual commencement of work.

B. When open-cut excavation is conducted in the roadways, the Contractor shall maintain one lane open for vehicular traffic between the hours of 9:00 A.M. and 4:00 P.M., daily. At all other times, full use of the roadways shall be restored.

C. At all times when work is not being conducted in roadways, trenches shall be backfilled and, if permanent pavement is not placed, a satisfactory wearing surface shall be maintained. No extra allowance will be made for such temporary wearing surface, if any, but the cost thereof will be deemed to be included in the Contract Price.

D. The Contractor shall construct and maintain, without extra compensation, such adequate and proper bridges over excavations as may be necessary or directed for the purpose of accommodating pedestrians or vehicles.

E. On all roads, the Contractor shall provide a minimum of one flagman per working crew to control the traffic. When directed by the Owner, he shall employ uniformed police officers to control the traffic. Any police officer, whether regular, reserve, special, or otherwise, shall be employed by the Contractor. No extra compensation will be given to the Contractor for flagmen controlling traffic. Uniformed police officers will be paid at the Contract unit price bid in the Proposal. All construction vehicles shall be equipped with suitable backup warning devices and shall be functional at all times.

F. Any road closed shall be properly detoured and so marked by lighted signs. Each proposed detour shall be submitted in writing to the Owner at least 15 working days prior to the actual need for the rerouting of traffic due to the commencement of work in the affected areas. Detour route will be accepted or rejected by the Owner in writing. In case of state roads, detour will be approved by proper authority. No extra compensation will be given to the Contractor for detours so provided.

G. The Contractor shall, 24 hours in advance of closing any street, notify the police and fire departments in writing, with a copy to the Owner.

H. Failure of the Contractor to comply with the requirements of this Paragraph 1.3 will be considered a sufficient cause for the Owner to shut down his work. The Contractor will not be entitled to any extra compensation therefor.

1.04 PROTECTION OF NATURAL WATERCOURSES

A. The Contractor must use all care possible to prevent siltation and other pollution of waters during and after construction. Prohibited practices include, but are not limited to:

1. Dumping of spoil material into streams or on stream banks where it may wash or slide into the stream.

2. Operating of equipment in the stream.

3. Pumping of silt-laden water from trenches or other excavations into the stream.

4. Disposing of trees, brush, and other debris in the stream.

5. Altering of the stream flow line.

B. The Contractor must take sufficient precautions to minimize run-off, due to construction, of polluting substances such as silt, clay, fuels, oils, bitumens, calcium chloride, or other polluting materials harmful to humans, fish or other life, into the water supplies and surface waters of the State. Unless otherwise permitted in writing control measures must be adequate to assure that turbidity in the receiving water shall not be increased to more than 10 Jackson Turbidity Units (JTU) in waters used for public water supply or fishing, unless limits have been established for the particular water. In surface water used for other purposes, the turbidity must not exceed 25 JTU unless otherwise permitted in writing. Special precautions shall be taken in the use of construction equipment to avoid operations which promote erosion. Refer to Section 01566 - Erosion Control.

C. In addition, the work area must be cleaned up, graded and seeded as the work proceeds.

D. Failure of the Contractor to comply with the requirements of this Paragraph 1.4 will be considered a sufficient cause for the Owner to shut down this work. The Contractor will not be entitled to any extra compensation therefore.

END OF SECTION

SECTION 01562

DUST CONTROL

PART I - GENERAL

1.01 GENERAL PROVISIONS

A. Furnish all labor, materials, tools, and equipment to apply water or calcium chloride on roads, other traveled surfaces or the Landfill surface within the construction site when directed by the Owner and/or as necessary to control dust.

B. When dust control is not included as a separate item in the Contract, the work shall be considered incidental to the appropriate items of the Contract.

PART 2 - PRODUCTS

2.01 WATER

Water for sprinkling shall be clean, free of salt, oil, and other injurious materials.

2.02 CALCIUM CHLORIDE

Calcium chloride shall meet the requirements of ASTM Specification D98-48 and as amended.

PART 3 - EXECUTION

3.01 WATER APPLICATION

A. Water shall be applied by equipment approved by the Owner. As a minimum it shall consist of a tank, a spray bar, and a gauge equipped pump. Water shall be dispersed through nozzles at a minimum pressure of 20 psi.

3.02 CALCIUM CHLORIDE APPLICATION

A. Calcium chloride shall be properly applied where directed by the Owner and distributed at the rate specified or ordered. Method of application shall be by hand or approved spreading device. The number and frequency of applications shall be determined by the Owner.

B. Whenever calcium chloride is applied, the Contractor shall take every precaution necessary to prevent calcium chloride from entering and contaminating surface waters on and around the job site. Any damage resulting to property or surface and ground waters, including public and private water supplies, from the use of calcium chloride shall be the Contractor's liability. The Owner's direction or approval for calcium chloride application shall not release the Contractor from responsibility for protection of property or water resources. Any reparations required as a result of the misuse of calcium chloride shall be at the Contractor's expense.

END OF SECTION

SECTION 01566

EROSION AND SEDIMENTATION CONTROL

PART I - GENERAL

1.01 SCOPE

A. Furnish all labor, materials, tools and equipment, and perform all operations necessary for erosion control work indicated on Drawings and specified.

1.02 PROJECT CONDITIONS

A. Earthmoving activities-shall be conducted in such a manner as to prevent accelerated erosion and the resulting sedimentation.

B. The Contractor shall design, implement and maintain erosion and sedimentation control measures which effectively prevent accelerated erosion and sedimentation. The Contractor shall be totally responsible for all damages resulting for failure to prevent erosion and sedimentation.

1.03 EROSION AND SEDIMENTATION CONTROL PLAN

A. The Contractor shall submit an Erosion Control Plan within 10 days of Notice to Proceed. The plan shall be prepared by a person trained and experienced in erosion and sedimentation control methods and techniques, to the Owner for approval. The plan shall detail the Contractor's proposed schedule and methods for implementing the requirements of the Contract Documents, including this Section.

1.04 GENERAL METHODOLOGY

A. Erosion and sedimentation control methods shall consider all factors which contribute to erosion and sedimentation including, but not limited to, the following:

1) Topographic features of the Project area.

2) Types, depth, slope and areal extent of the soils.

3) Proposed alteration of the area.

4) Amount of run-off from the Project area and the upstream watershed area.

5) Staging of earthmoving activities.

6) Temporary control measures and facilities for use during earthmoving.

7) Permanent control measures and facilities for long term protection.

8) Maintenance program for the control facilities including disposal of materials removed from the control facilities or Project area.

PART 2 - PRODUCTS

2.01 SEDIMENT BARRIERS

A. Sediment barriers shall be hay or straw bales, brush, stone, geotextile fabrics, or other approved materials that will prevent sedimentation.

2.02 MULCH AND SEEDING

A. Mulch and seeding shall be in accordance with requirements of Tables 1 and 2 attached to this Section.

PART 3 - EXECUTION

3.01 DIVERSION TERRACES

A. Diversion terraces shall be used as a temporary measure installed on the uphill side of the disturbed areas to divert surface runoff away from unstabilized slopes, and the Project area.

B. Recommended Minimum Dimensions:

Height	1.5 feet
Top Width	2 feet
Side Slopes	2:1 or flatter
Material	Soil

3.02 INTERCEPTOR CHANNELS

A. Interceptor channels shall be used across disturbed areas where the slope is running parallel to the direction of trenches.

B. Interceptor channels reduce erosion by intercepting storm runoff and diverting it to outlets on the lower side of the disturbed area where it can be disposed of having minimum erosion impact.

C. Recommended Dimensions and Materials:

Depth	0.5 feet
Width	2 - 4 feet
Side Slopes	2:1 or flatter
Spacing	Where required
Material	Stable on-site material

3.03 TRENCH BARRIERS

A. Trench barriers shall be used where the disturbed area is sloped in the direction of the pipeline, when the slope exceeds 15 percent or when the Owner deems necessary.

B. Trench barriers shall be earth-filled sacks or piled stone, stacked to the top of the trench prior to backfill, if backfill is delayed.

C. Trench barriers shall act as an erosion check by preventing the washout of the trench.

D. Recommended Dimensions and Materials:

Height	To top of trench
Spacing	Approximately every 150 feet
Material	Earth-filled sacks or piled stones

3.04 SEDIMENT BARRIERS

A. Sediment barriers shall be used at storm drain inlets; across minor swales and ditches; and at other applications where the structure is of a temporary nature and structural strength is not required. Sediment barriers are temporary berms, diversions, or other barriers that are constructed to retain sediment on-site by retarding and filtering storm runoff.

B. Recommended Materials and Dimensions:

1) Hay or Straw Bales:

a) Bales should be bound with twine.

b) Bales should be anchored to the ground with fence posts, wood pickets, or any naturally decomposable material. Two anchors per bale are required.

c) Bales shall be installed so that runoff cannot escape freely under the bales.

d)

Height:	1.5 feet
Width:	1.5 - 3.0 feet
Cross-Sectional area required per tributary acre:	50 square feet

2) Stone:

a)	Height:	1.5 - 2 feet (uniform top elevation)
b)	Material:	Coarse rock or stone

c) Side Slopes: 3:1 or flatter

Cross-Sectional area required tributary acre: 20 square feet

d) Top Width: 3 - 5 feet

3) Brush:

a) Brush should be bound with twine.

b) Brush should be anchored such that it does not move and runoff cannot escape freely under the barrier.

c) Height: 1.5 - 2.0 feet

d) Cross-Sectional area required per tributary acre: 15 square feet

3.05 MULCH

A. Used alone or in conjunction with other structural or vegetative erosion control measure, mulch is applied on any disturbed area which is subject to erosion, for protection of disturbed soil or newly reseeded areas.

B. Recommended Methods and Materials:

Material: Hay, straw, wood chips

Methods: Spread by hand tools on small plots and by mechanical blower on larger areas. Tacked by passing a tracked construction vehicle over the mulched area.

Rates: See Table 1

3.7 VEGETATION

A. Temporary Vegetation:

1) The planting of temporary vegetative cover shall be performed on disturbed areas where the earthmoving activities will be ceased for a period of more than 45 days. The vegetation shall provide short-term rapid cover for the control of surface runoff and erosion, until permanent vegetation can be established or earthmoving activities can resume.

2) Table 2 gives recommended types of temporary vegetation, corresponding rates of applications, and planting seasons.

B. Permanent Vegetation:

1) Planting of various permanent vegetative covers shall be performed on disturbed areas where the earthmoving activities have ceased. The

vegetation shall reestablish ground cover for the control of surface runoff and erosion.

TABLE 1

MULCH MATERIALS, RATES AND USES

Mulch Material	Quality Standards	Application Rates		Depth of Application	Remarks
		per 1,000 sq ft	per acre		
Straw or Hay	Air-dried Free from coarse materials	75-100 lbs 2 - 3 bales	1.5 - 2.5 tons 90 - 120 bales	Lightly cover 75 to 90% of surface.	Use straw where mulch effect is to be maintained for more than 3 months. Subject to wind blowing unless kept moist or tied down. Most common and widely used mulching material. Good for erosion control in critical areas.
Wood Chips	Green or air-dried	500 - 900 lbs	10 - 20 tons	2" - 7"	If intensive foot or vehicle traffic is anticipated, the application rate may be increased. Resistant to wind blowing. Decomposes slowly.

TABLE 2

TEMPORARY SEEDING FOR EROSION CONTROL ON CONSTRUCTION SITES

Species Or Mixture For Temporary Cover	Percent By Weight	Seeding Rates In Pounds		Recommended Seeding Dates
		per 1,000 sq ft	per acre	
Annual Ryegrass	100%	1	20 to 40	April 1 to June 1 August 15 to October 15
Field Bromegrass	100%	1	20 to 40	March 1 to June 15 August 15 to September 15
Sundangrass	100%	1	30 to 40	May 15 to August 15

END OF SECTION

SECTION 01710

CLEANING UP

1.01 GENERAL

During its progress the work and the adjacent areas affected thereby shall be kept clean and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.

1.02 REMOVAL OF DEBRIS

Where material or debris has washed or flowed into or been placed in watercourses, ditches, gutters, drains, catch basins, or elsewhere as a result of the Contractor's operations, such material or debris shall be entirely removed and disposed of during progress of the work, and the ditches, channels, drains, etc., kept in a neat, clean and functioning condition.

1.03 PROJECT CLOSEOUT

On or before the completion of the work, the Contractor shall, unless otherwise directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matters; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.

1.04 RESTORATION/REPLACEMENT

The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration as approved by the Owner, or as required elsewhere in these specifications.

1.05 ROADWAY CLEANUP

The Contractor shall promptly clean roadways, driveways and other service areas as he proceeds with any operations, not more than 20 feet of uncleaned area will be permitted at any one time in each area of work. All sections will be cleaned before completing his work day.

Contractor shall keep traveled public and private ways used during construction clear of debris and rocks. Sweeping shall be done at close of each day's work, at a minimum, and more often, if necessary.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 SCOPE

A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, and installation equipment necessary to perform all related work as specified, herein, as shown on the Drawings.

B. The work of this Section shall include, but not necessarily be limited to: excavating, separating, hauling, stockpiling, backfilling, compacting and grading of soils. The work of this Section may pertain in whole or in part to construction of the following: landfill liner subgrade preparation, landfill liner components, leachate collection system and general site preparation and grading.

The Contractor is advised that related sections contain additional detailed specifications and testing requirements for the various layers of the landfill liner, as to be constructed under this Contract.

C. The Contractor shall conform to the dimensions, lines and grades indicated on the Drawings.

D. Excavations into the landfill may create hazardous conditions due to the presence of methane gas and other organic compounds. The Contractor shall be responsible for continuously monitoring conditions associated with the excavation and shall employ appropriate health and safety protocol for the protection of the Contractor's employees and all subcontractors. The Contractor shall implement all applicable provisions of his Health and Safety Plan as required under Section 01036 of these specifications.

1.02 RELATED SECTIONS

A. Section 02210 - Sand

B. Section 02300 - Low Permeable Soil Liner

C. Section 02500 - HDPE Geomembrane Liner

D. Section 02714 - HDPE Pipe and Fittings

E. Section 02716 - Corrugated Polypropylene Pipe

1.03 PROTECTION

A. The Contractor shall protect trees, shrubs, lawns and other features remaining as part of final landscaping.

B. The Contractor shall protect benchmarks, survey markers, fences, roads, sidewalks, paving, curbs and other existing structures from damage due to the Contractor's activities.

C. The Contractor shall repair damage caused by the construction operations at his cost.

D. Erosion control must be maintained. Erosion control measures shall be implemented in conformance with the Contractor's Erosion Control Plan required under Section 01566 of these specifications and the minimum guidelines presented on the Drawings.

1.04 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 — Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
3. ASTM D 1556 — Standard Test Method for Density and Unit Weight of Soil In Place By the Sand-Cone Method.
4. ASTM D 1557 — Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.
5. ASTM D 2216 — Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.
6. ASTM D 2487 — Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
7. ASTM D 2922 — Standard Test Methods for Density of Soil and Soil-Aggregate In Place By Nuclear Methods (Shallow Depth).
8. ASTM D 2937 — Standard Test Method for Density of Soil In Place By the Drive-Cylinder Method.
9. ASTM D 3017 — Standard Test Method for Water Content of Soil and Rock In Place By Nuclear Methods (Shallow Depth).
10. ASTM D 4220 — Standard Practices for Preserving and Transporting Soil Samples.
11. ASTM D 4318 — Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.05 EXISTING UTILITIES, STRUCTURES AND FACILITIES

A. The locations of existing underground structures as shown on the Drawings are approximate only and are shown only for the convenience of the Contractor, who must verify the information to his own satisfaction. The Owner disclaims any responsibility for the accuracy or completeness of the information shown on the Drawings with regard to existing underground utilities or structures, and the Contractor shall not be entitled to any additional compensation because of inaccuracy or incompleteness of such information.

B. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, the Contractor shall inform the Owner of such piping or utility immediately. The Contractor shall make modifications as approved by the Owner.

C. The Contractor shall be held responsible for the cost of repairing all utilities, structures and subsurface drains which become damaged due to his construction operations, whether or not they appear on the Drawings. The notification of all utility companies before the start of work and the locating of underground structures which may be encountered during the course of construction are the responsibilities of the Contractor. All costs, including the costs of services of representatives of the affected utilities, incurred in such location operations shall be included in the work to be done under this Contract.

D. Furnish all the necessary equipment and assume the entire cost of handling any water from storm, surface and flood flows which may be encountered at any time during construction of the work. The manner of providing for these flows shall meet with the approval of the Owner, and the entire cost of said work shall be included in the work to be done under this Contract.

E. Should it become necessary to permanently or temporarily move any conduits, pipes, wires or structures in order to permit the Contractor to execute the work, the Contractor shall notify the Owner of the location and circumstances, and shall cease work if necessary, until satisfactory arrangements have been made by the owners of said obstructions to properly care for the same. No claims for damages shall be allowed on account of any delay occasioned thereby. The entire cost of the changes or temporary removal shall be included in the work to be done under this Contract.

F. The Contractor shall, at his own expense, shore up and protect any poles, or other public or private structures which may be encountered or endangered in the prosecution of the work, and that may not be otherwise provided for, and he shall repair and make good any damages caused to any such property by reason of his operations. All existing structures which due to the prosecution of the work are removed shall be replaced by the Contractor. No extra payment will be made for said work or material.

1.06 SUBMITTALS

A. Submit an Excavation Plan to the Owner for review and approval. The Excavation Plan shall include detailed description of the Contractor's proposed methods of construction, including dewatering, excavation, filling, compaction, and backfilling for the various portions of the work. The Contractor shall remain responsible for the adequacy and safety of the methods. The Plan shall be approved prior to the Contractor conducting any excavation work.

B. The Contractor shall submit to the Owner the required information and samples for all proposed fill materials a minimum of 14 days prior to delivery of the material to the Site, unless otherwise approved by the Owner.

C. The Contractor shall notify the Owner in writing at least 7 days in advance of intention to perform the work of this Section.

D. If work is interrupted for reasons other than inclement weather, the Contractor shall notify the Owner a minimum of 24 hours prior to the resumption of work.

1.07 SOURCE QUALITY CONTROL

A. All fill and backfill materials shall be procured from off site sources unless otherwise approved or allowed in these specifications. Approval of materials will be based on tests performed by the Contractor's independent testing laboratory.

B. Testing laboratory will determine maximum dry density and optimum water content of fills in accordance with ASTM D 1557. Provide samples of each fill material from proposed source of supply. Allow sufficient time for testing and evaluation of results before material is needed. Submit samples from alternate source(s) if required.

1.08 PRODUCT DELIVERY AND HANDLING

A. Handling Materials: Keep public roads clear of all spillage from trucks hauling earthwork materials either from or to project site.

1.09 SOIL TESTING

A. The Owner will select areas within the limits of the fill for testing the degree of compaction obtained. The Contractor shall cooperate fully in obtaining the information desired.

B. Testing shall be conducted by an independent laboratory hired by the Contractor and approved by the Owner. If test results do not meet the specified requirements, all costs involved in correcting deficiencies in compacted materials and retesting shall be borne by the Contractor.

C. Field density tests of the compaction of subgrade and each layer of fill shall be performed for every 5,000 square feet of embankment or fill areas. The tests shall be in accordance with one of the following: ASTM D1556, ASTM D1557, ASTM D2167, ASTM D2922, or ASTM D2937. Contractor shall allow time for the performance of the tests upon completion of each layer of fill in a designated area. The Contractor shall provide equipment to cut out smooth-surfaced spot locations designated by the Owner on which to perform the test. When the tests indicate that density or moisture content does not meet requirements specified herein, the particular layer or portion thereof, as determined by the Owner, shall be reworked by rolling or by scarifying, wetting, or drying and recompacting until the required density has been obtained.

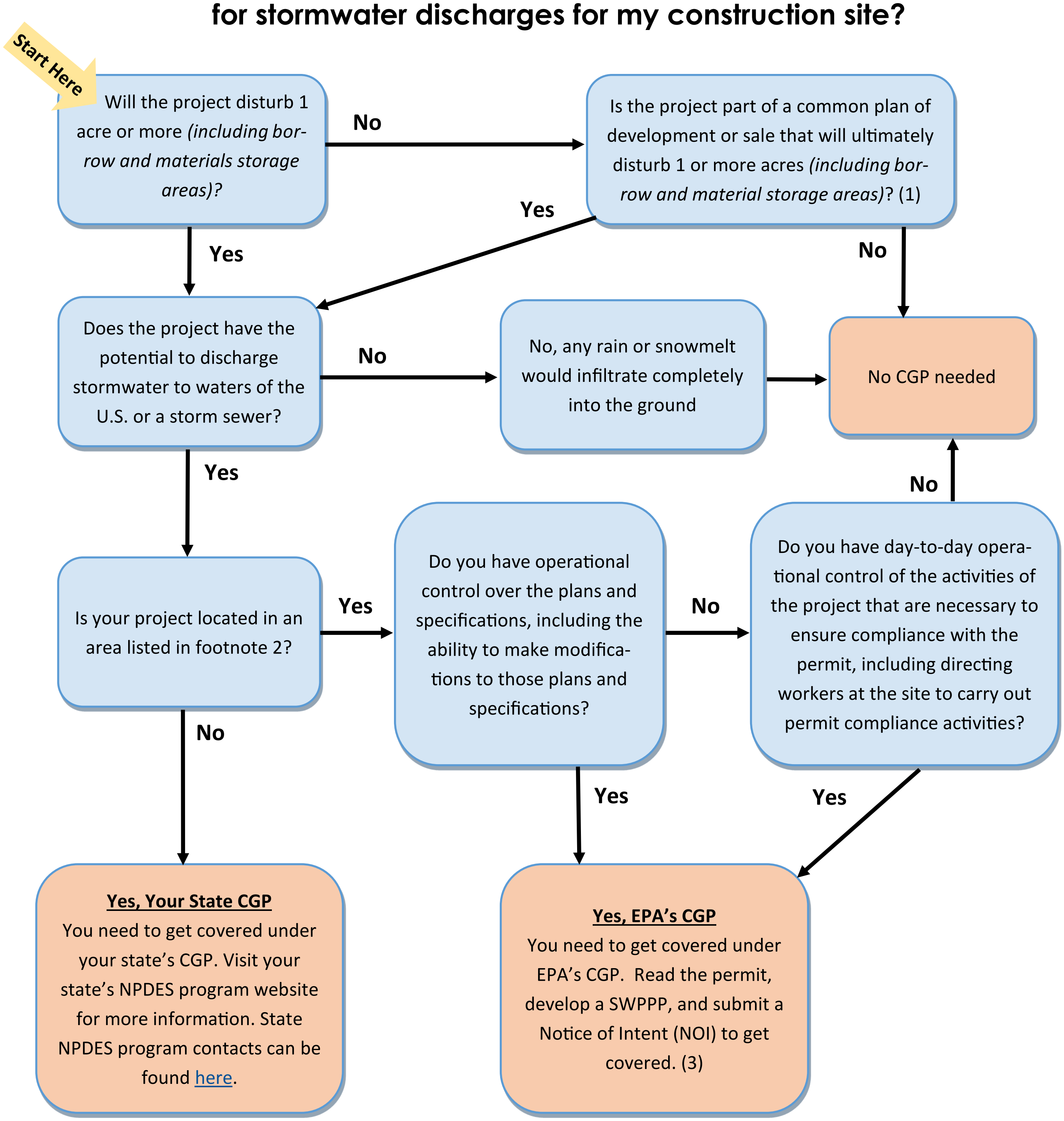
1.10 JOB CONDITIONS

A. Contractor shall examine the site prior to submitting his Bid, taking into consideration all conditions that may affect his work. The Owner will not assume responsibility for variations of subsoil quality or conditions.

B. Contractor shall barricade open excavations occurring as part of this work, and shall post and operate warning lights as recommended by authorities having jurisdiction.

C. Contractor shall protect structures, utilities, sidewalks, pavements, and other facilities, not designated to be demolished, from damage caused by settlement,

Do I need to get covered under an NPDES Construction General Permit (CGP) for stormwater discharges for my construction site?



Need assistance? Contact Us - We're your partners in protecting clean water!

EPA Headquarters: Emily Halter (halter.emily@epa.gov) (202) 564-3324

EPA Regional Offices contacts

State NPDES program contacts

Do I need to get covered under an NPDES Construction General Permit (CGP) for stormwater discharges for my construction site?

Footnotes to flowchart

(1) "Common Plan of Development or Sale" – A contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one common plan. The "common plan" of development or sale is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating construction activities may occur on a specific plot.

(2) Areas where EPA is the NPDES permitting authority for construction stormwater. See full detailed list of areas in Appendix B—Permit Areas Eligible for Coverage

- Idaho, Massachusetts, New Hampshire, New Mexico, and the District of Columbia;
- American Samoa, Guam, Johnston Atoll, Midway and Wake Islands, Northern Mariana Islands, and Puerto Rico;
- Indian Country lands within Alabama, Alaska (as defined in 18 U.S.C. 1151), Arizona, California, Colorado, Connecticut, Florida, Idaho, Iowa, Kansas, Louisiana, Massachusetts, Michigan, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Oregon, Rhode Island, South Dakota, Texas, Utah, Virginia, Washington, Wisconsin, and Wyoming;
- Areas within Colorado, Delaware, Vermont, and Washington subject to construction by a federal operator;
- Denali National Park and Preserve; and
- Limited areas of Oklahoma and Texas.

(3) What are the steps to obtain permit coverage?

⇒ Step 1. Read the 2017 CGP and Fact Sheet

⇒ Step 2. Before submitting your Notice of Intent (NOI), the form you file to obtain coverage under the CGP in step 4, you must:

- Follow the procedures in Appendix D of the 2017 CGP - Endangered Species Act (ESA) Requirements. Take note of the criterion (A, B, C, D, E or F) under which you are eligible because you will need to select this and provide supporting documentation in your NOI. Visit the Endangered Species Requirements page for more details on determining your ESA Eligibility under the CGP.
- Follow the procedures in Appendix E of the 2017 CGP – Historic Property Screening Process. Take note of your answers to the screening process questions because you will need to provide this information in your NOI.

⇒ Step 3. Develop a Stormwater Pollution Prevention Plan (SWPPP). A SWPPP outlines how you plan to implement erosion and sediment controls and meet other requirements of the permit on your construction site. Before submitting your Notice of Intent (NOI), the form you file to obtain coverage under the CGP in step 4, you must develop the SWPPP consistent with the requirements in Part 7 of the CGP. You can use EPA's SWPPP template to develop your SWPPP.

⇒ Step 4. Submit an NOI for your site using EPA's NPDES eReporting Tool (NeT) for the CGP.

Disclaimer: This information is guidance only and does not establish or affect legal rights or obligations. Agency decisions in any particular case will be made by applying the law and regulations to the specific facts of the case.

ATTACHMENT 10

WATER RESOURCES CORRESPONDENCE

TOWN OF BOURNE
BOARD OF HEALTH

24 Perry Avenue
Buzzards Bay, MA 02532

Terri A. Guarino
Health Agent

June 6, 2020

C/O Mr. Phil Goddard
Manager of Facility Compliance & Technology Development
Town of Bourne Dept. of Integrated Solid Waste Management
201 MacArthur Blvd.
Bourne, MA 02532

Dear Mr. Goddard:

Section 5.3 of the existing local Health Regulations indicates that "No well, private or public, will be allowed to be constructed, for human consumption, if its placement is hydraulically down-gradient of the Bourne Integrated Solid Waste Management Facility consisting of approximately 103 acres located at 201 MacArthur Boulevard, Bourne, as delineated on the Town of Bourne Assessor's maps as map 28, parcel 13 and map 32, parcel 9. Said down-gradient area shall be delineated by the particle tracking maps created by the United States Geological Survey (USGS) on file with the Board of Health office."

The Bourne Health Department does not permit the construction of potable wells downgradient from the Bourne Landfill and these areas are connected to the public water system. If you have any concerns please feel free to contact me at 508-759-0600 ext. 1513.

Sincerely,

Terri Guarino

Terri Guarino, RS, CHO
Health Agent

C.C. Board of Health

BOURNE WATER DISTRICT

211 Barlow's Landing Road. P.O. Box 1447
Pocasset, Massachusetts 02559
508-563-2294 FAX Number 508-564-4661

26 May, 2020

To: Phil Goddard
Manager of Facility Compliance and Technology Development
Town of Bourne, ISWM Department
24 Perry Avenue
Buzzards Bay, MA 02532
p. 508-759-0600, ext. 4241

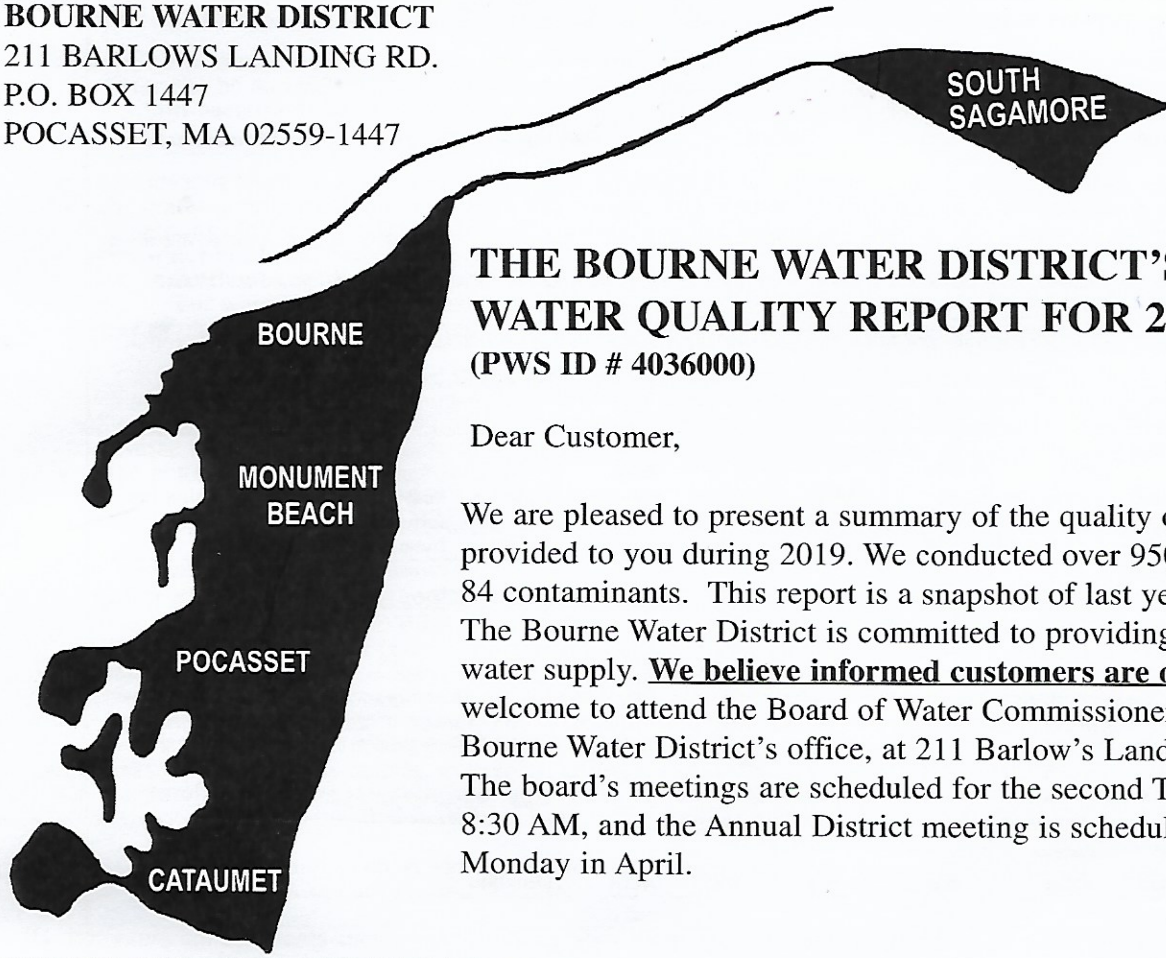
Re: Bourne Landfill build-out

Gentlemen:

Bourne Water District does not have a wellfield downgradient from the Bourne Sanitary Landfill. Bourne Water District would not be permitted by Mass Department of Environmental Protection to put a new production well downgradient of a Landfill. Bourne Water District has no objection to the build – out proposed by the I.S.W.M. Dept... If you have any questions or concerns please feel free to contact me at 508-563-2294.

Sincerely,
Robert Prophett, Superintendent
Bourne Water District

BOURNE WATER DISTRICT
211 BARLOWS LANDING RD.
P.O. BOX 1447
POCASSET, MA 02559-1447



THE BOURNE WATER DISTRICT'S WATER QUALITY REPORT FOR 2019
(PWS ID # 4036000)

Dear Customer,

We are pleased to present a summary of the quality of the drinking water provided to you during 2019. We conducted over 950 tests for more than 84 contaminants. This report is a snapshot of last year's water quality. The Bourne Water District is committed to providing you with a reliable water supply. **We believe informed customers are our best allies.** You are welcome to attend the Board of Water Commissioners meetings held at the Bourne Water District's office, at 211 Barlow's Landing Road in Pocasset. The board's meetings are scheduled for the second Tuesday of the month at 8:30 AM, and the Annual District meeting is scheduled on the fourth Monday in April.

WATER SOURCES AND TREATMENT

The Bourne Water District is supplied by 10 different sources, 7 of our own gravel packed well sites and 3 gravel packed well sites from the Upper Cape Regional Water Supply Cooperative. Four of our well sites are in the Monument Beach area of the Town Forest. The other two wells are in the Cataumet area of the Town of Bourne. One well is on Joint Base Cape Cod and we have one transfer station on Connery Ave. The Bourne Water District treats all supplies with lime slurry for corrosion control. The lime slurry is used to raise the pH of the water. This makes the water less aggressive to the copper pipe and lead joints in your homes to prevent exposure to lead and copper.

WHAT DOES THE FOLLOWING TABLE MEAN?

Action Level (AL) The concentration of a contaminant which if exceeded triggers treatment or other requirements.
Maximum Contaminant Level (MCL) The highest level of a contaminant that is allowed in the drinking water. The MCL is set as close to the MCLG as feasible using the best available treatment technology.
Maximum Contaminant Level Goal (MCLG) The level of a contaminant in the drinking water below which there is no known or expected risk to health. The MCLG allow for a margin of safety.
90th Percentile Out of every 10 houses sampled, 9 were below this level.

KEY TO TABLE

AL = Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MFL = million fibers per liter
Mrem/year = millirems per year (a measure of radiation absorbed by the body)
NTU = Nephelometric Turbidity Units
pci/l = picocuries per liter (a measurement of radioactivity)
ppm = parts per million, or milligrams per liter (mg/l)
ppb = parts per billion, or micrograms per liter (ug/l)
ppt = parts per trillion, or nanograms per liter
ppq = parts per quadrillion, or picograms per liter
TT = Treatment Technique

	DISTRIBUTION SYSTEM WATER QUALITY This report summarizes only those items detected during Sampling-not all contaminants that are monitored					
Microbial Results	Highest Detected	Range Detected	MCL	MCLG	Violation	Possible Source of Contamination
Total Coliform Bacteria**	0	0	0	0	No	Naturally present in the environment
Fecal Coliform or E. Coli	0	0	0	0	No	Human and Animal Fecal Waste

*Compliance with the Fecal Coliform/E.Coli MCL is determined upon additional repeat testing

**Total Coliform:Coliform are bacteria that are naturally present in the environment and are used as an indicator that other potentially harmful bacteria may be present

Lead and Copper	Dates collected	90th Percentile	Action Level	MCGL	# of sites sampled	# Sites above Action Level	Violation	Possible Source of Contamination
Lead (ppb)	9/1/2019thru 12/31/2019	0.0028	15	0	30	0	No	Corrosion of household plumbing systems: Erosio of natural deposits
Copper (ppm)	9/1/2019thru 12/31/2019	0.179	1.3	1.3	30	0	No	Corrosion of household plumbing systems: Erosio of natural deposits

TESTING FOR LEAD - If present, elevated levels of lead can causse serious health problems,especially for pregnant women and young childern. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing .Bourne Water District is responsible for providing high quality drinking water,but cannot control the variety of materials used in plumbing components.When you water has been sitting for several hours,you can minimize the potental for lead exposure by flushing you tap for 30 seconds to 2 minutes before using water for drinking or cooking.If you are concerned about lead in your water,you may wish to have your water tested. Information about lead in drinking water,testing methods and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

	SUMMARY OF FINISHED WATER CHARACTERISTICS						
Regulated Contaminants	Date(s) collected	Highest Detect Value	Range Detected	MCL	MCGL	Violation	
Inorganic Contaminants:							
Barium (ppm)	2018	0.009	0.002-0.009	2	2	No	Discharge of drilling waste; discharge from metal refineries;erosion of natural deposits
Nitrate * (ppm)	2019 2018	.71 0.35	.06-.71 0.08-0.35	10	10	No	Runoff from fertilizer use;leaching from septic tanks;sewage;erosion of natural deposits
Perchlorate ** (ppb)	2019 2018	0 ~~"J"0.23~~	0 ~~0-0.23 "J"~~	2	-	No	Rocket propellants,fireworks,munitions ,flares,blasting agents* (see note below)
*Nitrate	Nitrate in drinking water at levels above 10ppm is a health risk for infants of less than six months of age.High nitrate levels in drinking water can cause blue baby syndrome. Nitrate levels may rise quickly for short periods of time because of rainfall or agricultural activity. If you are caring for an infant, you should ask advise from your health care provider.						
**Perchlorate (Various Chemical Abstract Service RegistryNumbers (CASRN)for different chemical species	Perchlorate interferes with the normal function of the thyroid gland and thus has the potential to affect growth and development, causing braiun damage and other adverse effects, particularly in fetuses and infants. Pregnant women, the fetus, infants and children up to the age of 12, and people with hypothyroid condition are particularly suseptable to perchlorate toxicity. "J"values are required when the results are above the MDL(0.012) and below the MRL(0.05)						
Organic Contaminants							
Tetrachloroethylene(PCE)(ppb)	2019	1.64	0 -1.64	5	-	No	Discharge from factories and dry cleaners
Chloroform (ppb	2019	1.21	0-1.21	ORSG 70	NA	No	By-product of drinking water chlorination
CIS-3,2 Dichloroethylene (ppb)	2019	1.26	0-1.26	70	NA	No	Runoff from fertilizer use;leaching from septic tanks;sewage;erosion of natural deposits

Secondary Contaminents	Date(s) collected	Highest Detect Value	Range Detected	SMCL	OSRG	Possible Source of Contamination
Magnesium (ppm)	2019	3	1.1-3.0	-	-	Natural Mineral and Organic Matter
Chloride (ppm)	2019	40	7.2-40	250	NA	Natural Mineral, Road Salt
Calcium (ppm)	2019	14	3.0-14	-	-	Natural Mineral and Organic Matter
Iron (ppb)	2019	0.08	0-0.08	300	NA	Erosion of Natural Deposits and oxidation of iron components
Manganese (ppb)*	2019	0.012	0-0.012	50	NA	Erosion of Natural Deposits
Sodium(ppm)**	2019	28**	5.7-28	-	20	Road Salting;erosion of natural deposits
Potassium (ppm)	2019	1.2	0.6-1.2	-	-	Natural Mineral and Organic Matter
Sulfate (ppm)	2019	7.2	5.1-7.2	250	250	Natural Sources
Zinc (ppm)	2019	0.014	0-0.014	5	NA	Erosion of Natural Deposits and industrial discharge

*EPA has established a lifetime health advisory (HA) for Manganese at 300ppb and an acute at 1000ppb

**Sodium is a naturally-occurring element found in soil and water. It is necessary for the normal functioning of regulating fluids in human systems.Some people,however, have difficulty regulating fluid volumeas a result of several diseases , including congestive heart failure and hypoertension. The guideline of 20mg/L for sodium represents a level in water tthat physicians and sodium sensitive individuals should be aware of in cases where sodium exposures are being carefully controlled.For additional information,contact your health care provoder, your local Board of Health or the Massachusetts Dept. of Public Health,Bureau of Environmental Health Assessment at 617-624-5757.

NATIONAL PRIMARY DRINKING WATER REGULATION COMPLIANCE

The Total Coliform rule requires water systems to meet a stricter limit for Coliform bacteria. Coliform bacteria are harmless, but the presence in water can be an indication of disease-causing bacteria. When Coliform bacteria is found, special follow up tests are done to determine if harmful bacteria are present in the water supply. Over 500 Coliform samples were taken throughout the Bourne Water District in the year 2019.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead and copper in drinking water is primarily from materials and components associated with service lines and home plumbing. The Bourne Water District is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead and copper exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead and copper in your water, you may wish to have your water tested. Information on lead and copper in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Sodium; ORSG = 20 Sodium sensitive individuals, such as those experiencing hypertension, kidney failure or congestive heart failure, should be aware of the levels of sodium in their drinking water where exposures are carefully being controlled.
Massachusetts Office of Research and Standard Guidelines (ORSG): This is the concentration of a chemical in drinking water, at or below which, adverse health effects are likely to occur after chronic (lifetime) exposure, with a margin of safety. If exceeded, it serves as an indicator of the potential need for further action.

If you are interested in a more detailed report, contact Robert Prophett at 508-563-2294.

REQUIRED ADDITIONAL HEALTH INFORMATION:

To insure that tap water is safe to drink, Department of Environmental Protection (DEP) and Environmental Protection Agency (EPA) prescribes limits on the amounts of certain contaminants in water provided by public water systems. Food and Drug Administration (FDA) and the Massachusetts Department of Public Health regulations establish limits for contaminants in bottled water. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency Safe Drinking Water Hotline (1-800-426-4791).The sources of drinking water (both tap and bottled) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and radioactive material and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in the sources include:

(A) Microbial contaminants such as viruses and bacteria which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.

(B) Inorganic contaminants such as salts and metals which can be naturally-occurring or result from urban storm runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

(C) Pesticides and herbicides, which may come from a variety of sources such as agriculture, storm water runoff and residential uses.

(D) Organic chemical contaminants, including synthetic and volatile organics which are by-products of industrial processes and petroleum production and can also come from gas stations, urban storm water runoff and septic systems.

(E) Radioactive contaminants, which can be naturally occurring or be the results of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protec tion for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infections by Cryptosporidium are available from the Safe Drinking Water Hotline (1-800-426-4791).

SOURCE WATER ASSESSMENT

The Bourne Water District had a source water assessment performed by the MA. Department of Environmental Protection in 2002. The Source Water Assessment and Protection (SWAP) program, established under the Federal Safe Drinking Water Act requires every state to:

- Inventory land uses within the recharge areas of all public water supply sources.
- Assess the susceptibility of drinking water sources to contamination from these land uses.
- Publicize the results to provide support for improved protection.

A susceptibility ranking of high was assigned to the Bourne Water District using the information collected during the assessment by the DEP. The high ranking was due to the potential contamination from land uses such as auto repair shops, truck terminal, furniture refinishing, auto salvage operation, an industrial park and activities in the recharge area (Zone II's)of some of the wells. The complete SWAP report is available at the Bourne Water District's office. For more information contact Robert Prophett at 508-563-2294.

CROSS CONNECTION

A cross connection is a connection between a drinking water pipe and a polluted source. The pollution can come from your own home. For instance, you're going to spray fertilizer on your lawn, and you hook up your hose to the sprayer that contains the fertilizer. If the water pressure drops (say because of a fire hydrant being used or water main break) when the hose is connected to the fertilizer sprayer, the fertilizer may be sucked back into the drinking water pipes through your hose. Using an anti-siphon backflow-prevention device on your sprayer or hose bib can prevent this problem.
The Bourne Water District recommends using devices with an anti-siphon feature or equipping hose bibs with hose bib vacuum breakers to prevent against back flow. For additional information on cross connections and on the status of your water system's cross connection program, please contact Robert Prophett at 508-563-2294.

UPPER CAPE REGIONAL WATER SUPPLY COOPERATIVE
2019 Consumer Confidence Report (PWS ID # 4261024)

The Upper Cape Regional Drinking Water Supply Cooperative consists of three groundwater supply wells located in Sandwich, MA on Joint Base Cape Cod (JBCC). A Board of Managers representing four-member public water supply systems manages the Cooperative. The Cooperative has the capacity to provide a supplemental supply of water to its member public water systems, which include the Town of Falmouth, the Bourne Water District, the Mashpee Water District and the Sandwich Water District. The Cooperative also supplies water to the Otis Air National Guard public water system on JBCC and the Barnstable County Jail.
Wells #1, #2 and #3 are located in a forested area of the northeastern portion of the JBCC. In July 2004, the Department of Environmental Protection completed a source water assessment (SWAP) report for the Cooperative water supply wells. A SWAP report is a planning tool to support local and state efforts to improve water supply protection by identifying land uses within water supply protection areas that may be potential sources of contamination. The report identifies potential sources of contamination including a gas station, a medical facility and a military facility, and helps focus protection efforts on appropriate Best Management Practices. A susceptibility ranking of high was assigned to the Cooperative using information that was collected during the assessment. A copy of the report is available, upon request, from the Cooperative. JBCC has adopted a Groundwater Protection Plan to prohibit inappropriate activities on JBCC property within the Zone II areas of community public water supply wells. In addition, the Environmental Management Commission provides oversight over activities on the northern portion of the JBCC. For information regarding the Groundwater Protection Plan call Elizabeth Kirkpatrick at 508-968-6487. For information regarding the Environmental Management Commission call Len Pinaud at 508-946-2871. For questions regarding SWAP or other information contained within this document call Marisa Picone-Devine at 508-888-7262.
Our system, out of an abundance of caution and concerns about PFAS, sampled for PFAS compounds (PFBS, PFHpA, PFHxS, PFNA, PFOA, and PFOS) at all three wells in 2019; there were no detections of any of the analytes in any of the samples.

2019 WATER QUALITY DATA

Listed below are the substances detected in water samples collected during the most recent sampling period from the three (3) wells that comprise the Upper Cape Drinking Water Supply Cooperative.

Inorganic Contaminants	**Year Sampled**	**Highest Result**	**Range of Detections**	**MCL**	**MCLG**	**Violation (Y / N)**	**Possible Sources**
Nitrate	2019	0.08 ppm	0.08 ppm	10 ppm	10 ppm	No	Runoff from fertilizer use; Leaching form septic tanks, sewage; Erosion of natural deposits
Radioactive Contaminants	**Year Sampled**	**Amount Detected**	**Range of Detections**	**MCL**	**MCLG**	**Violation**	**Possible Sources**
Radium 228	2015	0.623 pCi/L	NA	5 pCi/L	0	No	Erosion of natural deposits
Combined Radium	2015	0.623 pCi/L	NA	5 pCi/L	0	No	Erosion of natural deposits
Unregulated and Secondary Contaminants	**Year Sampled**	**Amount Detected**	**Range of Detections**	**SMCL**	**ORSG**	**Violation**	**Possible Sources**
Chloroform	2019	2.08 ppb	1.09 -2.08 ppb	NA	70 ppb	No	Trihalomethane: by-product of drinking water chlorination. In non-chlorinated sources, chloroform may be naturally occurring
Chloride	2019	9.1 ppm	8.0 -9.1 ppm	250 ppm	--	NO	Runoff and leaching from natural deposits; seawater influence
Copper	2019	0.015 ppm	.009 ppm – 0.015 ppm	1 ppm	--	No	Internal corrosion of household plumbing; erosion of natural deposits
Iron	2019	10 ppb	ND – 10 ppb	300 ppb	--	No	Natural and industrial sources as well as aging and corroding distribution systems and household pipes
Sodium	2018	5.8 ppm	5.8 ppm	--	20 ppm	No	Natural erosion, road salt
Sulfate	2019	5.6 ppm	5.1 – 5.6 ppm	250 ppm	--	No	Runoff and leaching from natural deposits; industrial wastes

MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

March 6, 2017

Mr. Dan Mahoney, Chairman
Upper Cape Regional Water Supply Cooperative
P.O. Box 373
Mashpee, MA 02649

Town: Sandwich
PWS ID: 4261024
Program: Water Management Act
WMA Permit #: 9P2-4-22-261.03
Action: Final Permit Renewal

Dear Mr. Mahoney,

Please find attached the following:

- Findings of Fact in Support of the Permit Renewal Decision; and,
- Final Water Management Act Permit #9P2-4-22-261.03 for the Upper Cape Regional Water Supply Cooperative, Sandwich, Massachusetts.

If you have any questions regarding this information, please contact Julie Butler at 617-292-5552.

Sincerely,

Rebecca Weid

Rebecca Weidman
Division of Watershed Management
Bureau of Water Resources

Enclosures: UCRWSC Hydraulic Monitoring Program of the June 2002 Baseline Monitoring Report, Section 3.0

ecc: Jennifer Pederson, Massachusetts Water Works Association
Donald Rugg, UCRWSC Primary Distribution Operator
Maura Callahan, Callahan Consulting
Tom Cambareri, Cape Cod Commission
Emily Holt, MassDFG Division of Fisheries and Wildlife

Y:\DWPARCHIVE\SERO\2017\Sandwich-PWSID 4261024-Final WMA Permit Renewal-2017-03-06

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

Findings of Fact in Support of the Permit Renewal Decision
Water Management Permit #9P2-4-22-261.03

The Department of Environmental Protection ("MassDEP" or "the Department") has completed its review of the Upper Cape Regional Water Supply Cooperative's Water Management Act (WMA) permit renewal application. This review was conducted in regard to the permit for the Upper Cape Regional Water Supply Cooperative (UCRWSC) to withdraw water from the Cape Cod Basin. The Department hereby **proposes to renew** the Water Management Permit #9P2-4-22-261.03 (the "Permit") in accordance with the Water Management Act (M.G.L. 21G). The Department makes the following Findings of Fact in support of the attached Permit, and includes herewith its reasons for renewing the Permit and for the conditions of approval imposed, as required by M.G.L. c.21G, s. 11 and 310 CMR 36.00. The Permit is being issued since such action is necessary for the promotion of the purposes of M.G.L. c. 21G. The Department may modify, suspend or terminate the Permit, after notice and hearing, for violations of its conditions, of M.G.L. c. 21G, or of regulations adopted or orders issued by the Department, and when deemed necessary for the promotion of the purposes of the Water Management Act.

The Department adopted revised Water Management Regulations at 310 CMR 36.00 on November 7, 2014, (described in greater detail below). Since that time, the Department has been working closely with each Water Management Act (WMA) permittee to fully consider all aspects of their individual situations and ensure thoughtful and implementable permits.

UCRWSC Water Withdrawal History

UCRWSC is authorized to withdraw from the Cape Cod Basin a total of 3.0 million gallons per day (MGD). The system currently operates three sources: Wells 1, 2, and 3 (4261024-01G, -02G, and -03G). The original permit was issued on June 8, 2001 to the Falmouth Department of Public Works, and later transferred on December 26, 2002 to UCRWSC. The system volume was not intended to increase overall water use in the area but instead was based upon the projected need of the neighboring water systems to supplement existing sources, to provide redundancy to existing source capacity potentially impacted by contamination emanating from the Massachusetts Military Reservation, and to replace the capacity of proposed sources already lost to contamination.

A permit amendment was issued by MassDEP in April 2016 in response to a permit amendment application submitted by the UCRWSC to eliminate a special condition (Special Condition 5). Under the Water Management Act, permittees must obtain a permit amendment for changes to permit conditions.

This Permit does not authorize an increase in water withdrawal volume, nor does it add a new withdrawal source. UCRWSC's authorized withdrawal volume under its WMA Permit will continue to be an annual average daily volume of 3.0 MGD from the Cape Cod Basin.

The Permit Extensions

WMA permits issued during the first 20-year permitting cycle for the Cape Cod Basin expired on November 30, 2010. All permittees seeking to renew their Water Management permit were required to file a renewal application on or before August 31, 2010. UCRWSC filed a timely renewal application and the Department published notice of the permit renewal application in the Environmental Monitor on September 30, 2010. No public comment was received concerning UCRWSC's Water Management Permit Renewal Application.

Subsequently, the expiration dates for all Water Management permits were extended for four years by Chapter 240 of the Acts of 2010 as amended by Chapter 238 of the Acts of 2012, collectively known as the Permit Extension Act. In addition, in a letter of September 25, 2015, the Department informed UCRWSC that the Department would need additional time before making a determination on the application in order to ensure that all permit renewal applicants in the Cape Cod Basin fully understood the new Water Management Regulations (discussed below), and to give proper consideration to all permit renewal applications within the basin. Pursuant to M.G.L. c. 30A, § 13, and 310 CMR 36.18(7), UCRWSC's permit continues in force and effect until the Department issues a final decision on the permit renewal application.

The expiration date for all permits going forward in the Cape Cod Basin will be November 30, 2030, in order to restore the staggered permitting schedule set forth in the regulations.

The Water Management Act

The WMA requires the Department to issue permits that balance a variety of factors including without limitation:

- Impact of the withdrawal on other water sources;
- Water available within the safe yield of the water source;
- Reasonable protection of existing water uses, land values, investments and enterprises;
- Proposed use of the water and other existing or projected uses of water from the water source;
- Municipal and Massachusetts Water Resources Commission (WRC) water resource management plans;
- Reasonable conservation consistent with efficient water use;
- Reasonable protection of public drinking water supplies, water quality, wastewater treatment capacity, waste assimilation capacity, groundwater recharge areas, navigation, hydropower resources, water-based recreation, wetland habitat, fish and wildlife, agriculture, flood plains; and
- Reasonable economic development and job creation.

Sustainable Water Management Initiative (SWMI) and Water Management Regulation Revisions

In 2010 the Executive Office of Energy and Environmental Affairs (EEA) convened the Sustainable Water Management Initiative (SWMI) for the purpose of incorporating the best available science into the management of the Commonwealth's water resources. SWMI was a multi-year process that included a wide range of stakeholders and support from the Departments of Environmental Protection, Fish and Game, and Conservation and Recreation. In November 2012 the *Massachusetts Sustainable Water Management Initiative Framework Summary* (http://www.mass.gov/eea/docs/eea/water/swmi-framework-nov-2012.pdf) was released.

On November 7, 2014, the Department adopted revised Water Management Regulations at 310 CMR 36.00 that incorporate elements of the SWMI framework and the Water Conservation Standards adopted by the Massachusetts WRC. The regulations reflect a carefully developed balance to protect the health of Massachusetts' water bodies while meeting the needs of businesses and communities for water.

Without limitation, the Department has incorporated the following into Water Management permitting on Cape Cod:

- Safe yield determinations for the major river basins based on a new methodology developed through SWMI (see the Safe Yield in the Cape Cod Basin section of this document);
- Water needs forecasts for public water suppliers developed by the Department of Conservation and Recreation, Office of Water Resources (DCR), using a methodology reviewed and approved by the Massachusetts WRC;
- Water supply protection measures for public water supplies including Zone II delineations for groundwater sources, and wellhead and surface water protection measures as required by Massachusetts Drinking Water Regulations (310 CMR 22.00);
- Water conservation and performance standards reviewed and approved by the WRC in July 2006 and revised in June 2012 (http://www.mass.gov/eea/docs/eea/wrc/water-conservation-standards-rev-june-2012.pdf), including without limitation:
    - performance standard of 10% or less unaccounted-for-water;
    - seasonal limits on nonessential outdoor water use;
    - a water conservation program that includes leak detection and repair, full metering of the system and proper maintenance of the meters, periodic review of pricing, and education and outreach to residents and industrial and commercial water users; and
- Environmental protections developed through SWMI, including without limitation:
    - protection for coldwater fish resources;
    - minimization of withdrawal impacts in areas stressed by groundwater use;
    - mitigation of the impacts of increasing withdrawals.

Safe Yield in the Cape Cod Basin

This permit is being issued under the safe yield methodology adopted by the Department on November 7, 2014, and described in the regulations at 310 CMR 36.13. As of the date of the issuance of this permit, the safe yield for the Cape Cod Basin is 266.00 million gallons per day (MGD), and total registered and permitted withdrawals are 51.87 MGD, leaving 214.13 MGD potentially available. The maximum withdrawals that will be authorized in this permit, and all other permits currently under review by the Department within the Cape Cod Basin, will be within the safe yield and may be further conditioned as outlined in the regulations. Also as noted this renewed permit does not allocate any increase in withdrawals volumes over those previously allocated so there is no change to the volumes available under safe yield.

Findings of Fact for Special Permit Conditions in the UCRWSC's Water Management Act Permit Renewal

The following Findings of Fact for the special conditions included in the permit generally describe the rationale and background for each special condition in the permit. This summary of permit special conditions is not intended to, and should not be construed as, modifying any of the permit special conditions. In the event of any ambiguity between this summary and the actual permit conditions, the permit language shall control.

Special Condition 1, Maximum Authorized Annual Average Withdrawal Volume, reflects the permitted withdrawal volume of 3.0 MGD. UCRWSC's actual water use has been substantially below this value. The average daily withdrawal volumes for the system for 2013, 2014, and 2015 were 1.06, 1.36, and 1.03 MGD, respectively.

Although actual withdrawal volumes have been significantly below those allocated, the Department has not changed the volumes authorized in this Permit. This system is expected to have largely varying demands based on the status of its interconnected systems, and its role in replacing sources lost due to contamination.

Special Condition 2, Maximum Authorized Daily Withdrawal Volumes from Each Withdrawal Point, reflects the volume of groundwater withdrawal expressed as a maximum daily rate for each source included in the Permit, according to Department-approved Zone II rates.

Special Condition 3, Zone of Contribution (Zone II or Zone III Delineations)
The requirement has been met and no further delineations are required as a condition of this Permit.

Special Condition 4, Wellhead Protection
The requirement has been met and no further wellhead protection measures are required as a condition of this Permit.

Special Condition 5, Shawme Lakes Long-Term Monitoring Plan
In the original Permit, the Department required monthly groundwater level monitoring in six wells located between the three UCRWSC water-supply wells and Shawme Lakes. The purpose of the monitoring was to evaluate the potential withdrawal impacts of Wells 1-3 on Shawme Lakes. Monitoring was conducted consistent with the plan included in Section 3.0 of the Hydraulic Monitoring Program of the June 2002 Baseline Monitoring Report and related updates. A detailed assessment of the monitoring results was required annually by the Department. Water-level monitoring continued through 2015.

Due to a lack of observed impacts over the monitoring period, an April 2016 Permit Amendment suspended the condition provided that UCRWSC's annual average withdrawal remains below 2.5 MGD (authorized annual average withdrawal volume of 3.0 MGD). If UCRWSC's annual average withdrawal volume reaches or exceeds 2.5 MGD in the future, the monitoring shall recommence to reevaluate the withdrawal impacts of Wells 1-3 on Shawme Lakes. Note that the suspension of Special Condition 5 has no effect on UCRWSC's water-quality monitoring requirements, which fall under the Department's Drinking Water Program.

Special Condition 6, Water Conservation and Reporting Requirements
UCRWSC's Annual Statistical Report shall provide an explanation of any difference between the total volumes reported to be withdrawn from the wells and the total volumes reportedly sold to neighboring systems. Should the volume withdrawn exceed the volumes sold by 10% or more, UCRWSC must provide a plan to the Department within 3 months to address this unaccounted-for water loss.

UCRWSC is required to provide a monthly breakdown of the volumes sold to each individual supplier with the Annual Statistical Report filed each year with the Department.

Special Condition 7, Chapter 30 Section 61 Permit Findings
The Department hereby finds that, with implementation by the proponent of the appropriate conditions described above, all practicable and feasible means and measures will be taken to avoid or minimize adverse water withdrawal and related impacts to the environment associated with the three water supply wells.

Minimization of Groundwater Withdrawal Impacts in Stressed Subbasins, requires permittees with permitted groundwater sources in subbasins[1] with net groundwater depletion of 25% or more during August to minimize their withdrawal impacts on those subbasins to the greatest extent feasible.

Because the UCRWSC`s permitted sources are located on Cape Cod where August net depletion has not been established, minimization measures are not required in permits issued on the Cape at this time.

Coldwater Fish Resource Protection was incorporated into the Water Management Regulations in November 2014. Coldwater Fish Resource Protection is not a condition of this permit because the UCRWSC's withdrawals do not impact any waters that MA Division of Fisheries and Wildlife has identified as supporting coldwater fish at this time.

Mitigation of the Impacts of Increasing Withdrawals
Because UCRWSC acts as a wholesaler of water to other systems, mitigation was not applied to this Permit but is expected to be included as appropriate in the permits of Public Water Suppliers purchasing water from UCRWSC.

Nonessential Use Restrictions
Because UCRWSC acts as a wholesaler of water to other systems, the requirement to restrict nonessential seasonal uses has not be applied to this Permit but is expected to be included as appropriate in the permits of Public Water Suppliers purchasing water from UCRWSC.

[1] Subbasins used for WMA permitting are the 1,395 subbasins delineated by the U.S. Geological Survey in *Indicators of Streamflow Alteration, Habitat Fragmentation, Impervious Cover, and Water Quality for Massachusetts Stream Basins* (Weiskel *et al.*, 2010, USGS SIR 2009-5272).

WATER WITHDRAWAL PERMIT
MGL c 21G

This permit is issued pursuant to the Massachusetts Water Management Act for the sole purpose of authorizing the withdrawal of a volume of water as stated below and subject to the following special and general conditions. This permit conveys no right in or to any property.

PERMIT NUMBER: 9P2-4-22-261.03 **RIVER BASIN:** Cape Cod

PERMITTEE: Upper Cape Regional Water Supply Cooperative
P.O. Box 373
Mashpee, MA 02649

EFFECTIVE DATE: March 6, 2017

EXPIRATION DATE: November 30, 2030

TYPE AND NUMBER OF WITHDRAWAL POINTS:
Groundwater: 3
Surface Water: 0

USE: Public Water Supply

DAYS OF OPERATION: 365

LOCATION(S):

Table 1: Withdrawal Point Identification

Source	Source Code	Latitude	Longitude
Well #1	4261024-01G	40 43 14	70 29 35
Well #2	4261024-02G	41 44 00	70 30 27
Well #3	4261024-03G	41 44 10	70 30 45

SPECIAL CONDITIONS

1. Maximum Authorized Annual Average Withdrawal Volume

This permit authorizes UCRWSC to withdraw water from the Cape Cod Basin at the rate described below (Table 2). The permitted volume is expressed in millions of gallons, both as an average daily withdrawal rate per year (MGD) and as a total annual withdrawal volume (MGY) for each of the five-year periods of the permit term.

The Department will use the raw water withdrawal volume from all authorized withdrawal points to assess compliance with the registered and permitted withdrawal volumes.

Table 2: Maximum Authorized Average Annual Withdrawal Volume

Permit Periods	Daily Average (MGD)	Total Annual (MGY)
3/6/2017 to 11/30/2020	3.0	1095.00
12/1/2020 to 11/30/2025	3.0	1095.00
12/1/2025 to 11/30/2030	3.0	1095.00

2. Maximum Authorized Daily Withdrawal Volume

Withdrawals from individual withdrawal points are not to exceed the approved maximum daily volume listed below (Table 3) without specific advance written approval from the Department. The authorized maximum daily volume is the approved rate of each source. In no event shall the combined withdrawals from the individual withdrawal points exceed the withdrawal volumes authorized above in Special Condition 1.

Table 3. Maximum Authorized Daily Withdrawal Volumes

Source	Source Code	Maximum Daily Rate (MGD)
Well #1	4261024-01G	1.5
Well #2	4261024-02G	1.5
Well #3	4261024-03G	1.5

3. Zone of Contribution (Zone II or Zone III) Delineations

Department records show that all three wells have MassDEP approved Zones of Contribution. Therefore, no further Zone of Contribution work is required as a condition of this permit.

4. Wellhead Protection

UCRWSC's records indicate that UCRWSC has adopted land use controls and water supply protection measures meeting the requirements of 310 CMR 22.21(2) in the Zone IIs of Wells 1, 2, and 3. These controls are authorized through the *"Groundwater Protection Policy"* and the *"Groundwater Resources Performance Standards"* established by the state's Environmental Management Commission in the Final Environmental Impact Report (EOEA #12277), which was found to have adequately and properly complied with the Massachusetts Environmental Policy Act in the Secretary's Certificate issued on April 1, 2002. The *"Groundwater Protection Policy"* was established as a Memorandum of Agreement (MOA), in 1997 by the MMR Environmental Quality Control Committee. The MOA includes controls for areas off the Camp Edwards Training area that are not covered in the *"Groundwater Resources Performance Standards"*. Should the MOA expire and not be renewed, UCRWSC will need to demonstrate to the Department's satisfaction a "Best Effort" in encouraging the Town of Sandwich to amend the Sandwich Water Resources District Map (dated March 1995) to include the Zone II(s) for Wells 1-3. Provided either the MOA remains in place or the "Best Effort" standard is met, the Upper Cape Regional Water Supply Cooperative is in compliance with State Wellhead Protection requirements. Continued compliance with 310 CMR 22.21(2) is required as condition of this permit.

5. Shawme Lakes Long-Term Monitoring Plan

In the April 2016 Permit Amendment, the Department approved a suspension of the groundwater-level monitoring required by Special Condition 5, provided that UCRWSC's annual average withdrawal volume remains below 2.5 MGD of their authorized annual average withdrawal volume of 3.0 MGD. If UCRWSC's annual average withdrawal volume reaches or exceeds 2.5 MGD in the future, the monitoring shall recommence to reevaluate the withdrawal impacts of Wells 1-3 on Shawme Lakes. The monitoring shall be consistent with the plan included in Section 3.0 of the Hydraulic Monitoring Program of the June 2002 Baseline Monitoring Report (attached) and related updates. A detailed assessment of the monitoring results for the prior calendar year must be filed on or before April 15^{th} with: MassDEP, Attn: Water Management Program, One Winter St, 5^{th} floor, Boston, MA 02108.

6. Water Conservation & Reporting Requirements

UCRWSC's Annual Statistical Report shall provide an explanation of any difference between the total volumes reported to be withdrawn from the wells and the total volumes reportedly sold to neighboring systems. Should the volume withdrawn exceed the volumes sold by 10% or more, the Cooperative must provide a plan to the Department within three months to address this unaccounted-for water loss.

UCRWSC is required to provide a monthly breakdown of the volumes sold to each individual supplier with the Annual Statistical Report filed each year with the Department.

7. **Chapter 30 Section 61 Permit Findings**

The Department hereby finds that, with implementation by the proponent of the appropriate conditions described above, all practicable and feasible means and measures will be taken to avoid or minimize adverse water withdrawal and related impacts to the environment associated with the three water supply wells.

GENERAL CONDITIONS (applicable to all permittees)

No withdrawal in excess of 100,000 gallons per day shall be made following the expiration of this Permit, unless before that date the Department has received a renewal permit application pursuant to 310 CMR 36.00.

1. **Duty to Comply** The permittee shall comply at all times with the terms and conditions of this Permit, the Water Management Act and all applicable State and Federal statutes and regulations.

2. **Operation and Maintenance** The permittee shall at all times properly operate and maintain all facilities and equipment installed or used to withdraw water so as not to impair the purposes and interests of the Act.

3. **Entry and Inspections** The permittee or the permittee 's agent shall allow personnel or authorized agents or employees of the Department to enter and examine any property over which the Permitee has authority, title or control, for the purpose of determining compliance with this Permit, the Act or the regulations published pursuant thereto, upon presentation of proper identification and an oral statement of purpose.

4. **Water Emergency** Withdrawal volumes authorized by this Permit are subject to restriction in any water emergency declared by the Department pursuant to M.G.L. c. 21G ss 15-17, M.G.L. c. 150 ss 111, or any other enabling authority.

5. **Transfer of Permits** This Permit shall not be transferred in whole or in part unless and until the Department approves such transfer in writing, pursuant to a transfer application on forms provided by the Department requesting such approval and received by the Department at least thirty (30) days before the effective date of the proposed transfer. No transfer application shall be deemed filed unless it is accompanied by the applicable transfer fee established by 310 CMR 36.33 and 310 CMR 4.00.

6. **Duty to Report** The permittee shall complete and electronically submit annually, via eDEP available through the Department's website, all of the information required by the electronic Annual Statistical Report (eASR) including, without limitation, a certified statement of the withdrawal. Such report shall be received each year by the Department by the date specified on the eASR.

7. **Duty to Maintain Records** The permittee shall maintain withdrawal and all other records and other information in sufficient detail to demonstrate compliance with this Permit.

8. **Metering** All withdrawal points included within the Permit shall be metered within one year of the date of issuance of the Permit. Meters shall be maintained and replaced as necessary to ensure the accuracy of the withdrawal records.

9. **Right to Amend, Suspend or Terminate** The Department may amend, suspend, or terminate the permit in accordance with M.G.L. c. 21G and 310 CMR 36.29.

APPEAL RIGHTS AND TIME LIMITS
This Permit is a decision of the Department. Any person aggrieved by this decision may request an adjudicatory hearing as described herein and in accordance with the procedures described at 310 CMR 36.37. Any such request must be made in writing, by certified mail or hand delivered and received by the Department within twenty-one (21) days of the date of receipt of this permit. The hearing request, including proof of payment of the filing fee, must be mailed to:

Case Administrator
MassDEP Office of Appeals and Dispute Resolution
One Winter Street
Boston, MA 02108

No request for an appeal of this permit shall be validly filed unless a copy of the request is sent by certified mail or delivered by hand to the local water resources management official in the city or town in which the withdrawal point(s) is located; and for any person appealing this decision, who is not the applicant, unless such person notifies the permit applicant of the appeal in writing by certified mail or by hand within five (5) days of mailing the appeal to the Department.

CONTENTS OF HEARING REQUEST
310 CMR 1.01(6)(b) requires the request to include a clear and concise statement of the facts which are the grounds for the request and the relief sought. In addition, the request must include a statement of the reasons why the decision of the Department is not consistent with applicable rules and regulations, and for any person appealing this decision who is not the applicant, a clear and concise statement of how that person is aggrieved by the issuance of this Permit.

FILING FEE AND ADDRESS
The Department's fee transmittal form, together with a valid check, payable to the Commonwealth of Massachusetts in the amount of $100 must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

The request shall be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver as described below.

EXEMPTIONS
The filing fee is not required if the appellant is a city or town (or municipal agency), county, district of the Commonwealth of Massachusetts, or a municipal housing authority.

WAIVER
The Department may waive the adjudicatory hearing filing fee for any person who demonstrates to the satisfaction of the Department that the fee will create an undue financial hardship. A person, seeking a waiver must file, together with the hearing request, an affidavit setting forth the facts, which support the claim of undue hardship.

Rebecca Weid

Rebecca Weidman
Director of the Division of Watershed Management

March 6, 2018
Date

3.0 HYDRAULIC MONITORING PROGRAM

3.1 Introduction

A detailed analysis of Upper and Lower Shawme Lakes conducted as part of the New Source Approval process indicated no effect on surface water elevations although the potential exists that at non-stop higher withdrawal rates groundwater entering the Lakes may be intercepted. To ensure protection of the resource, hydrogeologic monitoring of the lake system was incorporated into the LTMP. The program includes measurement of stream discharge leaving the lake system and monitoring of six existing and one newly installed well on a monthly basis to record groundwater levels. The combined water level will be compared to historical data from USGS well SDW-253.

SDW-253 is located far enough from the production wells that it is not affected by pumping. Data collected over approximately 40 years by the USGS will be used to differentiate normal seasonal fluctuations from potential impacts from the project. Seasonal fluctuation can not be accounted for in the numerical groundwater flow model.

A monitoring well couplet will be installed on the northern shore of Upper Shawme Lake, by the Sandwich Water Department during the summer of 2002. Water table elevation, as well as a vertical hydraulic gradient will be recorded from this location on a monthly basis by the members of the Shawme Ponds Association and provided to the Cooperative.

The data from the monitoring program will allow the system operators and regulators to verify results from groundwater modeling and provide a better understanding of the groundwater aquifer.

3.2 Baseline Conditions at Shawme Lakes

The Army Corps of Engineers contracted the USGS establish baseline conditions at Shawme Lakes. The USGS installed staff gauges and developed rating curves in both Upper and Lower Shawme Lakes early this fall at Shawme Lakes under non-pumping conditions.

The USGS installed a staff gauge at the discharge of Lower Shawme Lake, on the upstream side of Main Street above a small wooden weir. Flow in Mill Creek was measured weekly to establish a rating curve for this gauge and was shown to fluctuate from 8 cubic feet per second (cfs) in the spring months and 5 cfs during the summer. These measurements will be used to relate stage to discharge in Mill Creek for long term monitoring. Another staff gauge was installed at the canoe launch on Lower Shawme Lake, which will be used to record lake levels.

A third staff gauge was installed on Cook's Dam on Upper Shawme Lake. Here the USGS is attempting to relate lake stage at the dam to the discharge over the dam. However, the configuration and condition of the dam makes obtaining an accurate measurement difficult. The spillway over the dam is very narrow, steep, turbulent and short in length. These factors create an insensitive rating in which a small change in lake levels result in a large change in discharge. Thus, the USGS is attempting to measure flow below the spillway in an area where the flow enters the lake.

The initial USGS report is included in Appendix F. The report indicates that the discharge at Mill Creek can be adequately monitored. The report also states that the discharge at Lower Shawme Lake is largely controlled by the release of water through the gristmill located at the northern end of Lower Shawme Lake, The discharge has been shown to almost double when the grist mill is operated and has been recorded at up to 13 cfs or almost double the average discharge when not running. It also indicates that the leaks in the Upper Shawme Lakes dam make it difficult to get accurate reading, between the Lakes.

The staff gauges will continue to be recorded on a weekly basis by members of the Shawme Ponds Watershed Association, through September of 2002.

3.3 Baseline Groundwater Monitoring

The baseline monitoring of six existing wells has been accomplished by recording groundwater levels in the proposed wells except well S-7, which has not yet been located. Water levels have also not been recorded in well P-1, as it has not yet been installed. Background water levels are reported in Table 3-1 below for May and July of 2000 and for March of 2002. Based on this initial data it appears that water table fluctuation throughout the aquifer is currently fairly consistent.

Table 3-1
Groundwater Level Data

Well	Northing	Easting	TOC Elevation (ft msl)	Water Elevation (May 2000)	Water Elevation (July 2000)	Water Elevation (March 2002)
LRWS3-1	270414.96	873298.00	69.05	44.22	44.30	43.29
MW-101	271387.50	874847.60	121.2	NM	42.07	40.93
MW103S	272746.60	874895.90	NA	38.44	NM	37.44
S-7	NA	NA	NA	NM	NM	NM
SDW-263	277154.00	866866.00	NA	36.04	36.35	35.03
SM-5	273317.78	869850.18	115.26	40.69	40.81	39.63
P-1	TBD	TBD	NA	NM	NM	NM

The water levels in SDW-253 have been compared to historical data from USGS well SDW-253 and it appears that the groundwater fluctuation recorded in this well are similar to what has been observed to date in the selected wells.

As discussed earlier, seasonal groundwater fluctuations can not be accounted for in the numerical groundwater flow model nor can seasonal variation in recharge (precipitation). As part of this baseline evaluation rainfall data provided by the Sandwich Water District was reviewed an is attached in Appendix G.

The rainfall data which has been collected since 1989 indicates that the average yearly rainfall in Sandwich is approximately 48 inches, which is higher than the 44 inches that is normally referred to for Cape Cod. How this increase effects recharge of the groundwater system is beyond the scope of this report, however it indicates that the groundwater modeling effort may have conservatively under-estimated recharge.

The seasonal rainfall data indicates that the majority of the recharge is in March and April when almost 20 percent of the rainfall occurs. Therefore it would be expected that seasonal groundwater highs as in most of Massachusetts would occur during this time. However, it appears that in the Sandwich area this is not true based upon USGS water level records.

The water levels in SDW-253 have been recorded for forty years and are tabulated in Appendix G. A graph of this data presented in Figure 3-1 indicates that highest water levels seen in the aquifer are in July although they have also been recorded at the end of June or in August. The highest level ever recorded was on July 30, 1973, while the lowest level was on February 28, 1967. Resulting in a maximum water table fluctuation of over nine feet.

Based on the graph there appears to be a lag time between the high recharge events of March and April and the high water levels of June, July and August. The lower recharge period of July and August cause a lower water table in the fall months. This pattern appears to be consistent in almost every recorded year, even in years of drought.

Comparison of discharge data and water levels recorded in the five monitoring wells currently installed within the aquifer indicate that as water levels in the aquifer drop the discharge from the lake system is effected. Further collection of data through the spring summer of 2002 by the USGS and Sandwich Water Department will allow for a more detailed evaluation of this relationship.

MAHONEY & DOUGLAS, LTD.
ENVIRONMENTAL SERVICES
P.O. BOX 473 • FALMOUTH, MA 02540 • TEL (508) 457-1788

February 3, 2003

Ms. Julie Hutchison
DEP/BWSC/ER
20 Riverside Drive
Lakeville, MA 02347

RE: Town Of Bourne
County Road @ Marion Lane, Bourne
RTN 4-17333
Request for Information - Interim Deadline

Dear Ms. Hutchison:

In response to the *Request for Information with Enforceable Interim Deadline*, dated January 8, 2003, Mahoney & Douglas, ltd. (M&D), on behalf of the Town of Bourne, is pleased to provide the following information with respect to the release of hazardous material at the above-referenced location ("the site").

On May 8, 2002, laboratory results of a groundwater sample collected from the deep well of a well couplet installed on County Road, designated MW24D, were reported with 8.5 parts per billion (ppb) 1,2-Dichloroethane (1,2-DCE). On June 6, 2002, laboratory results of a duplicate groundwater sample collected from MW24D (designated MW24D-duplicate) was reported with 9.5 ppb 1,2-DCE. The well couplet was installed as part of a Hydrogeological Study being conducted by Bourne Integrated Solid Waste Management (ISWM), located on MacArthur Boulevard, Bourne, MA, as part of the ISWM facility's Solid Waste Permit and in cooperation with the Cape Cod Commission (CCC) Joint Review Process Application.

On January 27, 2003 and per your request, M&D spoke with Mr. Mark Dakers of the Solid Waste Division to discuss the findings of the Hydrogeological Study and the site-specific conditions at the release location. Key points of our discussion included:

The "site" is within the mapped "Impaired Area" as designated by Cape Cod Commission's Regional Policy Plan (RPP).

All private drinking water wells within the Impaired Area have been connected to town water. Therefore, there are currently no human receptors.

The Bourne Water District has provided an analysis of their current and future drinking water supply needs which they have stated are, and will be, met without water supply development in the area downgradient of the landfill - the Impaired Area. In addition, the Impaired Area is anticipated to be designated as Non-Potable by the Bourne Board of Health eliminating any possible future private water supply development. In response to these changes, the Town of Bourne intends to seek to have the area designated as a "Non-Potential Drinking Water Source Area (NPDWSA). Once the designation is applied to the area, and the site, the GW1 standard will no longer apply and a condition of no significant risk (NSR) will be met.

Although GW2 and GW3 standards will apply to the site, the concentration of 1,2-DCE is below the applicable standards. Therefore, there are no human or environmental receptors.

Plans to excavate the remaining unlined portion of the landfill are pending; the excavated material will be emplaced into the newly lined area once the Authorization To Construct (ATC) is issued. The previous excavation of refuse and the installation of lined cells has mitigated the impact from the former landfill on groundwater quality downgradient from the landfill. Groundwater quality will continue to improve based upon the former and planned lined cell installations.

The site is 4,687 feet from the landfill.

One (1) other location was found with 1,2-DCE during the Hydrogeological Study; MW25D, located on County Road at at 0.8 ppb. No locations at the ISWM facility or between the ISWM facility and County Road were found with any 1,2-DCE during the quarterly sampling event in April 2002. The highest reported level of 1,2-DCE at the landfill was 10 ppb in MW7 in August 1986.

Potential sources of the 1,2-DCE located downgradient of the landfill include:

•Former un-permitted stump dump known as "the Nightingale Property" located in the vicinity of Brookside Golf Association
•A Gravel Pit on Great Rock Road
•Sel's Foreign Auto - Colonel Drive
•Great Rock Tractor - Colonel Drive
•O'Brien & Co Printers - Colonel Drive
•Bourne Bridge Rental - Colonel Drive
•Pro's Finishing - Colonel Drive
•Donovan Construction - Colonel Drive
•Dean's Carpets - Colonel Drive
•Quadrant-MA Automation - Colonel Drive

Based upon the historic data from the landfill, the distance of the site from the landfill, the field screening data from the well couplet installations, and the lack of 1,2-DCE in other wells at or between the ISWM facility and the site, M&D determined that the site is not within the area defined as "adequately regulated" under the Solid Waste Division. Furthermore, M&D determined that it is more likely than not that the potential source of 1,2-DCE is from other sources situated upgradient of the site and downgradient of the landfill (noted above).

The identification of 1,2-DCE in MW24D above the applicable reportable concentration, RCGW-1, was reported to the Department of Environmental Protection (DEP), Bureau of Waste Site Clean-up (BWSC) per the 120-Day notification requirements on September 5, 2002. The reporting was completed with the Release Notification Form (RNF), BWSC #103 according to the Massachusetts Contingency Plan (MCP) 310 CMR 40.0315(1). The attached USGS Topographic Quadrangle of Pocasset, MA (7.5 min Series) indicates the locations of the well couplets installed during the Hydrogeological Study conducted for Bourne ISWM.

According to Mr. Dakers, if his analysis of the Hydrogeological Study finds that the site is within the adequately regulated area of the landfill, then it will be regulated under the Solid Waste Division and not under Waste Site Clean-up. The issue of regulatory jurisdiction will be resolved upon the submittal of the Hydrogeological Study Report anticipated to be completed sometime in February 2003.

Should you have any questions, comments, or concerns, please do not hesitate to contact me.

Sincerely,

Kate Mahoney
Project Manager

encl: USGS Topographic Quadrangle of Pocasset showing well couplet locations installed in 10/01 and 1/02

cc: William R. Griffin, Town Administrator
Brent Goins, General Manager ISWM
Dick Keller, P.E.
Mark Dakers, DEP/Solid Waste

Figure 9 Monitoring Well Locations Of New Well Couplets H.I. Sudy Area

Bourne Integrated Solid Waste Management Facility
201 MacArthur Blvd.
Bourne, Massachusetts 02532

MAHONEY & DOUGLAS, LTD.
P. O. Box 473
Falmouth, Massachusetts 02541

BOURNE WATER DISTRICT
211 Barlow's Landing Road, P.O. Box 1447
Pocasset, Massachusetts 02559
508-563-2294 FAX Number 508-564-4661

November 4, 2002

Phil Goddard, Environmental Manager
I.S.W.M. Dept.
24 Perry Ave.
Buzzards Bay, 02532

Gentlemen,

First, I would like to state that the Bourne Water District does not have any water supplies downgradient of the present Bourne Landfill, or any plans to look for potential supplies in that area. The Bourne Water District presently has 6 water supply wells. 3 of the wells are presently shutdown as a precaution to a perchlorate issue. The MCL for perchlorate has yet to be set. The EPA is working on this issue and looks to set a MCL in the near future.

The Bourne Water District is a member of the Upper Cape Water Supply Cooperative and can and has bought water from the Cooperative. We are also looking at a potential water source on the MMR known as WS-4 for a future emergency water supply with the potential for a permanent site in the future.

In conclusion, we have no intention of looking in the Bourne Water District boundaries for new well sites. We will be looking at different treatment processes for our affected wells if we must treat for the perchlorate. We will continue to use Cooperative water as needed with our 3 other sources to meet our daily demands.

If you have any questions please contact me at 508-563-2294

Sincerely,

Ralph M. Marks
Superintendent of Operations

BOURNE WATER DISTRICT
211 Barlow's Landing Road, P.O. Box 1447
Pocasset, Massachusetts 02559
508-563-2294 FAX Number 508-564-4661

RECEIVED
AUG 11 1993
BO
TOWN OF BOURNE
BOARD OF SELECTMEN

August 6, 1993

Town of Bourne
Office of the Selectmen
24 Perry Avenue
Buzzards Bay MA 02532

Re: Re-permit for the Bourne Sanitary Landfill

Gentlemen:

The Bourne Water District does not have a wellfield downgradient from the Bourne Sanitary landfill and although we are beginning to look for additional wellfield sites the State Department of Environmental Protection would not permit us to use a site that is downgradient of the landfill.

The District has no objection to the renewal of the landfill permit.

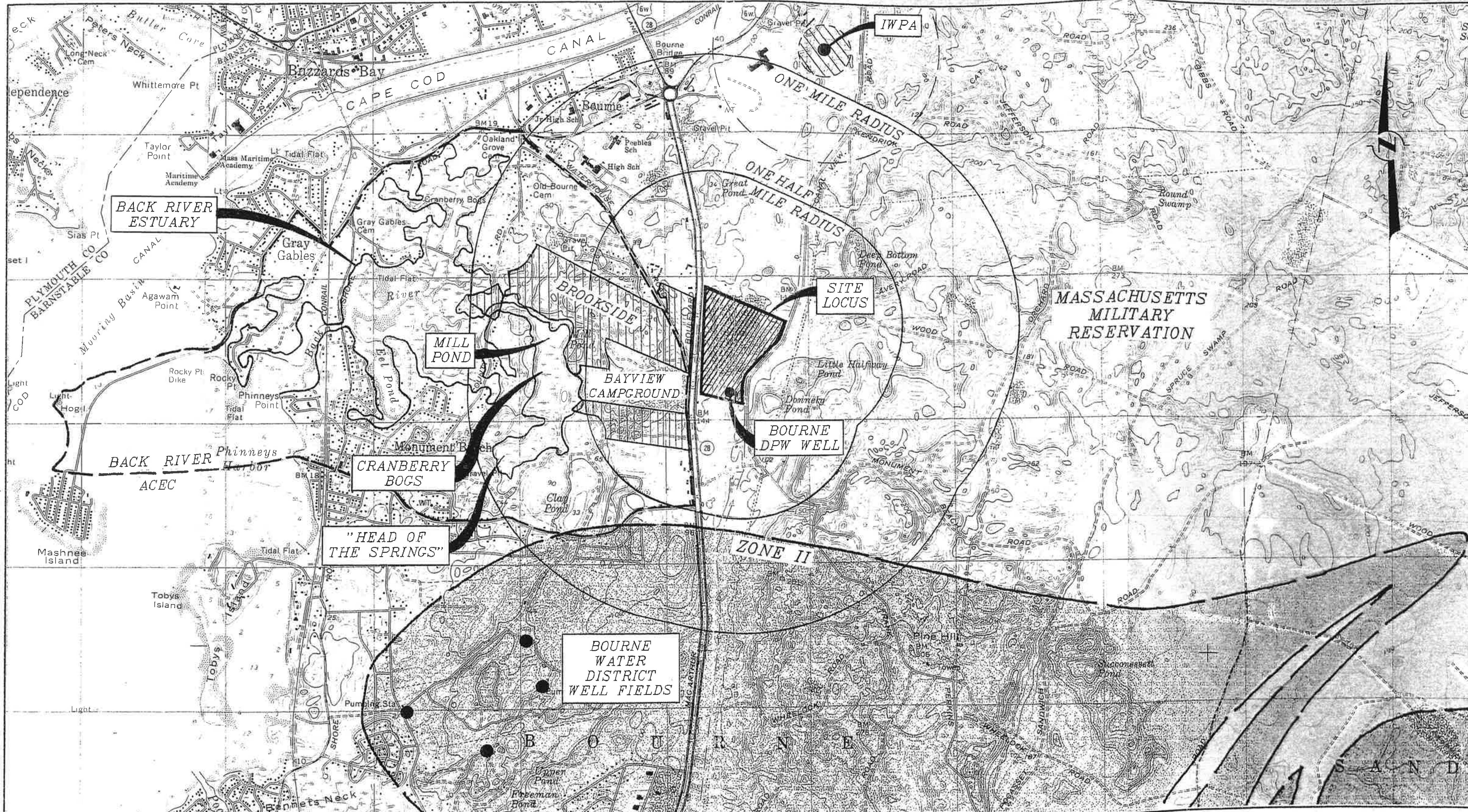
Sincerely,

Ann C. Candrilli

Ann C. Candrilli
Treasurer

DEIR Dec 88

FIGURES



REFERENCES:

1. MASS GIS, PRIORITY RESOURCES MAP, NOVEMBER 4, 1998.
2. USGS 7 1/2 MINUTE QUADRANGLES: POCASSET (1979), ONSET (1967).

INTEGRATED SOLID WASTE MANAGEMENT FACILITY

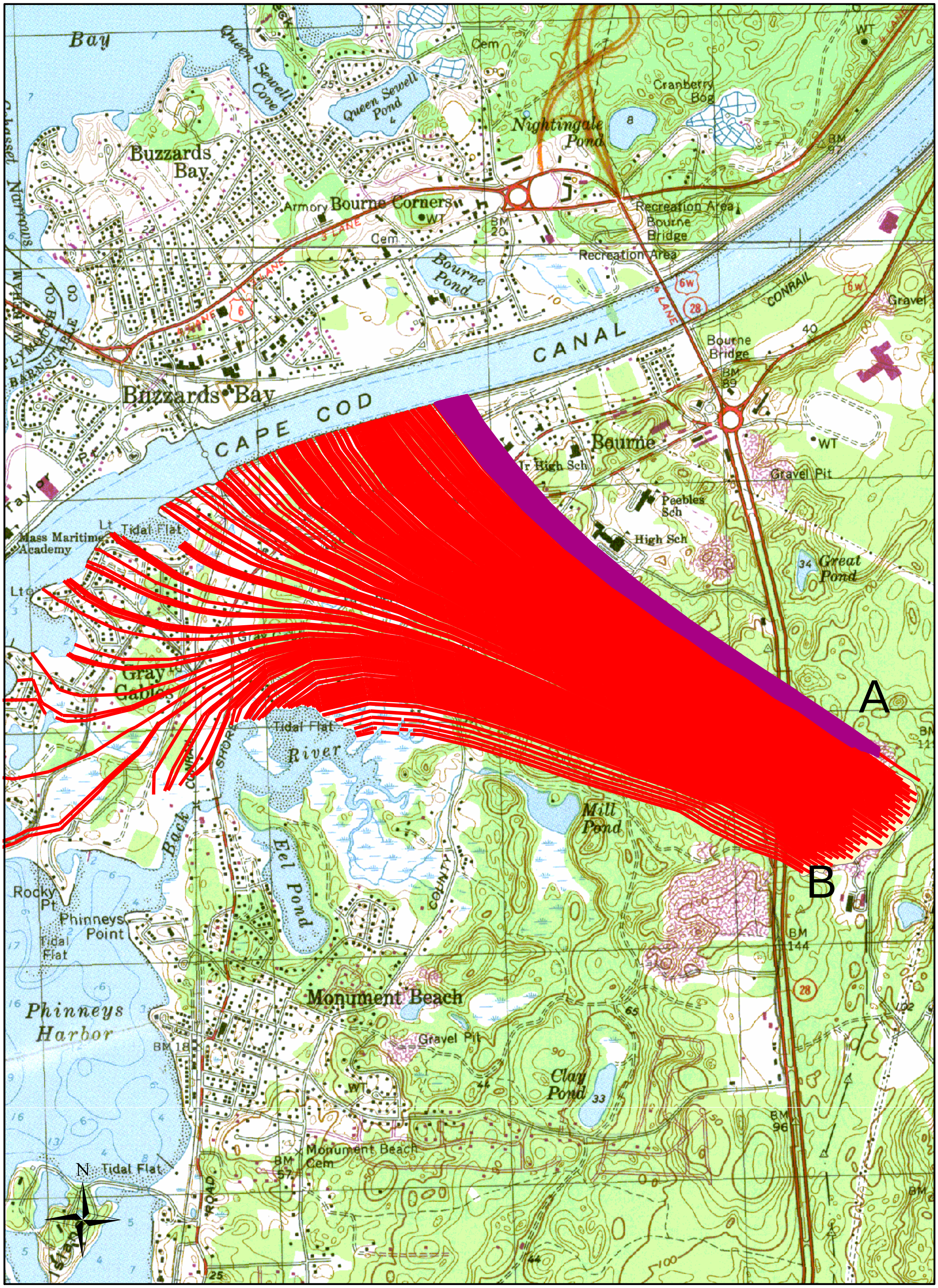
BOURNE, MASSACHUSETTS

SCALE: 1:25,000

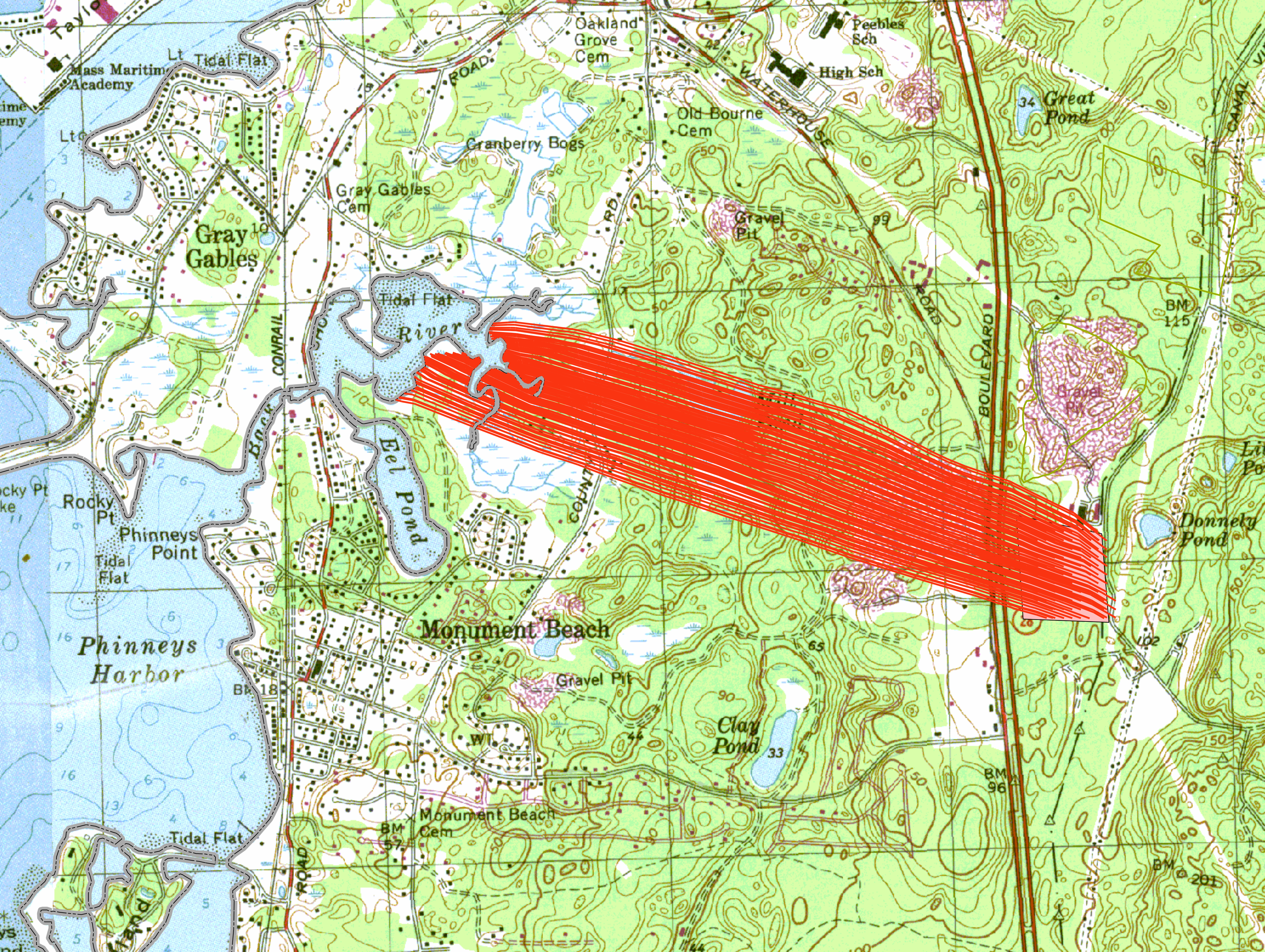
WATER RESOURCES PLAN

FIGURE 14

Cushing, Goins & Kirschner, Inc
422 West Grove Street
Middleborough, Massachusetts 02348
Phone Number: (508) 923-0879 Fax Number: (508) 923-089



Buzzards Bay
Queen Sewell Cove
Queen Sewell Pond
Buzzards Bay
Nightingale Pond
Cranberry Bog
Armory
Bourne Corners
Cem
Recreation Area
Bourne Bridge
Bourne Pond
CAPE COD CANAL
Buzzards Bay
Bourne
Jr High Sch
Peebles Sch
High Sch
Gravel Pit
Great Pond
Mass Maritime Academy
Tidal Flat
Gray Gables
River
Mill Pond
A
B
Back
Eel Pond
Rocky Pt
Phinneys Point
Phinneys Harbor
Monument Beach
Gravel Pit
Clay Pond
Monument Beach Cem
N



Mass Maritime Academy
Tidal Flat
Oakland Grove Cem
Peebles Sch
High Sch
Great Pond
Old Bourne Cem
Cranberry Bogs
Gray Gables Cem
Gray Gables
Gravel Pit
Tidal Flat
River
BM 115
Gravel Pit
Eel Pond
Rocky Pt
Phinneys Point
Tidal Flat
Donnely Pond
Monument Beach
Phinneys Harbor
Gravel Pit
Clay Pond
BM 96
Monument Beach Cem
BM 57
Tidal Flat
BM 201
CONRAIL
ROAD
WATERHOUSE
BOULEVARD
COUNTY RD
CANAL

ATTACHMENT 11

A CUSTOM SOIL RESOURCE REPORT FOR BARNSTABLE COUNTY, MASSACHUSETTS, TOWN OF BOURNE, ISWM DEPARTMENT – U.S.D.A.

United States Department of Agriculture

NRCS

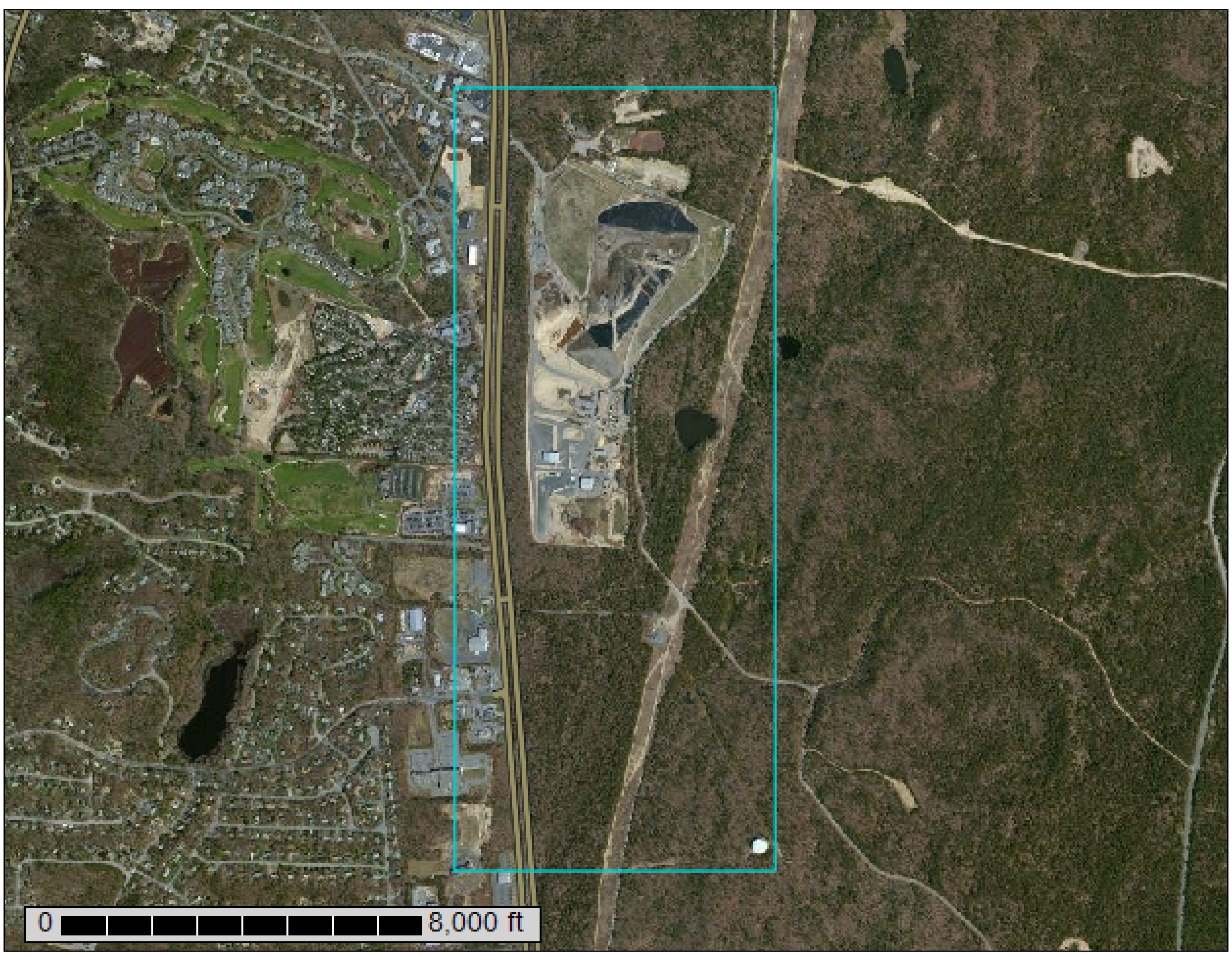
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Barnstable County, Massachusetts

Town of Bourne, ISWM Department



May 2, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

70° 35' 23" W
70° 34' 14" W
41° 44' 4" N
41° 42' 39" N
367900
368100
368300
368500
368700
368900
369100
369300
4621400
4621200
4621000
4620800
4620600
4620400
4620200
4620000
4619800
4619600
4619400
4619200
4619000
435D
431B
431C
431B
430B
435D
665
600
430B
430C
431C
600
254B
652
431B
254C
431C
1
435C
435D
254B
431B
665
483C
254A
665
483C
435C
435B
431D
431C
484C
484D
484C
431D
431B
Colonel Dr
Waterhouse Rd
Dump Rd
Wood Rd
Walkway
Canalview Rd
Macarthur Blvd
28
Harbor Hill Dr
Westerly Dr
Clay Pond Rd
Frank Perkins Rd
Laura Ln
Stephanie St
Industrial Dr
Map Scale: 1:7,280 if printed on B portrait (11" x 17") sheet.
N
0
100
200
400
600
Meters
0
350
700
1400
2100
Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 12, Sep 28, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 30, 2011—Oct 8, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Barnstable County, Massachusetts (MA001)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Water	1.9	0.4%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	20.8	4.3%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	33.4	7.0%
254C	Merrimac fine sandy loam, 8 to 15 percent slopes	4.5	0.9%
430B	Barnstable sandy loam, 3 to 8 percent slopes	31.5	6.6%
430C	Barnstable sandy loam, 8 to 15 percent slopes	9.4	2.0%
431B	Barnstable sandy loam, 3 to 8 percent slopes, very stony	72.2	15.1%
431C	Barnstable sandy loam, 8 to 15 percent slopes, very stony	42.5	8.9%
431D	Barnstable sandy loam, 15 to 25 percent slopes, very stony	6.8	1.4%
435B	Plymouth loamy coarse sand, 3 to 8 percent slopes	100.4	21.0%
435C	Plymouth loamy coarse sand, 8 to 15 percent slopes	11.3	2.4%
435D	Plymouth loamy coarse sand, 15 to 35 percent slopes	25.7	5.4%
483C	Plymouth-Barnstable complex, rolling, very bouldery	0.8	0.2%
484C	Plymouth-Barnstable complex, rolling, extremely bouldery	24.1	5.0%
484D	Plymouth-Barnstable complex, hilly, extremely bouldery	34.7	7.3%
600	Pits, sand and gravel	15.6	3.3%
652	Dumps, landfill	29.3	6.1%
665	Udipsamments, smoothed	13.2	2.8%
Totals for Area of Interest		**478.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Barnstable County, Massachusetts

1—Water

Map Unit Setting

National map unit symbol: 98s8
Frost-free period: 120 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

254A—Merrimac fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tyqr
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Merrimac and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Kames, outwash plains, outwash terraces, moraines, eskers
Landform position (two-dimensional): Summit, shoulder, footslope, backslope
Landform position (three-dimensional): Crest, side slope, tread, riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Terraces, outwash plains, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Head slope, crest, side slope, nose slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear

Agawam

Percent of map unit: 3 percent
Landform: Eskers, kames, stream terraces, outwash terraces, outwash plains, moraines
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex

Windsor

Percent of map unit: 2 percent
Landform: Dunes, deltas, outwash terraces, outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear

254B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Merrimac and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash terraces, moraines, eskers, kames, outwash plains
Landform position (two-dimensional): Shoulder, summit, footslope, backslope
Landform position (three-dimensional): Crest, side slope, tread, riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A

Minor Components

Sudbury
Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear

Hinckley
Percent of map unit: 5 percent
Landform: Eskers, outwash plains, deltas, kames
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Head slope, crest, side slope, nose slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear

Windsor
Percent of map unit: 3 percent
Landform: Deltas, outwash plains, outwash terraces, dunes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex

Agawam
Percent of map unit: 2 percent
Landform: Eskers, kames, outwash plains, outwash terraces, moraines, stream terraces
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex

254C—Merrimac fine sandy loam, 8 to 15 percent slopes

Map Unit Setting
National map unit symbol: 2tyqt
Elevation: 0 to 1,030 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Merrimac and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Eskers, outwash plains, moraines, kames, outwash terraces
Landform position (two-dimensional): Footslope, backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest, tread, riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 2 percent
Salinity, maximum in profile: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 1.0
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A

Minor Components

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Head slope, crest, side slope, nose slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear

Sudbury

Percent of map unit: 5 percent
Landform: Outwash plains, deltas, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave

Across-slope shape: Linear

Windsor

Percent of map unit: 5 percent
Landform: Outwash plains, dunes, deltas, outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex

430B—Barnstable sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 98ps
Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Barnstable and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barnstable

Setting

Landform: Ground moraines
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy ablation till over reworked sandy glaciofluvial deposits

Typical profile

H1 - 0 to 1 inches: sandy loam
H2 - 1 to 23 inches: sandy loam
H3 - 23 to 64 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A

Minor Components

Plymouth

Percent of map unit: 8 percent

Nantucket

Percent of map unit: 7 percent

Merrimac

Percent of map unit: 5 percent

Carver

Percent of map unit: 5 percent

430C—Barnstable sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 98pt
Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Barnstable and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barnstable

Setting

Landform: Ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy ablation till over reworked sandy glaciofluvial deposits; loamy ablation till over reworked sandy outwash

Typical profile

H1 - 0 to 1 inches: sandy loam
H2 - 1 to 23 inches: sandy loam
H3 - 23 to 64 inches: coarse sand

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A

Minor Components

Nantucket
Percent of map unit: 10 percent

Plymouth
Percent of map unit: 10 percent

Carver
Percent of map unit: 5 percent

Merrimac
Percent of map unit: 5 percent

431B—Barnstable sandy loam, 3 to 8 percent slopes, very stony

Map Unit Setting
National map unit symbol: 98pv
Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Barnstable and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barnstable

Setting
Landform: Ground moraines
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Parent material: Friable loamy ablation till over reworked sandy glaciofluvial deposits; loamy ablation till over reworked sandy outwash

Typical profile

H1 - 0 to 1 inches: sandy loam
H2 - 1 to 23 inches: sandy loam
H3 - 23 to 64 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 2.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A

Minor Components

Plymouth

Percent of map unit: 10 percent

Nantucket

Percent of map unit: 8 percent

Carver

Percent of map unit: 7 percent

431C—Barnstable sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 98pw
Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Barnstable and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barnstable

Setting

Landform: Ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy ablation till over reworked sandy glaciofluvial deposits; loamy ablation till over reworked sandy outwash

Typical profile

H1 - 0 to 1 inches: sandy loam
H2 - 1 to 23 inches: sandy loam
H3 - 23 to 64 inches: coarse sand

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 2.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A

Minor Components

Nantucket

Percent of map unit: 10 percent

Plymouth

Percent of map unit: 10 percent

Carver

Percent of map unit: 10 percent

431D—Barnstable sandy loam, 15 to 25 percent slopes, very stony

Map Unit Setting

National map unit symbol: 98px
Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 45 to 55 degrees F

Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Barnstable and similar soils: 65 percent
Minor components: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barnstable

Setting

Landform: Ground moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy ablation till over reworked sandy glaciofluvial deposits; loamy ablation till over reworked sandy outwash

Typical profile

H1 - 0 to 1 inches: sandy loam
H2 - 1 to 23 inches: sandy loam
H3 - 23 to 64 inches: coarse sand

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 2.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A

Minor Components

Plymouth

Percent of map unit: 10 percent

Nantucket

Percent of map unit: 9 percent

Carver

Percent of map unit: 8 percent

Hinckley

Percent of map unit: 8 percent

435B—Plymouth loamy coarse sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 98rs
Elevation: 0 to 1,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Plymouth and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Plymouth

Setting

Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loose sandy glaciofluvial deposits and/or loose sandy ablation till; loose sandy ablation till and/or loose sandy glaciofluvial deposits; loose sandy ablation till and/or loose sandy glaciofluvial deposits

Typical profile

H1 - 0 to 3 inches: loamy coarse sand
H2 - 3 to 29 inches: gravelly loamy coarse sand
H3 - 29 to 64 inches: gravelly coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A

Minor Components

Hinckley

Percent of map unit: 8 percent

Carver

Percent of map unit: 8 percent

Barnstable

Percent of map unit: 6 percent

Nantucket

Percent of map unit: 6 percent

Merrimac

Percent of map unit: 2 percent

435C—Plymouth loamy coarse sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 98rt
Elevation: 0 to 1,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Plymouth and similar soils: 65 percent
Minor components: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Plymouth

Setting

Landform: Ice-contact slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loose sandy glaciofluvial deposits and/or loose sandy ablation till; loose sandy ablation till and/or loose sandy glaciofluvial deposits

Typical profile

H1 - 0 to 3 inches: loamy coarse sand
H2 - 3 to 29 inches: gravelly loamy coarse sand
H3 - 29 to 64 inches: gravelly coarse sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained

Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A

Minor Components

Carver
Percent of map unit: 15 percent

Hinckley
Percent of map unit: 8 percent

Barnstable
Percent of map unit: 6 percent

Nantucket
Percent of map unit: 6 percent

435D—Plymouth loamy coarse sand, 15 to 35 percent slopes

Map Unit Setting
National map unit symbol: 98rv
Elevation: 0 to 1,000 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Plymouth and similar soils: 65 percent
Minor components: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Plymouth

Setting
Landform: Ice-contact slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loose sandy glaciofluvial deposits and/or loose sandy ablation till; loose sandy glaciofluvial deposits and/or loose sandy ablation till

Typical profile

H1 - 0 to 3 inches: loamy coarse sand
H2 - 3 to 29 inches: gravelly loamy coarse sand
H3 - 29 to 64 inches: gravelly coarse sand

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Minor Components

Carver

Percent of map unit: 15 percent

Hinckley

Percent of map unit: 10 percent

Barnstable

Percent of map unit: 5 percent

Nantucket

Percent of map unit: 5 percent

483C—Plymouth-Barnstable complex, rolling, very bouldery

Map Unit Setting

National map unit symbol: 98rz
Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Plymouth and similar soils: 55 percent
Barnstable and similar soils: 20 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Plymouth

Setting

Landform: Moraines
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loose sandy glaciofluvial deposits and/or loose sandy ablation till; loose sandy glaciofluvial deposits and/or loose sandy ablation till

Typical profile

H1 - 0 to 3 inches: loamy coarse sand
H2 - 3 to 29 inches: gravelly loamy coarse sand
H3 - 29 to 64 inches: gravelly coarse sand

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 2.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A

Description of Barnstable

Setting

Landform: Moraines
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy ablation till over reworked sandy glaciofluvial deposits; loamy ablation till over reworked sandy outwash

Typical profile

H1 - 0 to 1 inches: sandy loam
H2 - 1 to 23 inches: sandy loam
H3 - 23 to 64 inches: coarse sand

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A

Minor Components

Carver
Percent of map unit: 10 percent

Hinckley
Percent of map unit: 10 percent

Nantucket
Percent of map unit: 5 percent

484C—Plymouth-Barnstable complex, rolling, extremely bouldery

Map Unit Setting
National map unit symbol: 98s1
Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Plymouth and similar soils: 55 percent
Barnstable and similar soils: 20 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Plymouth

Setting
Landform: Moraines
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loose sandy glaciofluvial deposits and/or loose sandy ablation till; loose sandy glaciofluvial deposits and/or loose sandy ablation till

Typical profile
H1 - 0 to 3 inches: loamy coarse sand
H2 - 3 to 29 inches: gravelly loamy coarse sand

H3 - 29 to 64 inches: gravelly coarse sand

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Description of Barnstable

Setting

Landform: Moraines
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable loamy ablation till over reworked sandy glaciofluvial deposits; loamy ablation till over reworked sandy outwash

Typical profile

H1 - 0 to 1 inches: sandy loam
H2 - 1 to 23 inches: sandy loam
H3 - 23 to 64 inches: coarse sand

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Minor Components

Carver

Percent of map unit: 10 percent

Hinckley

Percent of map unit: 10 percent

Nantucket

Percent of map unit: 5 percent

484D—Plymouth-Barnstable complex, hilly, extremely bouldery

Map Unit Setting

National map unit symbol: 98s2
Elevation: 0 to 1,000 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Plymouth and similar soils: 55 percent
Barnstable and similar soils: 20 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Plymouth

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loose sandy glaciofluvial deposits and/or loose sandy ablation till; loose sandy glaciofluvial deposits and/or loose sandy ablation till

Typical profile

H1 - 0 to 3 inches: loamy coarse sand
H2 - 3 to 29 inches: gravelly loamy coarse sand
H3 - 29 to 64 inches: gravelly coarse sand

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Description of Barnstable

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy ablation till over reworked sandy glaciofluvial deposits; loamy ablation till over reworked sandy outwash

Typical profile

H1 - 0 to 1 inches: sandy loam
H2 - 1 to 23 inches: sandy loam
H3 - 23 to 64 inches: coarse sand

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Minor Components

Nantucket

Percent of map unit: 10 percent

Hinckley

Percent of map unit: 5 percent

Carver

Percent of map unit: 5 percent

Merrimac

Percent of map unit: 5 percent

600—Pits, sand and gravel

Map Unit Setting

National map unit symbol: 98rq
Frost-free period: 120 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Pits: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits

Setting

Parent material: Loose sandy and gravelly glaciofluvial deposits

652—Dumps, landfill

Map Unit Setting

National map unit symbol: 98qm
Frost-free period: 120 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Dumps: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

665—Udipsamments, smoothed

Map Unit Setting

National map unit symbol: 98s6
Mean annual precipitation: 41 to 48 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udipsamments and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udipsamments

Setting

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy excavated or filled land

Properties and qualities

Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

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ATTACHMENT 12

SITE SPECIFIC SOIL SURVEY REPORTS – L.E.C.

December 28, 2017

Email (rquinn@sitecenv.com)

Raymond Quinn, PE
SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
Tel: 781-319-0100, Ext. 12
FAX: 781-834-4783

Re: Site Specific Soil Survey Report [LEC File #: SIEC \17-395.01]
SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
For: Bourne Landfill, Town of Bourne, MA

Dear Mr. Quinn:

On November 28, 2017, we performed a site-specific soil survey of approximately four acres of land, adjacent and south of the solid waste disposal facility in Bourne Massachusetts. This soil survey was performed in accordance to USDA, Natural Resources Conservation Service (NRCS) National Cooperative Soil Survey standards, at a more detailed level than the published NRCS Web Soil Survey[1]. The purpose of this site-specific soil survey was to determine if the published, NRCS map properly reflects actual soil composition on this site, in the area mapped as 431B (*Barnstable sandy loam, 3 to 8 percent slopes, very stony*). The 431B map unit is classified as "farmland of statewide importance" in Barnstable County, Massachusetts.

In the course of our field investigation, we collected three detail soil profile descriptions and data from fifteen additional soil borings within the 431B map unit. A soil profile description that represents the 431B map unit that we investigated, is included in the following narrative.

Data and Site Specific Soil Survey

Soil data we collected is consistent with the published NRCS information. The soils in the study area consistently fall within the range of characteristics for the Barnstable Soil Series. The principal soil map unit in the study area is *Barnstable sandy loam, 3 to 8 percent slopes*. This map unit has the statewide numerical symbol *430B* and the Barnstable County published map unit symbol *BaB.*

[1] Soil Survey of Barnstable County Massachusetts, Web Soil Survey, December 4, 2017

The Barnstable series consists of very deep, well drained soils formed in loamy glacial till overlying loose, sandy glacial-fluvial material. They are on nearly level to moderately steep soils of moraines. On this site the slope ranges from 0 through 15 percent. Saturated hydraulic conductivity is moderately high or high in the solum and high or very high in the substratum. The seasonal high, water table is greater than 60 inches from the surface. Mean annual precipitation is about 43 inches (1092 mm) and mean annual temperature is about 48º F (9º C). These soils are classified as: Coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts.

The principal difference between the NRCS Web soil survey map and map unit specific to this site, is surface stoniness. The site is virtually stone-free (map unit 430), whereas the NRCS map unit for the site is described as *very stony* (map unit 431). The lack of surface stones does not change the farmland classification. Both map units: 430B and 431B, are classified as "farmland of statewide importance".

On this site, textures in the solum are sandy loam, fine sandy loam and very fine sandy loam and coarse fragment content is less than 5 percent. Textures in the substratum are medium sand, coarse sand, very coarse sand. Course fragments including gravel and small cobbles make up less than 15 percent in the substratum. No contrasting inclusions were encountered, similar inclusions make up less than 5 percent of the map unit.

A representative soil profile description of the Barnstable soils ("S-1") on this site is described as follows:

2-0" – Oe horizon of hemic material composed of partially and well decomposed pine needles, leaves and twigs.
0-2.5" – A horizon consisting of black (7.5YR 2.5/1) very fine sandy loam; massive; very friable with a clear irregular boundary.
2.5-3.5" – E horizon (discontinuous) consisting of gray (10YR 4/1) fine sandy loam; massive; very friable with a broken irregular boundary.
3.5-10" – Bs horizon; brown (7.5YR 4/4) very fine sandy loam; weak sub-angular blocky; friable; gradual wavy boundary.
10-27" – Bw horizon; dark yellowish brown (10YR 4/6) fine sandy loam; weak sub-angular blocky; friable; 5 percent gravel, 5 percent cobbles in the lower part; clear wavy boundary.
27-42" - 2C horizon; yellowish brown (10YR 5/4) coarse and very coarse sand; single grain; loose; 5 percent gravel.

Barnstable Soil Profile @ S-1

Conclusion

Eighteen soil profile observations all confirm that the Barnstable soil series dominates the entire portion of the parcel that we investigated. Based on our investigation, we cannot recommend adjusting or changing the NRCS published soil map at this specific location. As a result, the state farmland classification would remain: "Farmland of Statewide Importance".

Thomas A. Peragallo, CPSS/SC ASA #2148
Certified Professional Soil Scientist/Soil Classifier

Soil Map—Barnstable County, Massachusetts
(Bourne Landfill, Bourne, MA)

Map Scale: 1:9,410 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 100, 200, 400, 600

Feet: 0, 450, 900, 1800, 2700

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 14, Oct 6, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 30, 2011—Oct 8, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	2.1	0.6%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	20.6	6.0%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	40.5	11.9%
254C	Merrimac fine sandy loam, 8 to 15 percent slopes	5.9	1.7%
430B	Barnstable sandy loam, 3 to 8 percent slopes	31.7	9.3%
430C	Barnstable sandy loam, 8 to 15 percent slopes	9.4	2.8%
431B	Barnstable sandy loam, 3 to 8 percent slopes, very stony	57.9	17.0%
431C	Barnstable sandy loam, 8 to 15 percent slopes, very stony	23.2	6.8%
435B	Plymouth loamy coarse sand, 3 to 8 percent slopes	53.2	15.6%
435C	Plymouth loamy coarse sand, 8 to 15 percent slopes	6.5	1.9%
435D	Plymouth loamy coarse sand, 15 to 35 percent slopes	29.0	8.5%
436C	Plymouth loamy coarse sand, 8 to 15 percent slopes, very stony	0.4	0.1%
483C	Plymouth-Barnstable complex, rolling, very bouldery	3.4	1.0%
484C	Plymouth-Barnstable complex, rolling, extremely bouldery	0.0	0.0%
484D	Plymouth-Barnstable complex, hilly, extremely bouldery	7.9	2.3%
600	Pits, sand and gravel	15.6	4.6%
652	Dumps, landfill	29.3	8.6%
665	Udipsamments, smoothed	4.7	1.4%
Totals for Area of Interest		**341.3**	**100.0%**

August 9, 2018

Email (rquinn@sitecenv.com)

Raymond Quinn, PE
SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050

Re: Site Specific Soil Survey Report [LEC File #: SITEC \17-395.01]
Bourne Landfill
Department of Integrated Solid Waste Management
201 MacArthur Boulevard
Bourne, Massachusetts

Dear Mr. Quinn:

On July 17, 2018, LEC Environmental Consultants, Inc. (LEC) performed a soil survey on approximately twenty acres of land at the solid waste disposal facility in Bourne Massachusetts. This soil survey was performed in accordance with USDA, Natural Resources Conservation Service (NRCS) National Cooperative Soil Survey standards.

The purpose of the survey was to identify the boundaries of soil types at a more detailed level than the published NRCS Web Soil Survey[1]. The end-product is a Site-Specific Soil Survey for the purpose of determining the classification as Massachusetts prime, important, and unique farm land. The Farmland Classification is from the USDA-NRCS Field Office Technical Guide, Version 12, September 28, 2015 (Web source).

The base map used in the field for the site-specific soil survey consists of an existing conditions plan, with topography at two-foot contours overlaid by a color aerial photograph. The base map was produced by SITEC Environmental, Inc. and the Bourne Department of Integrated Solid Waste Management at a scale of 1" = 40'. This report and the site-specific soil map are two parts of the Site-Specific Soil Survey and are intended to be used together.

In the course of our field investigation, we collected twenty soil profile descriptions that represent the primary map units and additional data from hand-borings throughout the site that represent the various map units. The detailed soil descriptions are included in Appendix A. The survey area consists of the three principal soil map units described below.

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[1] Soil Survey of Barnstable County Massachusetts, Web Soil Survey, July 27, 2018

Soil Map Unit Descriptions

Barnstable sandy loam, 3 to 8 percent (431B) consists of very deep, well drained soils formed in loamy glacial till overlying loose, sandy glacial-fluvial material. They are on nearly level to moderately steep soils of moraines. In this survey, these soils occur along the western and southern boundaries of the active landfill work area. Slopes range from 0 to 4 percent. Saturated hydraulic conductivity is moderately high or high in the solum and high or very high in the substratum. The seasonal, high water table is greater than 60 inches from the surface. Mean annual precipitation is about 43 inches (1092 millimeters) and mean annual temperature is about 48 degrees F (9 degrees C). These soils are classified as Coarse-loamy over sandy or sandy-skeletal, mixed, active, mesic Typic Dystrudepts.

Included within this map unit are large areas that do not have stones on the surface. The A and B horizon (solum) textures range from very fine sandy loam to sandy loam. Coarse fragment content is less than 5 percent throughout the solum. Textures in the substratum are medium sand, coarse sand, very coarse sand. Course fragments, including gravel and small cobbles, make up less than 15 percent. No contrasting inclusions were encountered in this map unit and similar inclusions make up less than 5 percent of the map unit. Seven detailed soil profile descriptions (TP-3, TP-4, TP-16, TP-17, TP-18, TP-19, TP-20) were collected where this soil occurs and are included in Appendix A.

Urban Land (602). This nearly level to gently sloping unit dominates the survey area and consists of impervious surfaces including pavement (primarily asphalt) and buildings. Underlying soils are unknown but are most likely dominated by coarse sand from prior excavations of cutting and filling. This map unit supports the principal daily landfill activities of recycling, transport, and storage of useable soil and non-soil material.

Included with this unit in mapping are small areas of Udipsamments, smoothed and storage piles of non-soil debris including undecomposed yard waste, chipped woody debris, building rubble, stones and boulder piles, recycled material such as crushed glass, piles of crushed stone and rip-rap. The piles of non-soil material are constantly changing in size, distribution, and elevation as a result of machine handling. This Site-Specific Soil map identifies some of the non-soil areas as they existed at the time of this survey, adjusted from aerial photography taken in January of 2018.

Udipsamments, smoothed (655). These gently sloping to very steep areas consist of excavated, filled and re-graded soil, originating from the underlying substrata or manufactured on-site. Slopes range from

2 to 70 percent. The nearly level areas make up portions of the site where equipment is traveling. The remaining areas are dominated by steep side slopes (40 to 70 percent) of stored soil material and landscaped side slopes adjacent to some buildings. The soil textures are dominantly coarse and very coarse sand, excavated from a newly constructed land fill cell to the north of the survey area. Other stored piles contain various blends of "topsoil" constructed from mixing sand with organic material and compost. The topsoil storage piles have soil textures that range from very coarse sand to loamy sand and their gravelly analogs.

Included with this unit in mapping are small areas of non-soil debris, areas with extremely stony and boulder surfaces and areas where textures range to coarse sandy loam. The soil storage piles periodically change in size, distribution, and elevation, as a result of machine handling. This Site-Specific Soil map identifies the boundary of these areas as they existed at the time of this survey and based on aerial photography taken in January of 2018. Seven detailed soil profile descriptions (TP-1, TP-2, TP-5, TP-6, TP-7, TP-8, TP-9, TP-10, TP-11, TP-12, TP-13, TP-14, TP-15) were collected where this soil occurs and are included in Appendix A.

Non-soil Areas

Chipped Woody Debris (foreground)
Yard Waste background)

Asphalt, Brick, and Concrete Rubble

Soil Map Legend

The Soil Map Legend is correlated with the Barnstable County Soil Survey legend, referenced to the USDA-NRCS Web Soil Survey, July 27, 2018. The Farmland Classification is from the USDA-NRCS Field Office Technical Guide, Version 12, September 28, 2015 (Web). A number of non-soil areas are shown on the map and are considered to be map unit inclusions.

MA Statewide Numeric Symbol	Barnstable County Alpha-Numeric Symbol	Map Unit Name	Farmland Classification
431B	BbB	Barnstable sandy loam, 3 to 8 percent slopes, very stony	Farmland of Statewide Importance
602	Ur	Urban Land	None
665	Ud	Udipsamments, smoothed	None
Non-soil Areas			
1	W	Water (Sediment Pond)	None
N/A	N/A	Yard Waste	None
N/A	N/A	Woody Debris (chipped)	None
N/A	N/A	Asphalt, brick and concrete rubble	None

Conclusion

The re-surveyed area of this site is currently mapped Barnstable sandy loam, 3 to 8 percent slopes, very stony (431B) and classified as Farmland of Statewide Importance on the current NRCS Barnstable County Web Soil Survey. Based on our field investigation, the Barnstable map unit (431B) does not exist in most of the Bourne landfill work area. This area consists of soil and non-soil material that has been disturbed by human activity, related to the operation of the landfill. This Site-Specific Soil Survey redefines most of this area as Urban Land (602) and Udipsamments, smoothed (655), which are not Prime, Important or Unique Farmland in Massachusetts.

Thank you for the opportunity to assist the Bourne Department of Integrated Solid Waste Management with re-mapping of the solid waste disposal facility. Should you have any questions or need additional information I may be contacted in our Rindge, New Hampshire Office.

Sincerely,

LEC Environmental Consultants, Inc.

Thomas A. Peragallo, CPSS/SC
Certified Professional Soil Scientist/Soil Classifier

Attachments

Appendix A

Soil Profile Descriptions

Soil Profile Description

Observation Hole Number: TP-1					**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA					
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management					
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.					
Time: AM		Weather: Cloudy, 70's			
Landform, Landscape Position & Parent Material: Sand storage pile, removed from recently excavated cell (north)					
Slope: 8-70 %		Aspect: north		Stoniness: none	
Soil Drainage: ED		Soil Classification: Udipsamments (Great Group)		Depth to Bedrock: >20'	

Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
^C	0-60	Gravelly Coarse Sand (Gr CoS)	2.5Y 5/4	None	20% Gravel, loose, single grain

Landscape Setting

Soil Profile

Soil Profile Description

Observation Hole Number: TP-2					**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA					
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management					
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.					
Time: AM		Weather: Cloudy, 70's			
Landform, Landscape Position & Parent Material: "Topsoil" storage pile, manufactured on-site from sand and composted yard waste					
Slope: 4-60 %		Aspect: south		Stoniness: none	
Soil Drainage Class: ED		Soil Series: Udipsamments (Great Group)		Depth to Bedrock: >25'	
Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
^C1	0-72	Loamy Coarse Sand (LCoS)	10YR 2/3 and 2/3 - mixed	None	10% woody debris 10% gravel, massive, mvfr buried log

Soil Profile

Soil Profile Description

Observation Hole Number: TP-3		**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA		
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management		
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.		
Time: AM	Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Aeolian material over glacial fluvial material Access way at the southern edge of the disturbed area, adjacent to undisturbed forest boundary		
Slope: 4 %	Aspect: south	Stoniness: none
Soil Drainage Class: WD	Soil Classification: Barnstable (Series)	Depth to Bedrock: >5'

Horizon	Depth (inches)	Soil Texture	Moist Color	Redoximorphic Features	Other Features (structure, consist.)
A	0-8	Very fine sandy loam (VFSL)	10YR 2/2	None	Mcopl, mfi compacted from machinery traffic
Bw	8-25	Very fine sandy loam (VFSL)	10YR 4/6	None	1mbsk, mfr
2C	25-48	GravellyCoarse Sand (GrCoS)	2.5Y 5/6	None	20% gravel, loose, single grain

Soil Profile

Soil Profile Description

Observation Hole Number: TP-4	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: AM Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Fill overlying aeolian and glacial fluvial mat. Access way at the southern edge of the disturbed area, adjacent to undisturbed forest boundary	
Slope: 4 % Aspect: south Stoniness: none	
Soil Drainage Class: WD Soil Classification: Barnstable (Series)	Depth to Bedrock: >5'

Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
C^	0-6	Loamy Sand (LS)	2.5Y 5/4	None	Massive, mfr (Fill)
A	6-14	Very fine sandy loam (VFSL)	10YR 2/2	None	Mcopl, mfi compacted from machinery traffic
Bw	14-32	Very fine sandy loam (VFSL)	10YR 5/6	None	1mbsk, mfr
2C	32-48	Coarse Sand (CoS)	2.5Y 5/4	None	5% gravel, loose, single grain

Soil Profile

Soil Profile Description

Observation Hole Number: TP-5	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: AM Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Fill and non-soil debris overlying glacial fluvial material. On access way at the southern edge of the disturbed area, adjacent to undisturbed forest boundary	
Slope: 4 % Aspect: south Stoniness: none	
Soil Drainage: ED Soil Classification: Udipsamments (Great Group)	Depth to Bedrock: 4'

Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
C^	0-34	Loamy coarse sand (LCoS)	10YR 3/2 (mixed)	None	Massive, mfr 50% foreign debris: tailings, stones, wood, stumps
2C	34-48	Coarse Sand (CoS)	2.5Y 5/4	None	5% gravel, loose, single grain

Soil Profile

Soil Profile Description

Observation Hole Number: TP-6	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: AM Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Sandy fill storage pile	
Slope: 40% Aspect: north Stoniness: none	
Soil Drainage: ED Soil Classification: Udipsamments (Great Group) Depth to Bedrock: >20'	

Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
^C1	0-14	Very gravelly loamy sand (VGrLS)	2.5Y 4/4	None	Massive, mfr 25% gravel
^C2	14-60	Coarse Sand & Loamy Sand (CoS &LS)	2.5Y 5/4 & 10YR 5/2	None	massive, mvfr, 10% gravel,

Soil Profile

Soil Profile Description

Observation Hole Number: TP-7	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: AM	Weather: Cloudy, 70's
Landform, Landscape Position & Parent Material: Re-graded sandy fill in work area	
Slope: 2% Aspect: south	Stoniness: none
Soil Drainage: ED Soil Classification: Udipsamments (Great Group) Depth to Bedrock: >20'	

Horizon	Depth (inches)	Soil Texture	Moist Color	Redoximorphic Features	Other Features (structure, consist.)
^C	0-48	Loamy coarse sand (LCoS)	10YR 3/2	None	Massive, mfr About 25% asphalt, stone, bricks, steel debris

Landscape Setting

Soil Profile

Soil Profile Description

Observation Hole Number: TP-8					**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA					
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management					
Described by: T. A. Peragallo, LEC Environmental Consultants, Inc.					
Time: AM		Weather: Cloudy, 70's			
Landform, Landscape Position & Parent Material: Re-graded sandy fill in work area					
Slope: 2%		Aspect: south		Stoniness: none	
Soil Drainage: ED	Soil Classification: Udipsamments (Great Group)				Depth to Bedrock: >20'

Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
^C1	0-32	Loamy coarse sand (LCoS)	10YR 3/2	None	Massive, mfr About 25% asphalt, stone, bricks, steel debris
^C2	32-50	Coarse sand (CoS)	2.5Y 5/4	None	Loose, single grain Refusal-boulder

Soil Profile

Soil Profile Description

Observation Hole Number: TP-9	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: AM Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Re-graded sandy fill in work area -access road	
Slope: 2% Aspect: south Stoniness: none	
Soil Drainage: ED Soil Classification: Udipsamments (Great Group) Depth to Bedrock: >20'	

Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
^C1	0-60	Gravelly Loamy coarse sand (GrLCoS), coarse sand (CoS) and sandy loam (SL) – Mixed	10YR 3/2 10YR 2/2 2.5Y5/3 2.5Y 5/4 (Mixed)	None	Massive, mfr 15% gravel About 10% asphalt, stone, bricks, rubble
Note: GrLCoS dominates the upper 12 inches					

Landscape Setting

Soil Profile

Soil Profile Description

Observation Hole Number: TP-10	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: AM Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Manufactured "topsoil" storage pile (east slope)	
Slope: 70% Aspect: east Stoniness: none	
Soil Drainage: WD-ED Soil Classification: Udorthents (Great Group) Depth to Bedrock: >20'	

Horizon	Depth (inches)	Soil Texture	Moist Color	Redoximorphic Features	Other Features (structure, consist.)
^C	0-30	Coarse sandy loam (CoSL) & Loamy sand (LS) Mixed	10YR 3/3	None	Massive, mvfr

Landscape Setting

Soil Profile

Soil Profile Description

Observation Hole Number: TP-11	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: AM Weather: Cloudy, 70’s	
Landform, Landscape Position & Parent Material: Manufactured “topsoil” storage pile near landfill office	
Slope: 70% Aspect: east Stoniness: none	
Soil Drainage: WD-ED Soil Classification: Udorthents (Great Group) Depth to Bedrock: >20’	

Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
^C	0-30+	Coarse sandy loam (CoSL), Coarse sand (CoS) & Loamy sand (LS) Mixed	10YR 3/3 (variable)	None	Massive, mvfr

Landscape Setting

Soil Profile

Soil Profile Description

Observation Hole Number: TP-12	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: AM Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Smooth re-graded area between soil storage piles	
Slope: 3 % Aspect: north Stoniness: none	
Soil Drainage: ED Soil Classification: Udipsamments (Great Group)	Depth to Bedrock: N/A

Horizon	Depth (inches)	Soil Texture	Moist Color	Redoximorphic Features	Other Features (structure, consist.)
^C1	0-10	Coarse Sand (CoS)	2.5Y 5/3 and 5/4 - mixed	None	5% cobbles, loose, single grain Extremely cobbly surface
^C2	10-40	Coarse Sand (CoS)	2.5Y 5/4	None	10% Gravel, loose, single grain

Landscape Setting

Soil Profile Description

Observation Hole Number: TP-13	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental, Inc.	
Time: PM Weather: Cloudy, 70’s	
Landform, Landscape Position & Parent Material: Re-graded sandy fill in work area (SW corner), overlying glacial fluvial material	
Slope: 3% Aspect: south Stoniness: none	
Soil Drainage: ED Soil Classification: Udipsamments (Great Group) Depth to Bedrock: >20’	

Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
^C1	0-3	Loamy sand (LS)	10YR 4/4	None	Massive, mvfr
^C2	3-20	Loamy coarse sand (LCoS)	10YR 5/4	None	Massive, mvfr
^C3	20-48	Coarse sand (CoS)	2.5Y 5/4	None	Loose, single grain

Landscape Setting

Soil Profile

Soil Profile Description

Observation Hole Number: TP-14	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: AM Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Fill on landscaped slope	
Slope: 30% Aspect: east Stoniness: none	
Soil Drainage: ED Soil Classification: Udipsamments (Great Group) Depth to Bedrock: >15'	

Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
^A	0-3	Loamy sand (LS)	10YR 3/2 (variable)	None	Massive, mvfr
^C1	3-20	Loamy coarse and very coarse sand (LCoS & LVCoS)	2.5Y 5/6	None	Massive, mvfr
^C2	20-48	Coarse sand (CoS)	2.5Y 6/4	None	Loose, single grain

Landscape Setting

Soil Profile

Soil Profile Description

Observation Hole Number: TP-15		**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA		
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management		
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.		
Time: PM	Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Manufactured "topsoil" storage pile (west slope)		
Slope: 70%	Aspect: west	Stoniness: none
Soil Drainage: WD-ED	Soil Classification: Udorthents (Great Group)	Depth to Bedrock: >20'

Horizon	Depth (inches)	Soil Texture	Moist Color	Redoximorphic Features	Other Features (structure, consist.)
^C	0-60	Coarse sandy loam (CoSL) & Loamy sand (LCoS) Mixed	10YR 3/2	None	Massive, mfr

Landscape Setting

Soil Profile

Soil Profile Description

Observation Hole Number: TP-16	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: PM Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Aeolian material, along the western boundary of the landfill, east of Route 28. Natural soil in forested area.	
Slope: 2 % Aspect: south Stoniness: none	
Soil Drainage Class: WD Soil Classification: Barnstable (Series) Depth to Bedrock: >4'	

Horizon	**Depth (inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
A	0-3	Very fine sandy loam (VFSL)	10YR 3/2	None	wfgr, mvfr, CS
E	3-5	Loamy very fine sand (LVFS)	10YR 5/3	None	Massive, mvfr, CS
Bw	5-30	Very fine sandy loam (VFSL)	10YR 5/6	None	1mbsk, mfr, GW
C	30-40+	Very fine sandy loam (VFSL)	10YR 5/4	None	Massive, mvfr

Landscape Setting

Soil Profile Description

Observation Hole Number: TP-17 & TP-18	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: PM Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Aeolian material overlying glacial fluvial material, along the western boundary of the landfill, east of Route 28. Natural soil in forested area.	
Slope: 3 % Aspect: south Stoniness: none	
Soil Drainage Class: WD Soil Classification: Barnstable (Series) Depth to Bedrock: >4'	

TP-17:

Horizon	Depth (inches)	Soil Texture	Moist Color	Redoximorphic Features	Other Features (structure, consist.)
Oe	2-0	Mpt	5YR 2.5/2	None	Hemic
A	0-1	Very fine sandy loam (VFSL)	10YR 2/2	None	wfgr, mvfr, CS
E	1-4	Loamy sand (LS)	10YR 5/2	None	Massive, mvfr, CS
Bs	4-18	Fine sandy loam (FSL)	7.5YR 4/6	None	Massive, mfr, GW
Bw	18-28	Loam sand (LS)	10YR 5/6	None	Massive, mvfr, CW
2C	28-40+	Coarse sand (CoS)	2.5Y 4/6	None	Loose, single grain

TP-18:

Horizon	Depth (inches)	Soil Texture	Moist Color	Redoximorphic Features	Other Features (structure, consist.)
Oe	2-0	Mpt	5YR 2.5/2	None	Hemic
A	0-1	Very fine sandy loam (VFSL)	10YR 2/1	None	wfgr, mvfr, CS
E	1-5	Loamy sand (LS)	10YR 5/2	None	Loose, s.g., CS
Bs	5-14	Fine sandy loam (FSL)	7.5YR 4/6	None	Massive, mvfr, GW
Bw	14-24	Very fine sandy loam (VFSL)	10YR 5/6	None	Massive, mfr, GW
C	24-36	Fine sandy loam (FSL)	2.5Y 5/4	None	Massive, mfr, CW
2C	36-40+	Loamy sand (LS)	2.5Y 6/4	None	Loose, single grain

Soil Profile Description

Observation Hole Number: TP-19	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental, Inc.	
Time: PM Weather: Cloudy, 70's	
Landform, Landscape Position & Parent Material: Aeolian material overlying glacial fluvial material, along the western boundary of the landfill, east of Route 28. Natural soil in forested area.	
Slope: 4 % Aspect: south Stoniness: stony - 50' apart	
Soil Drainage Class: WD Soil Classification: Barnstable (Series) Depth to Bedrock: >4'	

Horizon	Depth (inches)	Soil Texture	Moist Color	Redoximorphic Features	Other Features (structure, consist.)
Oe	2-0	Mpt	10YR 2/2	None	Hemic
A	0-1	Loamy sand (LS)	10YR 2/2	None	Massive, mvfr, CS
E	1-2	Loamy sand (LS)	2.5Y 5/3	None	Loose, single grain, CS
Bs	2-20	Very fine sandy loam (VFSL)	7.5YR 4/6	None	1msbk, mfr, GW
Bw	20-23	Sandy loam (SL)	10YR 4/6	None	Massive, mfr, CW
2C	23-40+	Medium & Coarse sand (MS & CoS)	2.5Y 4/6	None	Loose, single grain

Soil Profile

Soil Profile Description

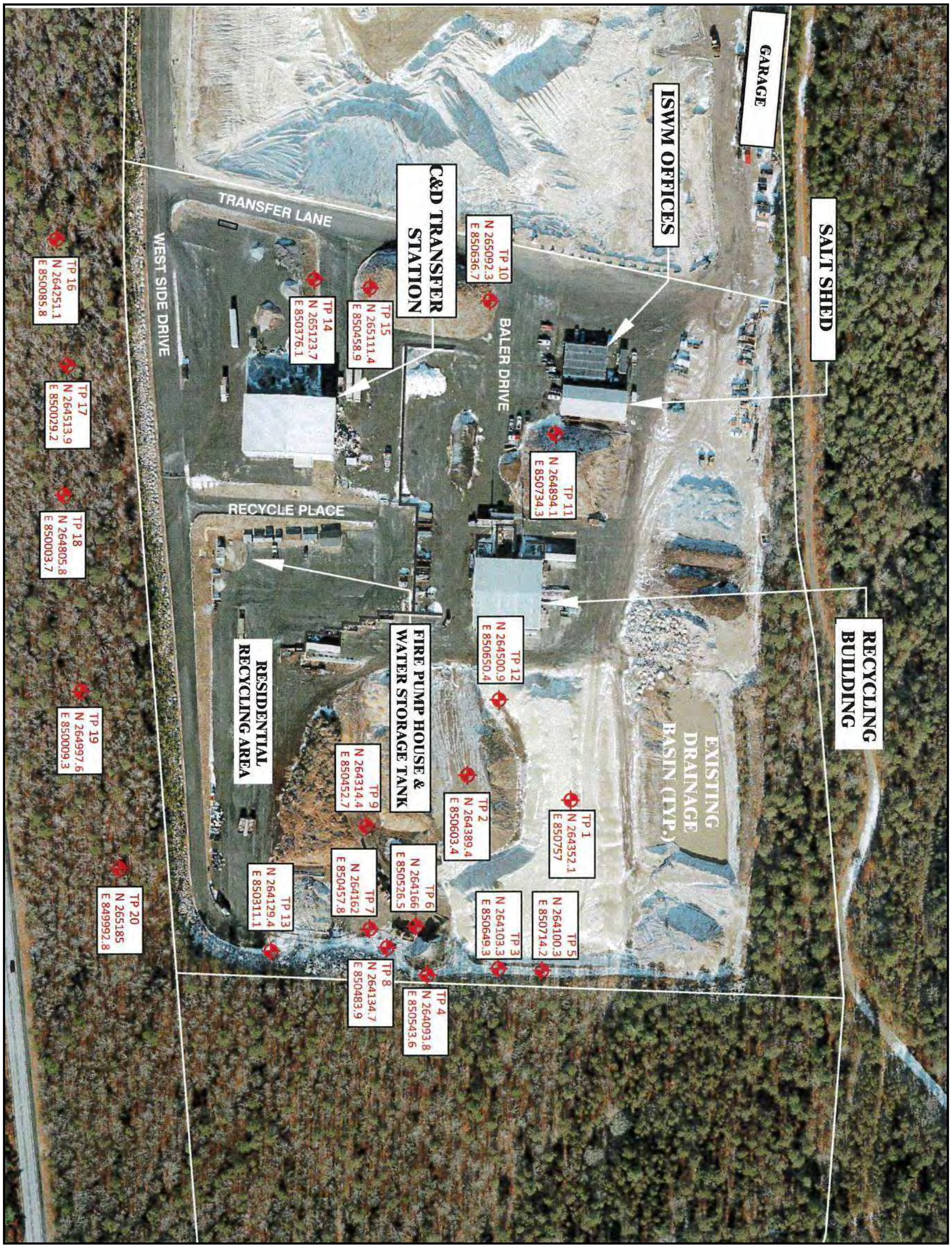
Observation Hole Number: TP-20	**Date: 7-17-18**
Location: Bourne Landfill, Rte. 28, Bourne, MA	
Requested by: SITEC Environmental, Inc. & Bourne Dept. of Integrated Solid Waste Management	
Described by: Thomas A. Peragallo, LEC Environmental Consultants, Inc.	
Time: PM	Weather: Cloudy, 70's
Landform, Landscape Position & Parent Material: Aeolian material overlying glacial fluvial material, along the western boundary of the landfill, east of Route 28. Natural soil in forested area.	
Slope: 3 % Aspect: south	Stoniness: Stony – 50' apart
Soil Drainage Class: WD Soil Classification: Barnstable (Series)	Depth to Bedrock: >4'

Horizon	**Depth inches)**	**Soil Texture**	**Moist Color**	**Redoximorphic Features**	**Other Features (structure, consist.)**
Oe	2-0	Mpt	10YR 2/2	None	Hemic
A	0-1	Very fine sandy loam (VFSL)	10YR 2/2	None	Massive, mvfr, CS
E	1-2	Loamy sand (LS)	2.5Y 5/3	None	Loose, single grain, CB
Bs	2-22	Very fine sandy loam (VFSL)	7.5YR 4/6	None	1msbk, mfr, GW
Bw	22-34	Fine sandy loam (FSL)	10YR 5/6	None	Massive, mfr, CW
2C	34-40+	Medium & Coarse sand (MS & CoS)	2.5Y 6/4	None	Loose, single grain

Appendix B

Detailed Soil Profile Description Locations

Detailed Soil Profile Description Locations



Appendix C

Site Specific Soil Survey Map

LEC

Site-Specific Soil Survey

This Soil Survey Map conforms to the standards of the USDA National Cooperative Soil Survey. It was performed on-site on July 17, 2018 by Thomas A. Peragallo, CPSS/SC #2148. A narrative report accompanies this map and is considered part of the map. The narrative report includes map unit descriptions and detail soil profile descriptions in specified locations.

Soil Map Legend

The Soil Map Legend is correlated with the Barnstable County Soil Survey legend, referenced to the USDA-NRCS Web Soil Survey, July 27, 2018. The Farmland Classification is from the USDA-NRCS Field Office Technical Guide, Version 12, September 28, 2015 (Web). A number of non-soil areas are shown on the map and are considered to be map unit inclusions.

MA Statewide Numeric Symbol	Barnstable County Alpha-numeric Symbol	Map Unit Name	Farmland Classification
431B	BbB	Barnstable sandy loam, 3 to 8 percent slopes, very stony	Farmland of Statewide Importance
602	Ur	Urban Land	None
665	Ud	Udipsamments, smoothed	None
Non-soil Areas			
1	W	Water (Sediment Pond)	None
N/A	N/A	Yard Waste	None
N/A	N/A	Woody Debris (chipped)	None
N/A	N/A	Asphalt, brick and concrete rubble	None

PLYMOUTH, MA
WAKEFIELD, MA
WORCESTER, MA
RINDGE, NH

ATTACHMENT 13

TRAFFIC ASSESSMENT – TEPP, LLC.

TEPP LLC TRANSPORTATION ENGINEERING, PLANNING AND POLICY

MEMORANDUM

93 Stiles Road, Suite 201, Salem, New Hampshire 03079 USA
800 Turnpike Street, Suite 300, North Andover, Massachusetts 01845 USA
Phone (603) 212-9133 and Fax (603) 226-4108
Email tepp@teppllc.com and Web www.tepplic.com

Ref:	789
Subject:	Traffic Assessment Integrated Solid Waste Management Facility Bourne, Massachusetts
From:	Kim Eric Hazarvartian, Ph.D., P.E., PTOE Principal
Date:	July 16, 2020

COMMONWEALTH OF MASSACHUSETTS
KIM ERIC HAZARVARTIAN
CIVIL
No. 32570
REGISTERED PROFESSIONAL ENGINEER

INTRODUCTION

TEPP LLC has prepared this traffic-assessment memorandum (TAM) at the request of the Town of Bourne Department of Integrated Solid Waste Management (ISWM). ISWM and TEPP LLC have thoroughly considered traffic safety and operations of the ISWM in conjunction with multiple permitting processes that have involved the Town, the Cape Cod Commission and the Commonwealth of Massachusetts.

These efforts have led to the following findings:

- substantial infrastructure improvements completed during 2012, including the driveway and gate area, have significantly enhanced traffic safety and operations
- traffic management has been significantly improved at the site since 1999
- waste delivery has shifted to denser materials being delivered in larger-capacity vehicles, resulting in less truck traffic per ton
- traffic operations and safety are appropriate for multiple operations scenarios, including ash waste and solid waste
- crash history near the ISWMF facility, for January 1, 2013 to June 4, 2020, confirms that traffic operations will not constitute a danger to public safety

TEPP LLC and staff have been involved with ISWMF since the 1990s and has prepared a number of documents and analysis regarding traffic safety, operations and design. TEPP LC has reviewed this body of work and confirms its validity and applicability going forward. This is especially so considering the substantial infrastructure improvements and significantly improved traffic management.

In conclusion:

- traffic safety and operations have been considered over many years
- substantial infrastructure improvements have enhanced traffic safety and operations
- crash history confirms that traffic operations will not constitute a danger to public safety

TEPP LLC INVOLVEMENT WITH THE ISWMF

TEPP LLC has for many years:

- been involved with transportation engineering for the Integrated Solid Waste Management Facility (ISWMF)
- analyzed traffic operations related to the ISWMF
- participated in the development of extensive infrastructure improvements at the ISWMF

COMPLETED INFRASTRUCTURE IMPROVEMENTS

Substantial on-site infrastructure improvements were completed in 2012. SITEC Environmental, Inc. has prepared a graphic, attached to this memorandum, which shows site infrastructure configurations at the driveway and scale area both before and after the improvements.

The infrastructure improvements include:

- eliminating opposing-traffic conflicts inside and outside the scale area
- designing and constructing a new residential recycling center in a new location
- designing and constructing new incoming and outgoing landfill-truck scales in new locations
- designing and constructing a new central scale house in a new location
- providing about 1,000 feet of inbound driveway length from MacArthur Boulevard northbound to the scale
- providing one landfill-truck lane each, for both incoming and outgoing directions
- providing one landfill-truck surge lane to accommodate additional queuing each, for both incoming and outgoing directions
- providing one residential drop-off/employee traffic lane each, that bypasses the scales, for both incoming and outgoing directions

These infrastructure improvements have made the driveway and scale area significantly more safe, efficient, simple and attractive. A graphic is attached that shows the traffic layout before and after the improvements were made.

The infrastructure improvements provide for operations of at least 1,500 tons per day (TPD). However, ISWM is limiting operation to 825 TPD, with the reserve capacity enhancing operational flexibility and quality.

IMPETUS FOR THE INFRASTRUCTURE IMPROVEMENTS

The ISWMF was permitted during 1999 by the Commonwealth of Massachusetts to operate at 825 TPD. The permitting process did not require the infrastructure improvements described above.

The infrastructure improvements came after the permitting process, at the volition of ISWM. ISWM recognized the potential benefits of infrastructure improvement and took proactive advantage of the opportunity for infrastructure improvements that was created by:

- acquiring the abutting 25-acre parcel located south of the landfill in 2001
- relocating the residential recycling center from just inside the scale area onto that parcel
- completion of the Phase 1D landfill reclamation, part of which was underneath the former residential recycling center, in 2011

OPERATIONAL SCENARIO 1—EXISTING MUNICIPAL-COMBUSTOR ASH AND MUNICIPAL-SOLID WASTE

In recent years, ISWM has changed the incoming waste stream for deposition into the landfill. As a result of a contract with Covanta SEMASS, located in Rochester, Massachusetts, ISWM now accepts approximately 85 percent of its permitted annual tonnage at the landfill as municipal-waste combustor ash. The ash is delivered via 30-ton transfer trailers, as opposed to municipal-solid waste (MSW), which is delivered in packer trucks that have a capacity of 12 to 15 tons. This results in less truck traffic per ton delivered. ISWM intends to continue this arrangement through 2021 and is considering the possibility of extending the arrangement further.

OPERATIONAL SCENARIO 2—ALL MSW

The Town has also considered an incoming waste scenario whereby it no longer has a contract for municipal-combustor ash and instead envisions utilizing 100 percent of its permitted capacity for MSW deposition. For many years dating to 1999, the ISWMF received MSW, which required a greater number of truck-trips per ton than waste ash, as described above.

POTENTIAL FUTURE LEACHATE

In addition, ISWM is evaluating options for processing and treating leachate from the landfill at an on-site wastewater-treatment works. The clean, treated effluent would be then discharged to a pipeline and associated infrastructure located at the abutting Joint Base Cape Cod, as further described in another section of this filing. Currently, ISWM has a contractor remove leachate by tanker truck to a variety of off-site treatment facilities. Constructing the on-site treatment facility could, depending on annual precipitation, reduce the number of truckloads by approximately 1,000 to 2,000 per year.

CRASH HISTORY

TEPP LLC obtained crash data from the Massachusetts Department of Transportation (MassDOT) from January 1, 2013 to June 4, 2020 for locations near the facility. Analysis of the data confirms that traffic operations of the facility will not constitute a danger to public safety. The locations were:

- the driveway
- the MacArthur Boulevard northbound/driveway intersection
- the MacArthur Boulevard northbound/U-turn intersection
- the MacArthur Boulevard southbound/U-turn intersection

Table 1 shows relevant crash history:

- about 67 percent of crashes were property-damage only
- the remainder involved personal injury
- no crash showed a fatality
- each location showed an average of less than one crash per year
- each intersection showed a crash rate below MassDOT averages
- one crash involved a heavy vehicle

CONCLUSION

TEPP LLC and staff have been involved with ISWMF since the 1990s and has prepared a number of documents and analysis regarding traffic safety, operations and design. TEPP LC has reviewed this body of work and confirms its validity and applicability going forward. This is especially so considering the substantial infrastructure improvements and significantly improved traffic management.

TEPP LLC concludes that:

- traffic safety and operations have been considered over many years
- substantial infrastructure improvements have enhanced traffic safety and operations

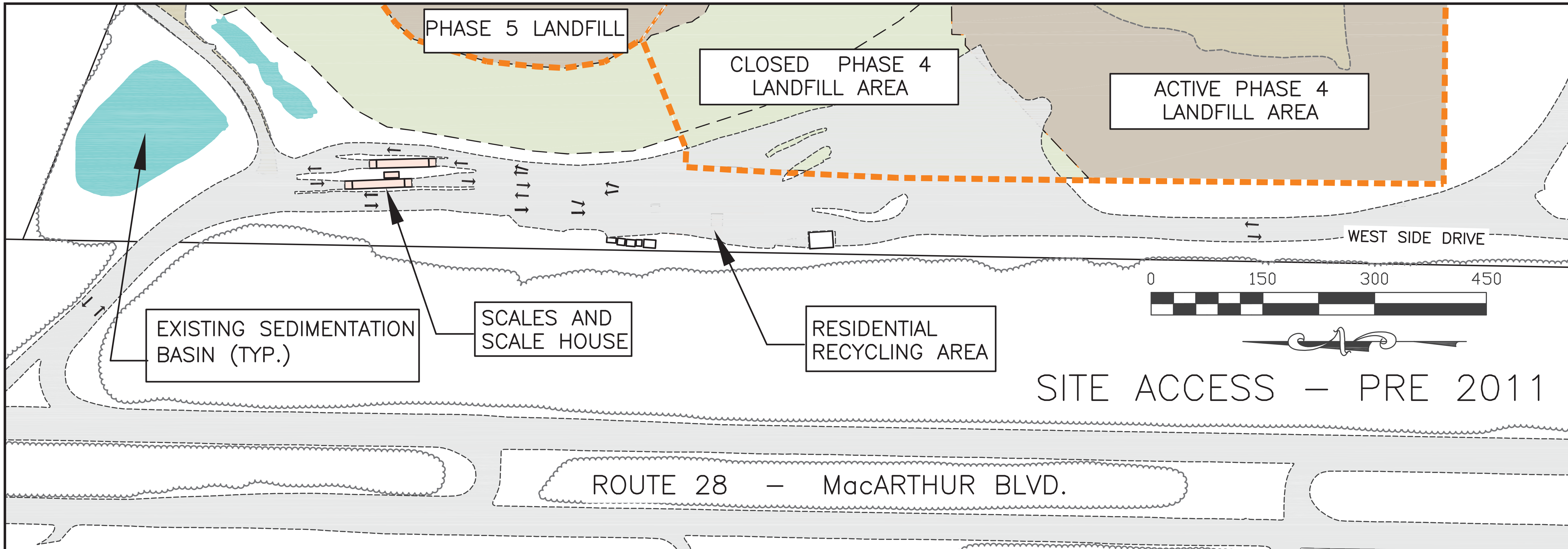
- crash history confirms that traffic operations will not constitute a danger to public safety

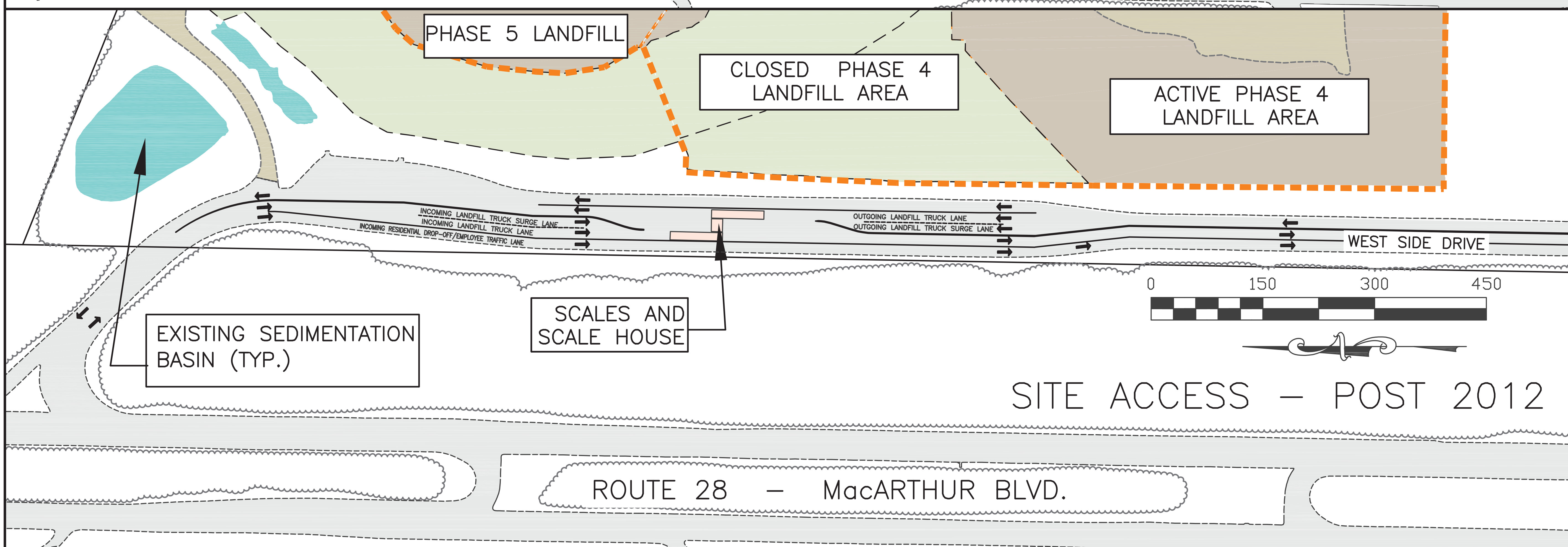
attachments: table, SITEC Environmental, Inc. graphic

Table 1. Crash history.

		Number of Crashes[a] and Crash Rates			
		Driveway	MacArthur Boulevard Northbound Driveway Intersection	MacArthur Boulevard Northbound/ U-Turn Intersection	MacArthur Boulevard Southbound/ U-Turn Intersection
Years	2013	0	0	0	0
	2014	1	0	0	0
	2015	1	1	0	0
	2016	0	2	0	0
	2017	0	0	1	0
	2018	0	1	1	0
	2019	0	0	1	0
	2020	0	0	0	0
	Total	2	4	3	0
	Average Per Year	0.31	0.62	0.47	0
Crash Rates	This Location[b]	---	0.17	0.13	0
	MassDOT District 5 Average[c]	---	0.57	0.57	0.57
	MassDOT State Average[c]	---	0.57	0.57	0.57
Severity	Property-Damage Only	1	3	2	0
	Personal Injury	1	1	1	0
Type	Angle	0	0	2	0
	Rear-End	0	4	1	0
	Single-Vehicle	2	0	0	0
Road Surface	Dry	1	4	3	0
	Wet	1	0	0	0
Weather	Clear	0	3	3	0
	Cloudy	1	0	0	0
	Rain	1	0	0	0
	Not Reported	0	1	0	0
Light	Daylight	2	4	1	0
	Dusk	0	0	2	0
Heavy Vehicle	Yes	0	1	0	0
	No	2	3	3	0

[a] From MassDOT, accessed June 4, 2020. For January 1, 2013 to June 4, 2020. Crash information after December 31, 2017 is subject to change, per MassDOT.
[b] Estimated entering vehicles = 10,000 per day. MEV = 1,000,000 entering vehicles.
[c] From https://www.mass.gov/service-details/intersection-and-roadway-crash-rate-data-for-analysis, accessed June 8, 2020. MEV = 1,000,000 entering vehicles.





scale: AS SHOWN
date: AUG. 9, 2017
drawn: HKB
checked: ARQ
approved: ARQ
drawing number:

BOURNE INTEGRATED SOLID WASTE
MANAGEMENT FACILITY

client: BOURNE DEPARTMENT OF
INTEGRATED SOLID WASTE MANAGEMENT

drawing title: ACCESS ROAD IMPROVEMENTS

SITEC Environmental, Inc.
769 Plain Street, Unit C
Marshfield, MA 02050
PHONE (781) 319-0100
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SITEC
ENVIRONMENTAL
Civil and Environmental Engineering
Land Use Planning and Surveying
Hazardous and Solid Waste Consultants

Acad No.
SITE SCHEMATIC-02-22-2017.dwg
SE01-456-11

ATTACHMENT 14

SOUND LEVEL SURVEY – CAVANAUGH TOCCI ASSOCIATES

CAVANAUGH
TOCCI
ASSOCIATES, INCORPORATED

327 F BOSTON POST ROAD, SUDBURY, MA 01776-3027 TEL: (978) 443-7871 FAX: (978) 443-7873 e-MAIL: cta@cavtocci.com

September 7, 2001

Mr. Richard W. Keller, P.E.
P.O. Box 1265
Middleboro, MA 02346

SUBJECT: ISWM - Bourne, MA
Sound Level Survey

Dear Mr. Keller,

The following letter summarizes our sound level survey for the development of a parcel of land immediately south of the existing Town of Bourne landfill facility. This development includes a construction and demolition materials processing facility. Operations at the temporary open-air processing facility on the existing landfill will be transitioned to the facility on the new parcel and will chiefly be contained within the proposed building. Therefore, we expect that sound emissions from the new facility will be less than from the current operation. Nevertheless the MDEP interim risk-evaluation guidance document for Solid Waste Facility Site Assignments requires that sound level surveys be conducted prior to and after construction of solid waste facilities. This letter summarizes our sound level survey.

SOUND LEVEL SURVEY

A sound level survey was conducted to quantify and characterize the existing noise environment in the vicinity of the proposed development of the new parcel. For this study, environmental sounds were monitored at three locations surrounding the new parcel. The monitoring locations were selected on the basis of where the potential for sound impact from the new facility was anticipated to be greatest. In addition, the three measurement locations were selected to obtain an adequate spatial representation of the ambient noise environment. These locations are indicated in Figure 1. A brief description of each monitoring location follows:

- **Location 1** – At property line between Bayview Camp Grounds Inc. at 260 MacArthur Boulevard and Brookside Golf Club at 1 Brigadoone Road. This location is representative of receptors located west of the new parcel across MacArthur Boulevard (Route 28),
- **Location 2** – At northeast corner of new parcel
- **Location 3** – At southeast corner of new parcel

Please note that the exact location for monitor location 1 is beyond the extents of the site plan. It is located further west of MacArthur Road approximately 100 feet north of the clubhouse at the Brookside Golf Club.

Sound levels are quantified in decibels (dB). Human hearing is restricted to the frequency range of 20 Hz to 20,000 Hz. However, the human ear is most sensitive to sound in the 500 Hz to 5,000 Hz frequency range. Above and below this range, the ear becomes progressively less sensitive. To account for this feature of human hearing, sound level meters incorporate a filtering of acoustic signals that corresponds to the varying frequency sensitivity of the human ear. This filtering is called A-weighting. Sound level measurements that are obtained using this filtering are referred to as A-weighted sound levels and are signified by the identifier dBA.

Percentile sound levels (L_{90}, L_{50}, L_{10}, and L_{01}) are the statistical descriptors of the A-weighted sound levels exceeded 90, 50, 10 and 1 percent of each time interval monitored. The L_{90} represents the nominally lowest levels reached during the monitoring interval. The L_{90} is typically influenced by sound of relatively low level, but nearly constant duration, such as distant traffic or continuously operating industrial equipment. The L_{90} is often used in standards to quantify the existing background or residual sound level. Conversely, the L_{10} represents the nominally highest sound levels reached during a monitoring interval. The L_{10} is typically influenced by sound of high level, but short duration, such as that produced by vehicles passing by on a nearby road. The L_{10} is sometimes called the intrusive sound level. By using percentile sound levels, it is possible to characterize the sound environment in terms of the steady-state background sound (L_{90}) and occasional transient sound (L_{10}).

The equivalent sound level (L_{eq}) is the energy average sound level. Sounds of low level and long duration, as well as sounds of high level and short duration influence this sound level descriptor. Because of the sensitivity of this descriptor to the temporal characteristics of sound, the L_{eq} has become widely accepted for use in environmental noise regulations and criteria. Among the federal agencies using energy average sound levels are the U.S. Environmental Protection Agency, the Federal Highway Administration, the U.S. Department of Housing and Urban Development, the Federal Aviation Administration, and the Department of Defense.

To document the time-varying characteristics of environmental sounds at the selected monitoring locations, sound levels were monitored using Larson-Davis model 700 environmental noise monitors outfitted with ½-inch electret microphones, and windscreens. The environmental noise monitors were calibrated before and after the measurement period using a Larson-Davis CA-250 sound level calibrator. The monitors, microphones, and signal processing conform to ANSI S1.4 for Type 1 precision sound measurement instrumentation. For this study, the monitors were programmed to record the following hourly A-weighted environmental noise descriptors.

- Maximum sound level (L_{max}),
- Minimum sound level (L_{min}),
- Percentile sound levels (L_{90}, L_{50}, L_{10}, and L_{01}),
- Equivalent sound level (L_{eq}).

A complete listing of measured descriptors is provided in Appendix A of this report. Figures 2-4 plot the hourly L_{90}, L_{eq}, and L_{01} sound levels for each monitoring location. These figures convey the variability of environmental sound at each location.

DISCUSSION

Based on the preliminary design documents that we have reviewed, we expect that the sound levels in the areas surrounding the new parcel will not significantly increase and will remain similar to the levels measured in our pre-construction survey. The background sound levels summarized in this letter can be used during the design process to ensure that facility operation will be in compliance with the MDEP Policy 90-001 on Community Noise.

The Commonwealth of Massachusetts Department of Environmental Protection policy on noise produced by facilities at adjacent properties (MDEP Policy 90-001) is as follows:

1. A facility may not increase ambient sound by more than 10 dBA above the previously existing background sound level.

2. A facility may not produce a pure-tone condition.

Background sound level is defined as the sound level exceeded 90% of the quietest operating period. A pure-tone condition is defined to exist when the sound level in any octave band exceeds the sound level in both adjacent octave bands by 3 dB or more.

We would be pleased to assist you with the facility design to ensure that the sound emissions from the completed facility satisfy the above criteria. We will provide you with a separate proposal for these services summarizing the project components that we would recommend for study based on our document review and sound survey.

Please call if you have any questions.

Sincerely,
CAVANAUGH TOCCI ASSOCIATES, INC.

Marc G. Cote

Marc G. Cote
MGC/GCT/mgc/01326ISWM BourneMAsoundlevelsurvey.doc

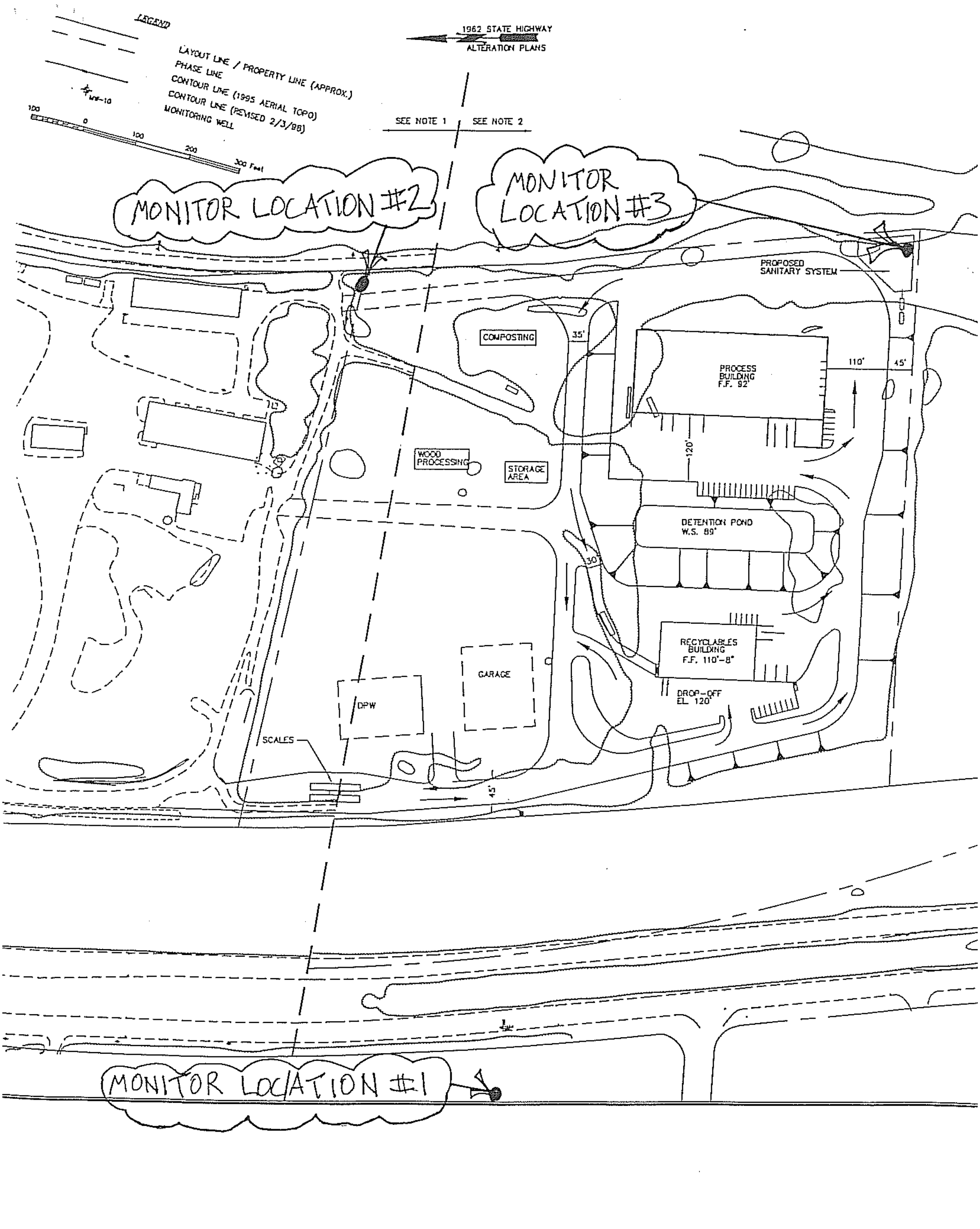

FIGURE 1 SITE PLAN SHOWING MONITOR LOCATIONS

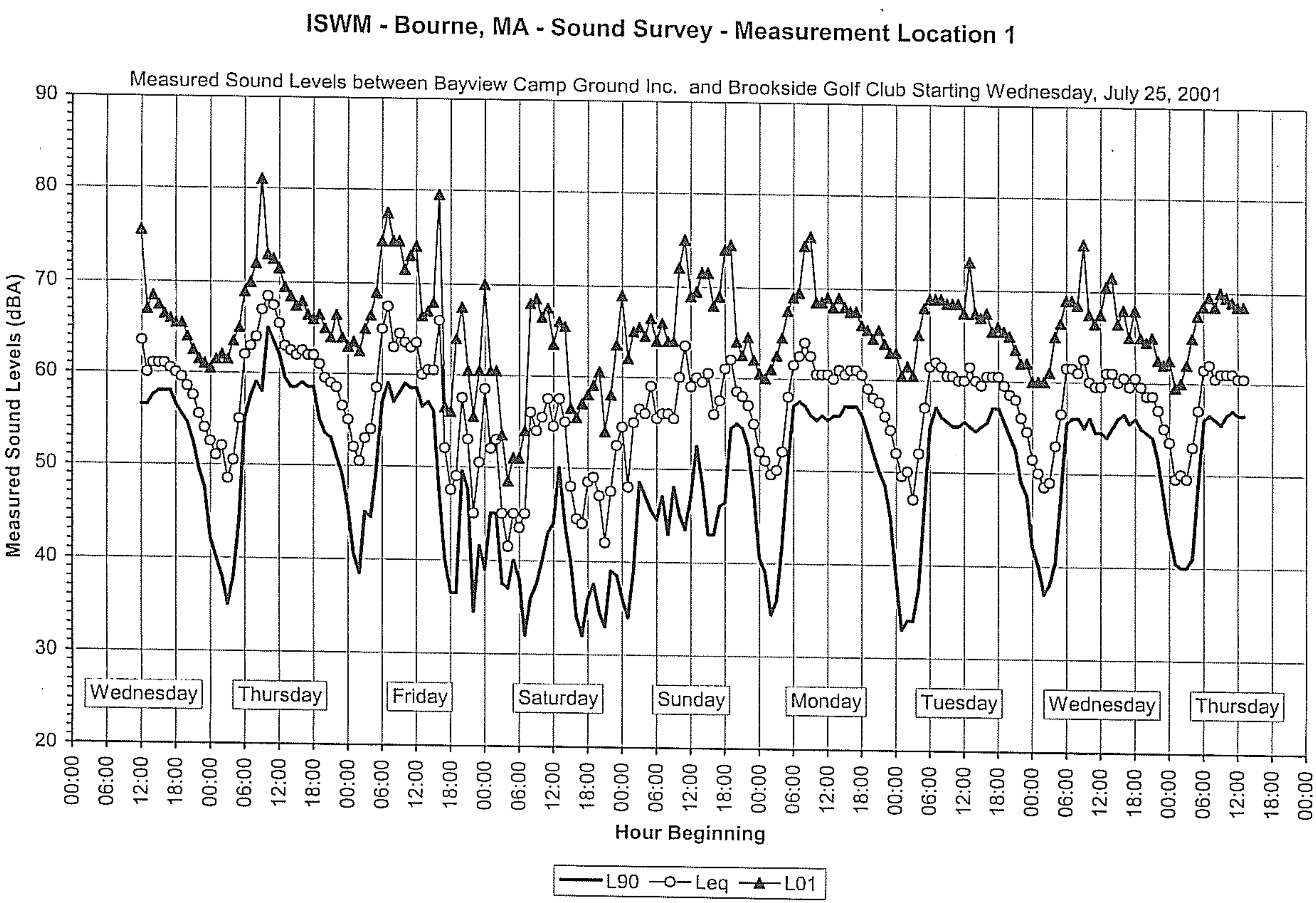
ISWM - Bourne, MA - Sound Survey - Measurement Location 1
Measured Sound Levels between Bayview Camp Ground Inc. and Brookside Golf Club Starting Wednesday, July 25, 2001
Measured Sound Levels (dBA)
90
80
70
60
50
40
30
20
Wednesday
Thursday
Friday
Saturday
Sunday
Monday
Tuesday
Wednesday
Thursday
00:00
06:00
12:00
18:00
Hour Beginning
L90
Leq
L01

Figure 2

ISWM - Bourne, MA - Sound Survey - Measurement Location 2

Measured Sound Levels at Northeast Corner of New Parcel Starting Wednesday, July 25, 2001

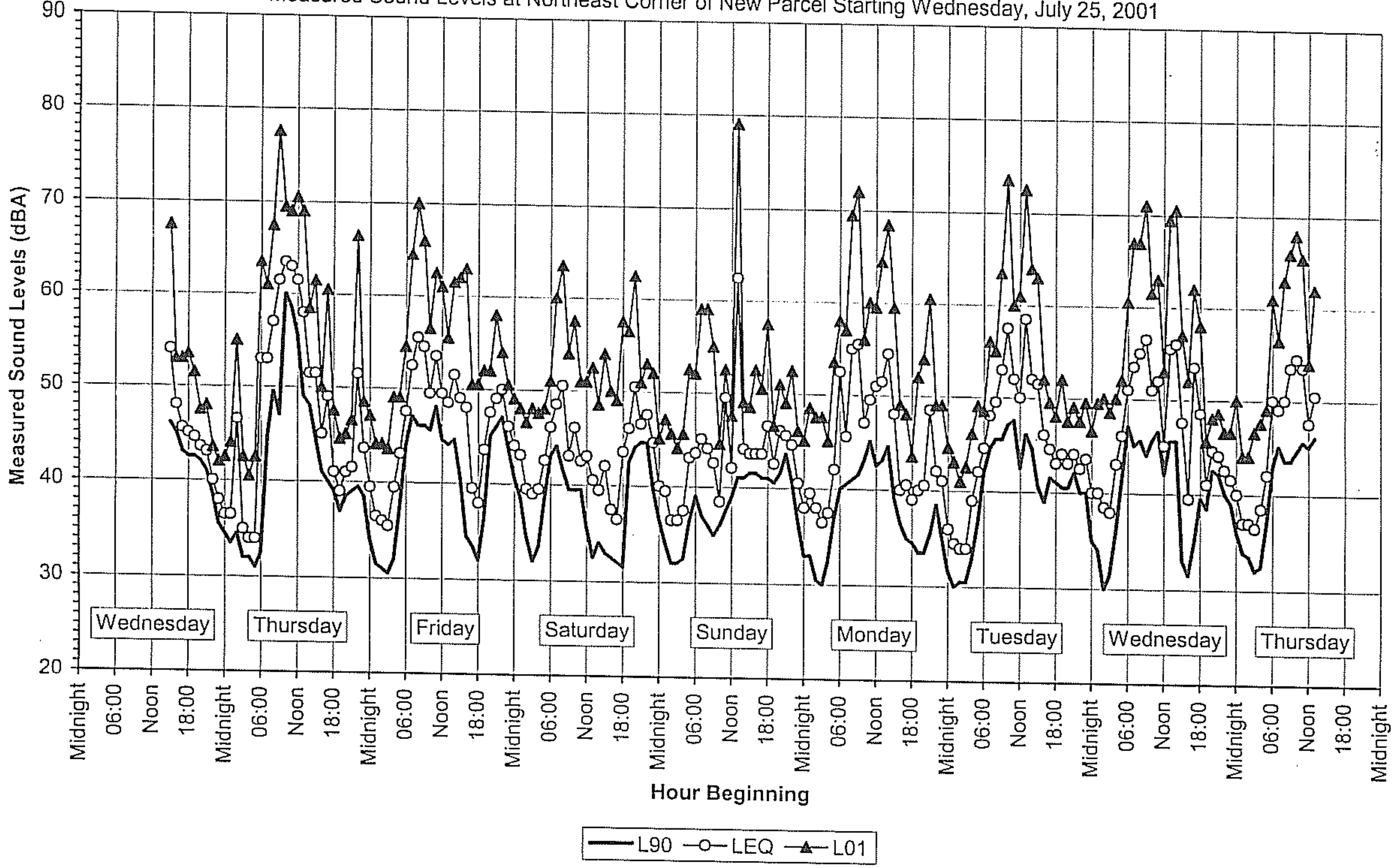

Figure 3

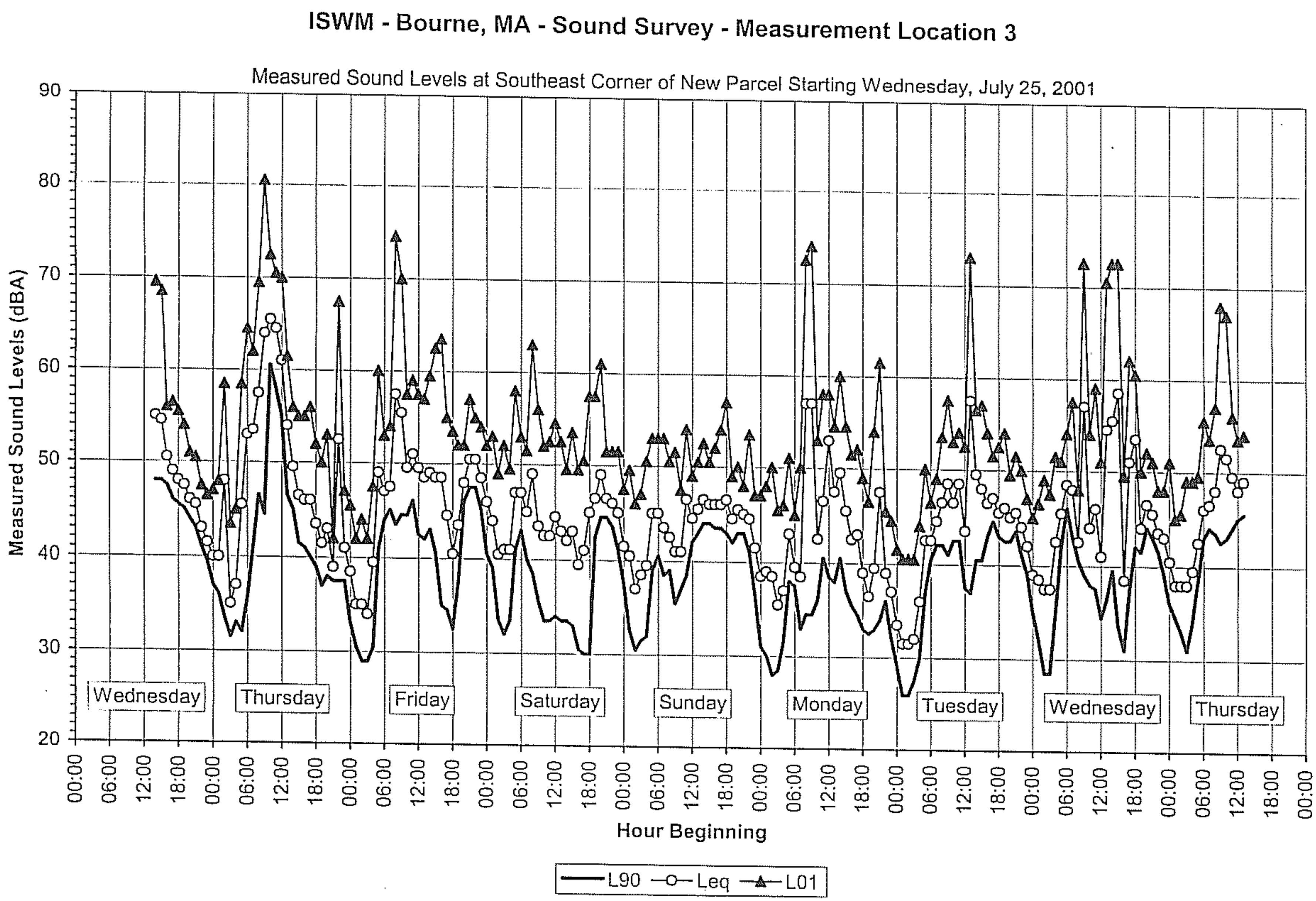
ISWM - Bourne, MA - Sound Survey - Measurement Location 3
Measured Sound Levels at Southeast Corner of New Parcel Starting Wednesday, July 25, 2001
Measured Sound Levels (dBA)
90
80
70
60
50
40
30
20
Wednesday
Thursday
Friday
Saturday
Sunday
Monday
Tuesday
Wednesday
Thursday
00:00
06:00
12:00
18:00
Hour Beginning
L90
Leq
L01

Figure 4

APPENDIX A

Sound Level Survey Data

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1364
DATA FROM: ISWMLD5.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 1 Brookside Golf Club/Bayview Camp Ground
Date: Wednesday, July 25, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
12:00	63.5	52.5	56.5	60.0	65.0	75.5	85.5	110.5
13:00	60.0	51.0	56.5	59.5	62.0	67.0	71.0	83.5
14:00	61.0	51.5	57.5	60.0	62.5	68.5	81.5	94.0
15:00	61.0	54.5	58.0	60.5	63.0	67.5	71.0	97.0
16:00	61.0	54.5	58.0	60.5	62.5	66.5	75.0	87.5
17:00	60.5	53.5	58.0	60.5	62.5	66.0	70.0	82.0
18:00	60.0	51.0	56.5	59.5	62.5	65.5	70.0	86.0
19:00	59.5	50.5	55.5	58.5	61.5	65.5	76.5	93.5
20:00	58.5	50.0	54.5	57.5	60.5	64.0	71.0	83.0
21:00	57.5	46.0	52.5	57.0	60.0	62.5	69.0	81.0
22:00	55.5	43.0	49.5	54.5	59.0	61.5	64.0	78.5
23:00	54.0	40.0	47.5	52.0	57.5	61.0	67.5	79.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1364
DATA FROM: ISWMLD5.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 1 Brookside Golf Club/Bayview Camp Ground
Date: Thursday, July 26, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	52.5	37.0	42.0	49.0	56.0	60.5	70.0	81.0
01:00	51.0	37.0	40.0	46.0	54.5	61.5	69.0	90.0
02:00	52.0	34.5	38.0	46.0	55.5	62.0	74.0	98.0
03:00	48.5	33.5	35.0	39.5	51.0	61.5	69.5	82.5
04:00	50.5	34.5	38.0	44.0	53.5	63.5	68.0	83.0
05:00	55.0	35.5	44.0	51.5	59.0	65.0	71.5	91.0
06:00	62.0	43.5	55.0	60.5	65.0	69.0	72.5	98.0
07:00	63.0	51.5	57.5	62.0	66.0	70.0	77.0	101.0
08:00	64.0	52.5	59.0	63.0	67.0	72.0	77.0	104.0
09:00	67.0	51.0	58.0	62.0	66.5	81.0	90.0	108.0
10:00	68.5	60.0	65.0	68.0	70.5	73.0	74.5	105.5
11:00	67.5	59.0	63.5	66.5	70.0	72.5	74.5	100.5
12:00	65.5	58.0	62.0	64.5	68.0	71.5	74.0	105.5
13:00	63.0	55.5	59.5	62.5	65.5	69.5	71.5	100.0
14:00	62.5	54.0	58.5	62.0	64.5	68.5	83.5	100.0
15:00	62.0	53.5	58.5	61.5	64.0	67.5	70.0	98.5
16:00	62.5	54.0	59.0	62.0	64.0	68.0	81.5	101.0
17:00	62.0	53.5	58.5	62.0	64.0	66.5	75.0	95.5
18:00	62.0	51.0	58.5	61.5	64.0	66.0	69.5	90.5
19:00	61.0	48.0	55.0	60.0	63.0	66.5	82.5	94.0
20:00	59.5	46.5	53.5	59.0	62.5	65.0	71.0	84.0
21:00	59.0	46.5	53.0	58.5	61.5	64.0	68.0	89.0
22:00	58.5	46.5	51.0	57.0	61.5	66.5	71.0	90.0
23:00	56.5	42.5	49.0	54.5	60.0	64.0	74.0	89.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1364
DATA FROM: ISWMLD5.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 1 Brookside Golf Club/Bayview Camp Ground
Date: Friday, July 27, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	55.0	38.5	45.5	51.5	59.0	63.0	69.5	87.0
01:00	52.0	36.0	40.5	46.5	55.5	63.5	70.0	93.0
02:00	50.5	35.0	38.5	44.0	53.5	62.5	71.0	88.0
03:00	53.0	38.0	45.0	49.5	56.0	65.0	73.0	99.0
04:00	54.0	39.0	44.5	49.0	57.0	66.5	72.0	97.0
05:00	58.5	43.0	49.5	55.5	61.5	69.0	73.5	96.5
06:00	65.0	50.0	57.0	62.0	68.5	74.5	79.0	101.0
07:00	67.5	53.5	59.0	63.5	71.5	77.5	82.5	103.5
08:00	63.0	50.5	57.0	60.5	64.5	74.5	80.0	100.5
09:00	64.5	51.0	58.0	61.5	66.5	74.5	80.5	105.0
10:00	63.5	55.0	59.0	62.0	66.0	71.5	79.0	104.5
11:00	63.0	54.5	58.5	61.0	64.5	73.0	81.0	103.0
12:00	63.5	52.5	58.5	61.5	65.5	74.0	82.0	101.0
13:00	60.0	51.5	56.5	59.5	62.0	66.5	77.5	102.0
14:00	60.5	51.5	57.0	59.5	62.5	67.0	75.5	99.5
15:00	60.5	50.0	56.0	59.0	62.0	68.0	79.0	94.0
16:00	66.0	43.0	47.0	52.5	70.0	79.5	87.5	120.5
17:00	52.0	36.5	40.0	44.0	49.5	56.5	86.0	121.0
18:00	47.5	34.0	36.5	41.5	48.0	56.0	79.5	112.5
19:00	49.0	32.5	36.5	39.0	46.0	64.0	69.0	92.0
20:00	57.5	43.5	49.5	54.5	61.0	67.5	73.5	96.5
21:00	53.0	44.0	47.5	51.0	56.0	60.5	65.0	91.5
22:00	45.0	32.0	34.5	41.0	48.5	55.5	68.0	103.5
23:00	50.5	36.5	41.5	48.5	53.5	60.5	66.0	103.0

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1364
DATA FROM: ISWMLD5.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 1 Brookside Golf Club/Bayview Camp Ground
Date: Saturday, July 28, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	58.5	33.5	39.0	46.0	63.0	70.0	81.0	114.0
01:00	52.0	39.5	45.0	49.5	55.0	60.5	67.5	98.0
02:00	53.0	36.5	45.0	51.5	56.5	60.5	65.0	93.5
03:00	45.0	33.5	37.5	42.0	48.0	53.5	62.5	94.5
04:00	41.5	33.0	37.0	40.5	44.5	48.5	58.0	91.0
05:00	45.0	35.0	40.0	44.0	47.5	51.0	57.0	80.5
06:00	43.5	33.0	38.0	42.0	46.5	51.0	54.5	81.5
07:00	45.0	28.5	32.0	42.5	48.5	54.0	57.5	77.5
08:00	56.0	29.5	36.0	44.5	58.0	68.0	85.0	119.0
09:00	54.0	32.5	37.5	44.0	56.0	68.5	79.5	111.0
10:00	55.5	36.5	40.0	46.5	60.0	66.5	76.0	107.5
11:00	57.5	38.0	43.0	51.5	62.0	67.5	73.5	97.5
12:00	54.5	38.5	44.0	52.0	58.0	63.5	67.5	95.5
13:00	57.5	43.0	50.0	55.5	61.0	66.0	72.5	98.0
14:00	55.0	38.5	44.0	51.0	58.5	65.5	73.5	111.5
15:00	48.0	35.5	40.0	44.5	52.0	56.5	63.5	96.0
16:00	44.5	30.5	34.0	39.5	48.5	55.5	60.5	96.5
17:00	44.0	29.5	32.0	37.0	47.0	57.0	63.0	99.5
18:00	48.5	29.5	36.0	44.0	52.5	58.0	68.5	99.0
19:00	49.0	30.5	37.5	45.0	52.0	59.0	75.0	109.5
20:00	47.0	33.0	34.5	37.0	47.0	60.5	71.0	98.5
21:00	42.0	31.0	33.0	37.5	45.0	54.0	63.0	96.5
22:00	47.5	35.0	39.0	43.0	51.0	58.0	66.5	98.5
23:00	52.5	30.5	38.5	46.0	56.0	63.5	69.5	101.0

INTERVAL REPORT   LARSON-DAVIS LABORATORIES   MODEL 700 SN B1364
DATA FROM: ISWMLD5.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 1 Brookside Golf Club/Bayview Camp Ground
Date: Sunday, July 29, 2001   Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	54.5	29.5	36.0	41.5	57.0	69.0	74.0	100.5
01:00	48.0	31.5	34.0	38.5	50.0	62.0	71.0	101.5
02:00	55.0	35.0	39.0	47.0	56.5	65.0	82.5	115.0
03:00	56.5	42.0	48.5	54.0	60.0	65.5	71.5	103.5
04:00	56.0	37.0	47.0	54.0	59.5	64.5	72.5	101.0
05:00	59.0	39.0	45.5	51.5	58.0	66.5	89.0	118.0
06:00	55.5	40.5	44.5	51.0	59.5	64.0	78.0	110.5
07:00	56.0	40.0	47.0	53.0	59.0	66.0	73.5	104.0
08:00	56.0	38.0	43.0	52.5	60.0	64.0	74.0	103.0
09:00	55.5	41.0	48.0	53.0	59.0	64.0	68.5	99.5
10:00	60.0	38.0	45.0	54.0	62.5	72.0	77.0	110.0
11:00	63.5	38.5	43.5	49.5	64.0	75.0	93.0	124.0
12:00	59.0	41.5	47.0	54.5	63.0	69.0	74.0	104.0
13:00	60.0	47.0	52.5	57.0	63.0	69.5	75.5	111.5
14:00	59.5	41.0	48.5	55.0	62.0	71.5	77.0	104.0
15:00	60.5	36.5	43.0	50.5	61.0	71.5	89.5	120.0
16:00	56.0	39.0	43.0	48.5	60.0	68.0	74.0	103.0
17:00	57.5	41.0	46.0	52.0	60.5	69.0	78.5	106.0
18:00	61.0	41.0	46.5	53.5	62.5	74.0	85.0	110.0
19:00	62.0	51.5	54.5	58.0	63.5	74.5	81.5	105.0
20:00	58.5	50.5	55.0	58.0	61.0	64.0	67.0	97.0
21:00	58.0	51.0	54.5	57.5	60.5	62.5	68.5	92.0
22:00	57.0	47.0	52.5	56.0	60.0	64.5	70.0	84.0
23:00	55.0	37.5	47.5	53.5	58.5	62.0	66.0	78.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1364
DATA FROM: ISWMLD5.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 1 Brookside Golf Club/Bayview Camp Ground
Date: Monday, July 30, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	52.0	35.5	40.5	49.0	56.0	60.5	67.0	78.5
01:00	51.0	33.5	39.0	46.5	55.0	60.0	68.5	80.0
02:00	49.5	32.0	34.5	43.5	53.0	61.0	68.5	86.0
03:00	50.0	32.0	36.0	43.0	52.5	62.5	71.0	92.0
04:00	52.0	34.0	42.0	48.0	54.5	64.5	71.0	86.5
05:00	58.0	45.0	50.5	55.0	60.5	67.5	76.5	89.0
06:00	61.5	52.0	57.0	61.0	64.5	69.0	72.5	85.5
07:00	62.5	53.0	57.5	61.0	64.5	69.5	81.0	93.0
08:00	64.0	52.0	57.0	60.5	64.5	74.5	86.5	103.0
09:00	62.5	51.5	56.0	59.5	63.5	75.5	80.5	95.0
10:00	60.5	49.5	55.5	59.0	63.0	68.5	75.5	89.0
11:00	60.5	51.0	56.0	59.5	63.0	68.5	76.0	90.0
12:00	60.5	50.5	55.5	59.0	62.0	69.0	76.5	90.5
13:00	60.0	48.5	56.0	59.0	62.5	68.0	71.0	84.0
14:00	61.0	50.0	56.0	59.5	62.5	69.0	78.5	97.0
15:00	60.5	53.0	57.0	59.5	62.5	68.0	76.0	90.0
16:00	61.0	52.0	57.0	60.5	63.0	67.5	71.5	83.5
17:00	61.0	52.0	57.0	60.5	63.0	67.5	76.5	94.0
18:00	60.5	49.0	56.0	60.0	63.0	66.0	72.5	84.0
19:00	59.0	47.5	54.0	58.0	62.0	65.5	71.0	83.5
20:00	58.0	47.0	52.0	57.0	61.0	64.5	71.0	84.5
21:00	57.5	42.5	50.0	56.0	60.5	65.5	74.5	90.0
22:00	56.0	43.0	48.5	54.0	59.5	64.0	70.0	82.0
23:00	54.5	34.0	45.0	51.0	58.0	63.0	70.5	83.0

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1364
DATA FROM: ISWMLD5.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 1 Brookside Golf Club/Bayview Camp Ground
Date: Tuesday, July 31, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	52.0	32.5	38.5	46.0	56.5	63.0	70.0	82.5
01:00	49.5	30.5	33.0	40.5	53.5	60.5	69.5	83.0
02:00	50.0	32.5	34.0	39.5	51.5	61.5	76.0	93.0
03:00	47.0	31.5	34.0	38.0	48.5	60.5	69.0	82.5
04:00	52.0	33.5	37.5	45.0	54.5	65.0	70.0	83.0
05:00	57.0	40.0	46.5	53.0	60.5	68.0	73.0	84.5
06:00	61.5	49.5	55.0	60.0	64.5	69.0	73.5	95.5
07:00	62.0	51.5	57.0	61.0	65.0	69.0	72.0	96.0
08:00	61.5	50.0	56.0	60.0	63.5	69.0	78.0	91.5
09:00	60.5	50.0	55.5	59.0	62.5	68.5	73.5	90.0
10:00	60.5	47.5	55.0	59.0	62.5	68.5	80.5	99.5
11:00	60.0	49.5	55.0	58.5	62.5	68.5	72.0	86.5
12:00	60.0	49.0	55.5	59.0	62.5	67.5	74.0	87.0
13:00	61.5	49.5	55.0	59.0	63.0	73.0	79.5	95.5
14:00	60.0	49.0	54.5	58.5	62.0	67.5	74.0	86.5
15:00	59.5	47.5	55.0	58.5	62.0	67.0	70.5	84.0
16:00	60.5	48.5	55.5	59.0	62.0	67.5	79.0	93.5
17:00	60.5	52.0	57.0	60.0	62.5	65.5	70.0	88.0
18:00	60.5	52.0	57.0	60.0	63.0	66.0	70.5	86.0
19:00	59.5	50.0	55.5	59.0	62.0	65.5	75.0	88.0
20:00	58.5	49.0	54.0	58.0	61.0	65.0	70.0	86.5
21:00	58.0	47.0	52.5	57.5	60.5	63.5	71.0	86.0
22:00	56.0	43.0	49.0	54.5	59.0	62.0	66.5	79.5
23:00	54.5	42.0	47.5	52.5	58.0	62.0	66.0	78.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1364
DATA FROM: ISWMLD5.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 1 Brookside Golf Club/Bayview Camp Ground
Date: Wednesday, August 1, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	51.5	38.0	42.0	47.5	56.0	60.0	63.0	76.5
01:00	50.0	37.0	40.0	45.5	54.0	60.0	69.5	82.0
02:00	48.5	35.0	37.0	41.0	50.5	60.0	70.5	84.0
03:00	49.0	36.0	38.0	42.5	51.5	61.0	69.5	82.5
04:00	53.0	34.0	40.5	48.0	56.0	65.0	71.5	85.0
05:00	56.5	41.0	47.5	53.5	60.0	66.5	70.5	85.0
06:00	61.5	49.5	55.5	60.0	64.0	69.0	72.0	85.0
07:00	61.5	50.5	56.0	60.5	64.5	69.0	75.5	89.5
08:00	61.0	49.0	56.0	60.0	63.5	68.5	71.0	83.5
09:00	62.5	48.0	55.0	59.5	64.0	75.0	78.0	93.0
10:00	60.0	49.0	56.0	59.0	62.5	67.5	72.0	84.0
11:00	59.5	48.5	54.5	58.5	62.0	66.5	71.0	84.0
12:00	59.5	47.0	54.5	58.5	61.5	67.5	78.0	94.0
13:00	61.0	47.5	54.0	58.5	63.0	70.5	81.0	95.5
14:00	61.0	49.5	55.0	59.0	62.0	71.5	78.0	91.5
15:00	60.0	49.0	56.0	59.0	62.0	66.5	70.0	86.5
16:00	60.5	51.5	56.5	60.0	62.5	68.0	71.0	86.5
17:00	59.5	47.5	55.5	59.0	62.0	65.0	72.0	86.0
18:00	60.5	48.5	56.0	59.5	62.5	68.0	81.5	93.5
19:00	59.5	48.0	55.0	58.5	62.0	65.0	68.5	80.5
20:00	58.5	51.0	54.5	58.0	61.0	64.5	72.5	82.0
21:00	58.5	50.5	54.0	58.0	61.0	65.0	72.0	89.5
22:00	57.0	46.5	51.5	56.0	60.0	62.5	68.0	81.0
23:00	55.0	42.0	47.5	52.5	58.0	62.0	76.0	91.0

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1364
DATA FROM: ISWMLD5.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 1 Brookside Golf Club/Bayview Camp Ground
Date: Thursday, August 2, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	53.5	40.0	43.5	50.0	57.5	62.5	72.0	90.0
01:00	49.5	39.0	40.5	44.5	53.5	59.5	66.0	77.5
02:00	50.0	38.0	40.0	44.5	53.0	60.0	69.0	80.5
03:00	49.5	38.0	40.0	43.0	52.0	62.0	70.0	82.0
04:00	53.0	39.0	41.0	47.5	55.5	65.0	71.0	84.0
05:00	57.0	42.5	48.5	54.0	60.0	67.5	72.5	88.0
06:00	61.5	50.5	56.0	60.0	64.0	68.5	73.0	87.0
07:00	62.0	52.5	56.5	61.0	64.5	69.5	76.0	91.5
08:00	60.5	52.0	56.0	59.5	63.0	68.5	71.5	88.0
09:00	61.0	51.0	55.5	59.5	63.0	70.0	76.0	89.5
10:00	61.0	50.5	56.5	59.5	62.5	69.5	74.0	88.5
11:00	61.0	52.0	57.0	59.5	63.0	69.0	72.5	86.0
12:00	60.5	53.0	56.5	59.5	62.5	68.5	72.0	87.0
13:00	60.5	53.0	56.5	59.0	62.0	68.5	75.5	94.5

INTERVAL REPORT   LARSON-DAVIS LABORATORIES   MODEL 700 SN B0905
DATA FROM: ISWMLD2.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 2 - NE Corner of New Parcel
Date: Wednesday, July 25, 2001   Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
15:00	54.0	43.5	46.0	48.0	52.0	67.5	76.5	96.5
16:00	48.0	43.0	45.0	46.5	48.5	53.0	71.5	87.0
17:00	45.5	41.0	43.0	44.5	46.5	53.0	62.5	93.0
18:00	45.0	41.5	42.5	44.0	46.0	53.5	58.5	70.5
19:00	44.5	40.5	42.5	44.0	46.0	51.5	54.5	74.0
20:00	43.5	40.0	42.0	43.0	44.5	47.5	57.0	71.0
21:00	43.0	39.0	41.0	42.5	44.5	48.0	51.5	69.0
22:00	40.0	36.5	38.5	40.0	41.5	43.5	46.0	69.0
23:00	38.0	33.5	35.5	37.5	39.5	42.0	43.5	69.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B0905
DATA FROM: ISWMLD2.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 2 - NE Corner of New Parcel
Date: Thursday, July 26, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	36.5	32.5	34.5	36.0	38.0	42.5	46.0	64.5
01:00	36.5	32.0	33.5	34.5	38.5	44.0	55.0	72.5
02:00	46.5	32.5	34.5	38.0	50.0	55.0	72.5	104.0
03:00	35.0	30.0	32.0	34.0	36.5	42.5	53.0	93.0
04:00	34.0	30.5	32.0	33.0	35.5	40.5	45.0	75.0
05:00	34.0	29.5	31.0	32.5	35.5	42.5	51.0	78.0
06:00	53.0	31.0	32.5	48.5	57.5	63.5	64.5	95.5
07:00	53.0	43.0	44.5	47.5	57.5	61.0	70.5	90.5
08:00	57.0	47.5	49.5	52.5	60.5	67.5	72.5	98.5
09:00	61.5	45.0	47.0	51.0	59.0	77.5	86.0	106.0
10:00	63.5	57.5	60.0	63.0	66.5	69.5	76.0	101.0
11:00	63.0	56.0	58.5	62.0	66.0	69.0	73.0	101.0
12:00	61.5	52.5	55.5	58.5	65.5	70.5	77.5	112.5
13:00	58.0	46.5	49.0	54.5	60.0	69.0	78.5	113.0
14:00	51.5	46.5	48.0	50.0	54.0	58.5	64.5	103.5
15:00	51.5	42.5	44.5	47.0	50.0	61.5	77.0	111.5
16:00	45.0	39.0	41.0	43.0	46.5	50.0	73.5	111.0
17:00	49.0	38.0	40.0	41.5	50.0	60.5	74.0	100.0
18:00	41.0	36.5	39.0	40.5	43.0	47.5	52.5	76.5
19:00	39.0	35.0	37.0	38.5	40.5	44.5	49.5	70.5
20:00	41.0	35.5	38.5	40.5	42.5	45.0	53.5	69.5
21:00	41.5	35.0	39.0	41.0	44.0	46.5	48.5	71.5
22:00	51.5	35.0	39.5	42.5	45.5	66.5	74.5	91.5
23:00	43.5	33.5	38.5	42.5	45.5	48.5	61.5	77.5

INTERVAL REPORT   LARSON-DAVIS LABORATORIES   MODEL 700 SN B0905
DATA FROM: ISWMLD2.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 2 - NE Corner of New Parcel
Date: Friday, July 27, 2001   Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	39.5	30.0	34.0	38.0	42.5	47.0	49.0	71.0
01:00	36.5	29.5	31.5	35.5	40.0	44.0	48.0	73.0
02:00	36.0	29.5	31.0	33.5	38.5	44.0	51.5	74.5
03:00	35.5	29.0	30.5	33.5	38.0	43.5	50.5	72.0
04:00	39.5	30.5	32.0	37.5	42.5	49.0	54.5	76.5
05:00	43.0	33.0	37.5	42.0	45.5	49.0	57.5	79.5
06:00	47.5	39.5	44.0	46.5	48.5	54.5	65.0	87.5
07:00	52.5	44.0	47.0	49.0	54.5	64.5	68.0	86.5
08:00	55.5	44.0	46.0	48.0	54.5	70.0	74.0	88.5
09:00	54.5	44.0	46.0	50.0	57.0	66.0	71.0	90.0
10:00	49.5	42.0	45.5	48.5	51.5	56.5	64.5	85.0
11:00	53.5	45.0	48.0	51.5	56.0	62.5	68.0	90.0
12:00	49.5	42.5	44.5	47.5	51.0	61.0	66.0	90.0
13:00	48.5	41.0	44.0	47.0	52.0	55.5	64.0	79.0
14:00	51.5	42.0	44.5	47.5	53.5	61.5	72.0	95.0
15:00	49.0	35.5	40.5	44.5	51.5	62.0	65.0	93.5
16:00	48.0	33.0	34.5	36.5	48.0	63.0	70.5	92.5
17:00	39.5	31.5	33.5	35.5	41.5	50.5	58.0	80.5
18:00	38.0	31.0	32.0	33.5	37.0	50.5	59.0	75.0
19:00	43.5	32.5	36.5	41.5	47.0	52.0	57.0	71.5
20:00	47.5	42.0	45.0	47.0	49.5	52.0	56.0	69.5
21:00	49.0	43.5	46.0	48.0	50.5	58.0	62.0	80.0
22:00	50.0	43.5	47.0	49.5	52.0	54.0	57.5	70.5
23:00	46.0	40.5	43.5	45.5	48.5	50.5	53.5	72.5

DATA FROM: ISWMLD2.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 2 - NE Corner of New Parcel
Date: Sunday, July 29, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	40.0	33.5	36.5	39.5	42.5	45.0	48.0	66.5
01:00	39.5	31.0	34.0	38.0	42.5	47.0	55.5	67.0
02:00	36.5	30.0	32.0	34.5	39.5	45.5	53.0	66.0
03:00	36.5	29.5	32.0	35.5	39.5	44.0	47.5	62.5
04:00	37.5	29.0	32.5	36.0	41.0	45.5	48.5	71.5
05:00	43.0	33.0	36.5	40.0	47.0	52.5	56.5	77.5
06:00	43.5	35.5	39.0	41.0	44.0	52.0	69.5	84.0
07:00	45.0	33.5	37.0	40.5	44.0	59.0	69.0	78.5
08:00	44.0	33.5	36.0	38.0	42.0	59.0	66.5	82.5
09:00	42.5	34.0	35.0	37.0	42.0	55.0	68.0	89.5
10:00	38.5	34.5	36.0	38.0	40.0	44.5	50.5	69.5
11:00	49.5	34.5	37.5	40.0	43.5	52.5	80.5	102.0
12:00	42.0	37.0	39.0	40.5	43.5	47.5	61.5	79.0
13:00	62.5	39.5	41.0	42.5	47.0	79.0	84.0	97.5
14:00	44.0	39.0	41.0	42.5	44.5	49.0	64.5	77.5
15:00	43.5	39.5	41.5	43.0	45.0	48.5	53.5	70.5
16:00	43.5	39.0	41.5	43.0	44.5	52.5	57.5	72.0
17:00	43.5	37.5	41.0	43.0	45.0	50.5	55.0	69.5
18:00	46.5	38.5	41.0	42.5	44.5	57.5	71.5	95.0
19:00	42.5	36.5	40.5	42.0	44.0	46.5	50.5	70.5
20:00	46.0	38.0	41.5	45.5	48.5	51.0	57.0	77.5
21:00	45.5	38.5	43.5	45.5	47.0	49.0	51.5	64.5
22:00	44.5	36.5	40.5	43.5	46.0	52.5	61.5	82.5
23:00	40.5	32.0	36.5	39.5	43.0	46.0	54.0	73.0

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B0905
DATA FROM: ISWMLD2.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 2 - NE Corner of New Parcel
Date: Monday, July 30, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	38.0	30.5	33.0	36.5	40.5	45.0	50.5	63.0
01:00	39.5	29.5	33.0	37.5	42.5	48.5	55.5	69.0
02:00	38.0	28.5	30.5	35.0	41.0	47.5	50.5	64.5
03:00	36.5	28.5	30.0	33.0	39.5	47.5	54.0	68.0
04:00	37.5	29.0	32.5	36.5	40.5	45.0	49.0	63.0
05:00	42.0	33.0	37.0	39.5	44.0	53.5	60.0	87.0
06:00	52.5	35.0	40.0	53.5	55.5	58.0	67.0	85.0
07:00	45.5	39.5	40.5	43.0	46.0	57.0	65.0	82.5
08:00	55.0	38.5	41.0	44.0	48.5	69.5	76.5	91.0
09:00	55.5	40.5	41.5	43.0	47.5	72.0	78.5	97.0
10:00	47.0	41.5	43.0	45.0	49.5	56.0	60.5	79.0
11:00	49.5	43.0	45.0	47.5	51.5	60.0	63.5	78.5
12:00	51.0	41.0	42.5	44.0	46.0	59.5	76.0	99.0
13:00	51.5	41.5	43.0	45.0	50.5	64.5	77.0	96.5
14:00	54.5	41.0	44.5	46.5	55.0	68.5	71.5	96.0
15:00	48.0	35.5	39.0	44.5	50.0	59.5	67.0	83.5
16:00	40.0	34.0	36.5	38.5	41.5	49.0	53.5	77.5
17:00	40.5	33.0	35.0	38.0	42.5	48.0	62.5	85.5
18:00	39.0	33.0	34.5	39.0	40.5	43.5	46.0	72.5
19:00	40.0	32.5	33.5	35.0	42.5	52.0	55.0	72.5
20:00	40.5	32.5	33.5	35.5	37.0	54.0	62.0	73.5
21:00	48.5	34.0	35.5	37.5	44.0	60.5	71.5	88.0
22:00	42.0	34.5	38.5	41.5	44.0	49.0	53.5	67.0
23:00	41.0	31.5	35.0	39.0	43.5	49.0	53.0	70.0

INTERVAL REPORT   LARSON-DAVIS LABORATORIES   MODEL 700 SN B0905
DATA FROM: ISWMLD2.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 2 - NE Corner of New Parcel
Date: Tuesday, July 31, 2001   Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	36.0	29.0	31.5	34.5	38.5	44.5	50.5	66.5
01:00	34.5	28.5	30.0	32.5	37.0	43.0	45.5	59.5
02:00	34.0	29.0	30.5	32.5	36.5	41.0	48.0	74.5
03:00	34.0	29.0	30.5	32.5	36.0	42.5	48.0	70.0
04:00	39.0	29.5	33.0	37.0	42.0	46.0	49.5	65.5
05:00	42.0	32.5	37.0	40.5	45.0	49.0	52.0	69.0
06:00	44.5	39.0	42.0	44.0	46.0	48.5	55.5	74.0
07:00	48.0	42.5	44.5	47.0	50.5	56.0	62.0	83.5
08:00	49.5	43.5	45.5	48.0	51.5	55.0	72.5	95.0
09:00	53.0	43.0	45.5	47.5	55.0	63.5	72.5	92.0
10:00	57.5	44.5	47.0	50.0	54.5	73.5	76.5	92.5
11:00	52.0	44.5	47.5	50.5	54.0	60.0	70.0	87.0
12:00	50.0	40.5	42.5	46.5	52.0	61.0	67.5	89.0
13:00	58.5	41.5	46.0	50.5	57.5	72.5	82.0	101.0
14:00	52.0	41.5	44.5	48.0	53.5	64.0	70.5	91.0
15:00	51.5	38.5	40.5	47.0	55.0	63.0	68.5	84.0
16:00	46.0	37.5	39.0	41.5	44.0	52.0	75.0	96.5
17:00	44.5	39.0	41.5	43.0	45.0	49.5	66.0	92.0
18:00	43.0	39.0	41.0	42.5	44.0	48.0	53.5	68.5
19:00	44.0	38.5	40.5	42.5	45.5	52.0	59.0	75.5
20:00	43.0	38.5	40.5	42.5	44.0	47.5	55.5	69.0
21:00	44.0	41.0	42.0	43.5	45.0	49.0	57.5	72.5
22:00	42.5	37.5	40.0	42.0	43.5	47.5	50.5	70.0
23:00	43.5	37.0	40.0	43.0	46.5	49.5	53.0	67.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B0905
DATA FROM: ISWMLD2.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 2 - NE Corner of New Parcel
Date: Wednesday, August 1, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	40.0	32.0	35.0	39.0	43.5	46.5	49.0	70.5
01:00	40.0	30.5	34.0	37.5	43.0	49.5	53.5	71.0
02:00	38.5	29.0	30.0	34.5	41.5	50.0	54.5	67.5
03:00	38.0	29.5	31.5	35.0	41.0	48.5	52.0	70.0
04:00	43.0	31.0	36.0	40.0	47.0	50.0	54.5	73.5
05:00	46.0	37.0	41.5	45.5	48.5	52.0	55.5	71.0
06:00	51.0	43.0	47.0	49.0	51.5	60.5	71.5	87.5
07:00	53.5	43.5	45.0	47.5	55.0	67.0	73.0	93.5
08:00	55.0	43.0	45.5	49.5	57.5	67.0	71.5	93.5
09:00	56.5	42.0	44.0	46.5	53.0	71.0	74.5	92.0
10:00	51.0	43.0	45.5	48.0	54.5	61.5	69.5	88.0
11:00	52.0	45.0	46.5	49.0	54.5	63.0	66.5	82.0
12:00	45.0	41.0	42.0	43.5	46.5	53.0	60.0	77.5
13:00	55.5	42.5	45.5	48.5	53.5	69.5	76.5	92.0
14:00	56.0	43.0	45.5	49.5	54.5	70.5	77.5	93.0
15:00	47.5	31.5	33.0	45.0	49.0	57.0	71.0	94.5
16:00	39.5	30.5	31.5	32.5	39.0	52.0	63.0	81.5
17:00	53.5	31.0	35.0	38.5	42.5	62.0	82.5	97.0
18:00	48.5	37.5	39.5	42.0	46.5	58.0	73.0	88.5
19:00	41.0	36.5	38.5	40.5	43.0	45.5	49.0	73.5
20:00	44.5	40.5	42.5	44.0	45.5	48.0	52.0	65.5
21:00	44.0	40.0	42.0	43.5	45.5	48.5	54.0	71.0
22:00	42.5	38.0	40.0	42.0	44.5	46.5	49.0	68.5
23:00	41.5	36.5	39.0	41.0	43.5	46.5	56.5	70.0

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B0905
DATA FROM: ISWMLD2.xls

Richard W. Keller, P.E.
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 2 - NE Corner of New Parcel
Date: Thursday, August 2, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	40.0	33.5	36.0	38.5	41.0	50.0	56.0	70.5
01:00	37.0	31.5	34.0	36.0	39.0	44.0	49.0	78.0
02:00	37.0	30.5	33.5	36.0	39.5	44.0	51.0	68.5
03:00	36.5	30.0	32.0	34.5	39.5	46.5	52.0	91.0
04:00	38.5	30.5	32.5	36.5	41.0	47.5	51.5	67.5
05:00	42.0	33.5	37.0	40.5	45.0	49.0	52.0	80.5
06:00	50.0	38.0	43.0	46.5	51.5	61.0	71.0	92.5
07:00	49.0	43.0	45.0	47.0	52.5	56.5	60.5	76.5
08:00	50.0	41.5	43.5	45.5	52.0	63.0	71.0	89.0
09:00	53.5	42.0	43.5	45.0	54.0	66.0	74.5	92.0
10:00	54.5	43.0	44.5	48.0	55.0	68.0	78.0	95.0
11:00	53.5	44.0	45.5	48.0	57.0	65.5	74.0	95.0
12:00	47.5	43.0	45.0	46.5	50.5	54.0	56.0	73.5
13:00	50.5	44.5	46.0	47.0	52.0	62.0	71.5	91.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1335
DATA FROM: ISWMLD7.xls

Richard W. Keller
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 3 - SE Corner of New Parcel
Date: Wednesday, July 25, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
14:00	55.0	41.0	48.0	49.5	53.5	69.5	74.5	95.5
15:00	54.5	46.0	48.0	50.0	53.0	68.5	73.0	91.5
16:00	50.5	45.0	47.5	49.5	52.0	56.0	68.0	81.5
17:00	49.0	44.0	46.0	48.0	50.5	56.5	65.5	81.5
18:00	48.0	43.5	45.5	47.0	50.0	55.5	60.5	79.0
19:00	47.5	43.0	45.0	46.5	49.0	54.0	60.0	72.5
20:00	46.0	42.0	44.0	45.5	47.5	51.0	57.0	73.0
21:00	45.5	39.5	43.0	45.0	47.0	50.5	54.5	72.5
22:00	43.0	37.5	41.0	43.0	44.5	47.5	52.0	70.0
23:00	41.5	35.0	39.5	41.0	43.0	46.5	50.0	66.0

INTERVAL REPORT   LARSON-DAVIS LABORATORIES   MODEL 700 SN B1335
DATA FROM: ISWMLD7.xls

Richard W. Keller
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 3 - SE Corner of New Parcel
Date: Thursday, July 26, 2001   Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	40.0	32.5	37.0	39.0	41.5	47.0	52.5	67.5
01:00	40.0	30.5	36.0	38.0	42.0	48.0	59.0	78.0
02:00	48.0	29.0	33.5	39.5	52.0	58.5	73.0	99.5
03:00	35.0	28.0	31.5	33.5	37.5	43.5	50.5	83.5
04:00	37.0	29.0	33.0	34.5	41.5	45.0	47.5	77.5
05:00	45.5	29.5	32.0	37.0	48.5	58.5	64.5	83.0
06:00	53.0	30.5	35.5	47.5	57.5	64.5	65.5	89.0
07:00	53.5	39.0	41.0	44.0	58.5	62.0	69.5	89.0
08:00	57.5	43.5	46.5	50.0	60.5	69.5	75.0	92.0
09:00	64.0	41.0	44.5	50.5	61.0	80.5	87.5	103.5
10:00	65.5	56.0	60.5	64.5	69.0	72.5	76.5	98.0
11:00	64.5	54.5	58.0	63.0	68.0	70.5	74.5	100.5
12:00	61.0	52.0	55.0	59.5	64.0	70.0	72.5	95.0
13:00	54.0	43.0	46.5	52.0	57.5	61.5	65.5	93.0
14:00	49.5	43.0	45.0	48.0	52.5	56.0	58.5	87.0
15:00	46.5	38.5	41.5	44.5	49.0	55.0	60.5	85.0
16:00	46.0	38.5	41.0	44.0	48.0	55.0	58.0	89.0
17:00	46.0	37.5	40.0	43.0	48.5	56.0	66.0	84.5
18:00	43.5	37.0	39.0	42.0	46.0	52.0	56.0	81.5
19:00	41.5	34.5	37.0	39.0	45.0	50.0	57.0	78.5
20:00	43.0	34.5	38.0	40.0	45.0	53.0	57.5	74.0
21:00	39.0	36.0	37.5	38.5	40.0	42.0	45.0	77.0
22:00	52.5	35.5	37.5	39.5	43.0	67.5	77.0	91.0
23:00	41.0	32.0	37.5	40.5	43.5	47.0	56.5	74.0

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1335
DATA FROM: ISWMLD7.xls

Richard W. Keller
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 3 - SE Corner of New Parcel
Date: Friday, July 27, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	38.5	28.5	33.0	36.5	41.5	45.5	49.5	68.0
01:00	35.0	27.5	30.5	34.0	37.5	42.0	48.0	70.0
02:00	35.0	26.5	29.0	33.0	38.0	44.0	48.0	71.0
03:00	34.0	26.5	29.0	32.5	36.5	42.0	48.0	81.0
04:00	39.5	27.0	30.5	37.0	43.0	47.5	52.5	74.0
05:00	49.0	34.5	41.0	44.0	48.5	60.0	72.5	91.5
06:00	47.0	40.0	44.0	46.0	48.5	53.0	56.5	78.5
07:00	47.5	42.5	45.0	46.5	49.5	54.0	57.0	79.0
08:00	57.5	41.0	43.5	46.0	52.0	74.5	80.0	94.0
09:00	55.5	41.5	44.5	47.0	52.0	70.0	81.0	96.0
10:00	49.5	40.0	44.5	47.5	52.5	57.5	62.5	79.5
11:00	51.0	43.0	46.0	49.0	54.0	59.0	66.5	82.5
12:00	49.5	39.0	42.5	47.5	52.5	57.5	64.0	81.0
13:00	48.5	39.0	42.0	46.0	51.5	57.0	60.5	82.5
14:00	49.0	39.5	43.0	46.0	51.0	59.5	65.0	83.5
15:00	48.5	36.5	40.5	44.0	49.5	62.5	67.0	88.5
16:00	48.5	32.5	35.0	39.0	47.5	63.5	71.5	90.5
17:00	44.5	30.0	34.5	40.0	47.0	55.0	63.0	77.0
18:00	40.5	30.5	32.5	35.0	43.0	53.5	59.5	74.0
19:00	43.5	33.0	37.5	42.0	46.0	52.0	56.0	68.0
20:00	48.0	43.0	46.0	48.0	50.0	52.0	58.0	71.0
21:00	50.5	44.0	47.5	49.5	52.0	57.0	61.5	76.0
22:00	50.5	44.0	47.5	50.0	53.0	55.0	58.0	70.0
23:00	48.5	40.5	45.0	48.0	51.0	54.0	59.0	73.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1335
DATA FROM: ISWMLD7.xls

Richard W. Keller
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 3 - SE Corner of New Parcel
Date: Saturday, July 28, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	46.0	36.5	40.5	44.5	49.0	52.0	61.0	74.5
01:00	44.0	34.5	39.0	43.0	46.5	53.0	56.5	72.0
02:00	40.5	29.5	33.5	39.0	43.5	49.0	54.0	66.5
03:00	41.0	29.0	32.0	37.5	44.0	52.0	56.5	69.5
04:00	41.0	30.5	33.5	38.0	45.5	49.5	52.0	70.5
05:00	47.0	37.5	41.0	44.5	49.5	58.0	64.5	82.5
06:00	47.0	39.5	43.0	46.0	49.5	53.0	60.0	74.0
07:00	45.0	37.5	40.0	43.5	48.0	51.5	65.5	83.5
08:00	49.0	36.0	38.5	43.0	48.0	63.0	69.5	93.0
09:00	43.5	33.5	35.5	39.5	45.0	56.0	63.5	79.0
10:00	42.5	31.0	33.5	39.0	46.5	52.0	56.0	73.0
11:00	42.5	30.0	33.5	39.5	45.5	52.5	58.5	75.0
12:00	44.5	32.0	34.0	38.5	47.0	54.5	66.0	86.5
13:00	43.0	29.5	33.5	39.5	46.0	52.5	58.0	75.0
14:00	42.0	30.5	33.5	39.5	46.0	49.5	55.0	76.5
15:00	43.0	29.5	33.0	38.5	45.0	53.5	64.5	81.5
16:00	39.5	28.0	30.5	34.5	43.0	49.5	54.5	72.5
17:00	41.0	28.0	30.0	36.0	45.0	50.5	56.5	74.0
18:00	45.0	27.5	30.0	39.5	47.0	57.5	64.5	83.5
19:00	46.5	38.0	42.5	44.0	48.0	57.5	65.0	77.0
20:00	49.0	42.0	44.5	46.0	49.5	61.0	67.5	83.0
21:00	46.5	40.5	44.5	46.5	48.0	51.5	54.5	73.5
22:00	46.0	41.0	43.5	45.5	47.5	51.5	62.0	80.5
23:00	45.0	35.0	41.0	44.0	47.0	51.5	57.5	75.0

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1335
DATA FROM: ISWMLD7.xls

Richard W. Keller
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 3 - SE Corner of New Parcel
Date: Sunday, July 29, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	41.5	34.0	37.5	41.0	43.5	47.5	54.5	65.0
01:00	40.5	28.5	32.5	39.0	43.5	49.5	54.0	67.5
02:00	37.0	27.5	30.5	34.0	40.5	46.0	50.0	64.5
03:00	38.5	28.5	31.5	36.5	42.0	47.0	50.0	67.5
04:00	39.5	27.5	32.0	37.0	42.5	50.5	56.0	69.5
05:00	45.0	32.0	39.0	43.5	48.0	53.0	61.0	76.5
06:00	45.0	36.0	40.5	43.5	47.5	53.0	58.0	72.5
07:00	43.5	32.5	38.5	42.0	46.0	53.0	63.0	84.0
08:00	42.5	34.0	39.0	41.5	44.5	50.5	55.5	69.5
09:00	41.0	31.0	35.5	39.0	42.5	51.5	58.0	82.5
10:00	41.0	34.0	37.0	40.0	44.0	47.5	54.0	70.5
11:00	46.5	35.0	38.5	43.0	46.5	54.0	70.5	85.5
12:00	44.5	38.0	42.0	44.0	46.0	49.0	61.0	77.0
13:00	45.5	40.5	43.0	45.0	47.5	50.5	56.0	70.0
14:00	46.5	41.0	44.0	45.5	47.5	52.5	61.0	73.0
15:00	46.0	41.5	44.0	45.5	47.5	50.5	54.0	70.0
16:00	46.0	41.0	43.5	45.0	47.0	52.0	59.5	72.5
17:00	46.0	39.5	43.5	45.5	47.5	54.0	61.0	78.0
18:00	46.5	40.0	43.0	44.5	47.0	57.0	65.5	85.0
19:00	44.5	39.0	42.0	44.0	46.0	49.0	56.5	75.5
20:00	45.5	38.5	43.0	45.0	47.5	50.0	56.5	71.5
21:00	45.0	40.0	43.0	45.0	46.5	48.0	50.5	67.5
22:00	44.5	36.5	41.0	43.5	46.0	53.5	60.0	73.0
23:00	41.5	30.5	36.5	40.5	44.0	47.0	56.5	68.0

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1335
DATA FROM: ISWMLD7.xls

Richard W. Keller
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 3 - SE Corner of New Parcel
Date: Monday, July 30, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	38.5	25.0	31.0	36.5	41.5	47.0	54.0	66.5
01:00	39.0	25.0	30.0	36.5	42.0	48.0	55.5	75.0
02:00	38.5	25.5	28.0	34.0	42.0	50.0	57.5	67.5
03:00	35.5	25.5	28.5	32.0	38.0	45.5	54.0	65.0
04:00	37.0	27.5	31.5	35.0	40.0	46.0	48.5	64.0
05:00	43.0	34.5	38.0	40.5	46.0	51.0	58.0	76.0
06:00	39.5	34.5	37.5	39.0	41.5	45.0	48.0	68.0
07:00	38.5	31.0	33.0	37.0	40.0	50.0	56.0	72.0
08:00	57.0	32.5	34.5	40.5	46.5	72.5	79.5	93.0
09:00	57.0	31.0	34.5	38.0	45.0	74.0	80.0	93.5
10:00	42.5	33.0	36.0	39.0	45.0	53.0	60.5	79.0
11:00	46.5	36.5	40.5	43.5	48.0	58.0	63.0	75.5
12:00	53.0	35.0	38.5	42.5	49.0	58.0	79.0	94.0
13:00	47.5	35.0	38.0	42.5	49.5	54.5	75.0	89.5
14:00	49.5	37.0	40.5	44.0	50.5	60.0	74.0	89.5
15:00	45.5	34.0	37.0	43.0	49.0	54.5	63.5	81.5
16:00	42.5	33.0	35.5	39.5	46.0	51.5	55.5	74.5
17:00	43.0	32.0	34.5	38.5	45.5	52.0	66.5	80.5
18:00	39.0	31.0	33.0	36.0	42.0	49.0	53.5	72.0
19:00	36.5	30.5	32.5	34.5	39.0	46.5	51.5	70.0
20:00	39.5	30.5	33.0	35.0	40.0	54.0	57.0	72.0
21:00	47.5	32.0	34.0	36.0	42.0	61.5	71.0	86.0
22:00	39.0	34.0	36.0	38.5	41.0	45.5	48.0	68.0
23:00	37.0	29.0	32.0	36.0	40.0	44.5	49.5	72.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1335
DATA FROM: ISWMLD7.xls

Richard W. Keller
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 3 - SE Corner of New Parcel
Date: Tuesday, July 31, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	33.5	26.0	29.0	32.0	36.0	41.5	46.0	64.0
01:00	31.5	23.5	26.0	29.5	34.5	40.5	45.0	63.0
02:00	31.5	24.0	26.0	29.5	34.5	40.5	44.5	63.5
03:00	32.0	25.0	27.5	30.0	34.5	40.5	46.0	60.0
04:00	36.0	26.0	30.0	34.5	39.0	44.0	47.5	70.0
05:00	42.5	32.0	37.0	41.0	45.5	50.0	54.0	72.5
06:00	42.5	38.0	40.5	42.5	44.5	46.5	50.0	71.5
07:00	44.5	40.0	42.0	43.5	46.5	49.0	52.5	70.0
08:00	46.5	39.0	42.0	44.5	48.0	53.5	68.5	87.0
09:00	48.5	37.5	41.0	43.5	48.5	57.5	76.5	90.0
10:00	46.5	38.5	42.5	45.0	49.5	53.0	58.5	88.0
11:00	48.5	38.0	42.5	47.5	51.5	54.0	57.0	76.5
12:00	43.5	33.0	37.5	40.5	46.0	52.5	64.0	92.5
13:00	57.5	35.5	37.0	41.0	51.5	73.0	79.0	93.0
14:00	49.5	36.5	40.5	46.0	53.5	56.5	66.5	89.5
15:00	48.0	35.0	40.5	44.5	53.0	57.0	59.5	77.0
16:00	46.5	40.0	43.0	45.0	47.5	54.0	68.0	81.5
17:00	47.0	42.5	44.5	46.0	48.0	51.5	69.5	89.5
18:00	45.5	40.5	43.0	45.0	47.5	52.5	57.0	77.5
19:00	46.0	40.0	42.5	44.5	47.5	54.0	59.5	71.5
20:00	45.0	39.5	42.5	44.5	46.5	49.5	55.5	68.5
21:00	45.5	41.5	43.5	45.0	46.5	51.5	64.5	77.0
22:00	44.0	38.0	41.0	43.0	45.5	50.0	55.0	69.5
23:00	42.0	34.5	39.0	41.5	44.0	47.0	50.5	69.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1335
DATA FROM: ISWMLD7.xls

Richard W. Keller
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 3 - SE Corner of New Parcel
Date: Wednesday, August 1, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	39.0	30.5	35.0	38.0	41.5	45.0	48.5	64.0
01:00	38.5	28.0	32.0	37.0	42.0	46.5	51.0	77.0
02:00	37.5	26.5	28.5	33.5	40.5	49.0	54.5	66.0
03:00	37.5	26.0	28.5	33.5	40.5	47.5	56.0	68.5
04:00	42.5	27.0	35.0	40.0	46.0	51.5	54.0	67.0
05:00	45.5	36.5	42.0	45.0	48.0	51.0	58.0	72.0
06:00	48.5	43.0	46.0	48.0	50.5	54.0	62.5	84.5
07:00	48.0	41.0	43.0	45.0	51.5	57.5	65.0	80.5
08:00	42.5	39.0	40.5	42.0	44.0	48.0	56.0	77.0
09:00	57.0	36.0	39.0	41.5	53.0	72.5	76.0	90.0
10:00	44.0	33.5	38.0	42.0	46.5	54.0	59.0	81.0
11:00	46.0	34.0	37.5	41.0	46.0	59.0	68.0	82.5
12:00	41.0	32.0	34.5	38.0	43.5	51.0	54.0	71.0
13:00	54.5	32.5	36.5	39.0	44.0	70.5	78.5	91.5
14:00	55.5	37.0	39.5	42.0	46.0	72.5	80.0	93.0
15:00	58.5	31.0	33.5	39.0	44.0	72.5	88.5	108.5
16:00	38.5	29.0	31.0	33.0	39.5	49.5	61.5	81.0
17:00	51.0	31.0	37.5	43.5	47.0	62.0	77.5	95.0
18:00	53.5	39.5	42.0	44.0	47.5	60.5	84.5	100.0
19:00	44.0	39.5	41.5	43.5	46.0	50.0	58.5	75.0
20:00	46.5	41.5	44.0	46.0	48.0	52.0	57.5	78.5
21:00	45.5	41.5	43.0	45.0	47.5	51.0	55.5	74.5
22:00	43.5	39.5	41.5	43.0	45.0	48.0	50.5	69.0
23:00	43.0	36.0	39.0	42.5	44.5	48.0	58.0	70.5

INTERVAL REPORT LARSON-DAVIS LABORATORIES MODEL 700 SN B1335
DATA FROM: ISWMLD7.xls

Richard W. Keller
ISWM Bourne, MA - Sound Level Survey

Measurement Location: Location 3 - SE Corner of New Parcel
Date: Thursday, August 2, 2001 Period: 01:00

Time	Leq	Lmin	L90	L50	L10	L01	Lmax	Lpk
00:00	40.5	33.0	36.0	39.0	42.5	51.0	57.5	72.5
01:00	38.0	32.0	34.5	37.0	40.5	45.0	49.0	63.5
02:00	38.0	29.5	33.0	36.0	40.5	45.5	53.5	72.5
03:00	38.0	29.0	31.0	35.0	41.0	49.0	54.5	76.5
04:00	39.5	30.0	34.0	37.5	42.0	49.0	52.5	68.5
05:00	42.5	33.0	38.5	41.5	45.0	49.5	54.5	68.0
06:00	46.0	37.5	43.0	45.0	47.5	55.5	64.5	84.5
07:00	46.5	41.5	44.0	45.5	48.5	53.5	61.0	80.5
08:00	48.0	40.5	43.5	45.5	48.5	57.0	67.5	80.0
09:00	52.5	40.5	42.5	44.5	48.0	68.0	76.0	89.0
10:00	51.5	40.5	43.0	45.0	48.5	67.0	72.0	89.0
11:00	49.5	41.5	44.0	46.0	49.0	56.0	73.5	87.0
12:00	48.0	43.0	45.0	47.0	50.5	53.5	58.5	73.5
13:00	49.0	43.0	45.5	47.5	50.0	54.0	74.0	86.0

ATTACHMENT 15

CAPE COD COMMISSION - DEVELOPMENT OF REGIONAL IMPACT DECISION AND CERTIFICATE OF COMPLIANCE

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630

(508) 362-3828 • Fax (508) 362-3136 • www.capecodcommission.org

CAPE COD
COMMISSION

November 15, 2018

Mr. Daniel T. Barrett
General Manager
Integrated Solid Waste Management
24 Perry Avenue
Buzzards Bay, MA 02532

RE: Bourne Integrated Solid Waste Management Facility Phase 6
201 MacArthur Boulevard, Bourne, MA
Development of Regional Impact Decision
CCC Project Number: EIR-DRI 17024

Dear Mr. Barrett:

Enclosed please find a copy of the Development of Regional Impact Decision for the **Bourne Integrated Solid Waste Management Facility Phase 6** project. After the 30-day appeal period has elapsed and no appeal has been filed or that if such appeal has been filed, that it has been dismissed or denied, the Cape Cod Commission will record the original decision with the Barnstable County Registry of Deeds and retain proof of such recording.

Thank you for your attention to this matter and should you have any questions, please do not hesitate to call.

Sincerely,

Gail Hanley

Gail Hanley
Commission Clerk

Enclosure

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630

(508) 362-3828 • Fax (508) 362-3136 • www.capecodcommission.org

CAPE COD COMMISSION

DEVELOPMENT OF REGIONAL IMPACT DECISION

PROJECT: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY – PHASE 6 (CCC FILE NO. 17024)

PROJECT APPLICANT: TOWN OF BOURNE
DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT
C/O DANIEL T. BARRETT, GENERAL MANAGER
201 MACARTHUR BOULEVARD, BOURNE, MA 02532

PROJECT LOCATION: 201 MACARTHUR BOULEVARD, BOURNE, MA 02532
(ASSESSORS MAP/ PARCEL NOS. 28/13, 32/5, 32/9)

TITLE REFERENCE: BCRD BOOK 1351 PAGE 456, BOOK 29639 PAGE 278, BOOK 13637 PAGE 54

DATE: NOVEMBER 15, 2018

SUMMARY

The Cape Cod Commission (Commission) grants Development of Regional Impact approval, with conditions, for Phase 6 of the Bourne Integrated Solid Waste Management Facility pursuant to Sections 12 and 13 of the Cape Cod Commission Act (Act). This decision is rendered pursuant to a vote of the Cape Cod Commission on November 15, 2018.

FINDINGS

The Cape Cod Commission hereby finds and determines as follows:

GF1. The Bourne Integrated Solid Waste Management Facility (Facility) is located at 201 MacArthur Boulevard in Bourne and is operated by the Bourne Department of Integrated Solid Waste Management (Department) on three (3) contiguous parcels totaling approximately 112 acres owned by the town of Bourne (Project Site). Previously disturbed, developed, and utilized areas of the Project Site (approximately 100 acres) have the benefit of a Site Assignment from the Bourne Board of Health (BOH) for the existing and proposed uses and development referenced herein.

GF2. The Facility serves as important solid waste infrastructure for the town of Bourne, the Cape Cod region, and southeastern Massachusetts. It is the last remaining operating municipal solid waste landfill on Cape Cod, and one of a handful remaining in the Commonwealth.

GF3. Operations at the Facility include: a double-lined landfill with leak detection, a landfill gas collection system and flare for thermal destruction of landfill gas, and a leachate load-out system for off-site management of landfill leachate; a residential recycling center that accepts materials from neighboring communities, including mattresses for recycling under a Massachusetts Department of Environmental Protection (DEP) program; a construction and demolition debris transfer station; a single-stream recyclables transfer station open to commercial haulers; a compost site including yard waste and brush; and, an area for asphalt, brick, and concrete recycling.

GF4. The town of Bourne (Town) now proposes to implement Phase 6 of the Facility which includes expanding the location of the existing lined landfill up to approximately 9.82 acres of previously disturbed site area, together with associated support infrastructure such as a double composite liner with leak detection, and expanded leachate and landfill gas collection (Project, or Phase 6).

GF5. The incoming waste mix to the Facility is predominantly municipal waste combustor ash (representing approximately 86% of the permitted annual capacity of 219,000 tons) under a long-term contract with Covanta SEMASS in Rochester, MA. The remaining yearly capacity is available for municipal solid waste (MSW) disposal for Bourne and Falmouth residents, and for difficult-to-manage waste streams. Any remaining capacity not used is held in reserve and carried over to successive years.

GF6. The existing daily tonnage and waste composition for the Facility will remain unchanged with Phase 6. Phase 6 is expected to extend the life of current landfill operations at the Project Site into the 2020s.

GF7. Phase 6 will be located on previously disturbed land at the southern end of the existing landfill, which has been site-assigned by the Bourne BOH and DEP for landfill use. Exiting roads will provide access to and throughout the Project Site. Construction and operation of Phase 6 will not change the way waste is currently managed at the site. In preparation for construction of Phase 6, former facilities and operations of the Bourne Department of Public Works (DPW), which were located where the additional lined landfill will be constructed, were relocated to a new DPW complex that was constructed off-site and is now in operation.

GF8. The Project qualifies as a Development of Regional Impact and requires Commission review under Section 2(d)(i) of Chapter A: *Enabling Regulations Governing Review of Developments of Regional Impact*, as revised April 2018 (Enabling Regulations) because the Project required preparation of an Environmental Impact Report (EIR) pursuant to the Massachusetts Environmental Policy Act, M.G.L. c. 30, §§61-62I (MEPA).

GF9. Between 1998-2000, the Town pursued regulatory reviews and obtained the required permits and approvals to establish the Facility in what is generally its current state of use and development (for so-called Phases 2, 3, and 4 of the Facility), including a certificate of adequacy on an EIR under MEPA; Development of Regional Impact (DRI) approval from the Cape Cod Commission (Commission) (See Commission File No. #97031, DRI decision dated February 17, 2000, "original DRI decision"); and Authorization to Construct (ATC) and Authorization to Operate (ATO) permits from DEP.

GF10. Those EIR and DRI reviews contemplated and included conceptual planning (though not detailed design) for the development of Phases 5 and 6. Phase 6 is the last Phase in a progressive development plan first discussed in the original EIR filed in 1998.

GF11. Since that time, the Facility has been built out and operated in accordance with those permits and approvals, including in accordance with several modifications to those permits and approvals obtained by the Town for the Facility through the present. Such modifications included authorization for Phase 5. The Commission has issued Certificates of Compliance for the Facility up to and including Phase 5.

GF12. In November 2017, the Town submitted an Expanded Notice of Project Change (ENPC) under MEPA for Phase 6. The ENPC also included conceptual design for potential Phases 7 and 8 for which the Town is currently undertaking planning and due diligence. Should the Town opt to pursue it, Phase 6 is designed to support development of Phase 7. The Secretary of Energy and Environmental Affairs (EEA) issued a Certificate on the ENPC requiring the Town to prepare a Single Supplemental EIR (SSEIR) to include a detailed description of the Project, identify potential impacts associated with the Project, provide updated information on state regulatory reviews and approvals, and provide an updated conceptual plan for Phases 7 and 8. The Town submitted an SSEIR to the MEPA office in May 2018. The Secretary of EEA issued a Certificate on the SSEIR in June 2018 and determined that the SSEIR adequately and properly complies with MEPA.

GF13. Development associated with Phases 7 and 8 includes expanding the lined landfill and associated infrastructure, with the purpose to extend the anticipated life of operations at the Project Site until approximately 2034. Phases 7 and 8 would require further MEPA review and preparation of an EIR and would require further DRI review by the Commission.

GF13A. The Town has undertaken strategic planning in anticipation of potentially pursuing Phases 7 and 8:

In 2016, the Town purchased land adjacent to the Facility (now included within the approximately 112-acre Project Site) for further landfill expansion. Such land is mapped as Priority Habitat for the Eastern Box Turtle under the Massachusetts Endangered Species Act (MESA); accordingly, the Town has been coordinating with the MA Division of Fish and Wildlife Natural Heritage and Endangered Species Program (NHESP) on what permitting and mitigation actions might be necessary to authorize future development of that land under MESA;

Additionally, the Town has been granted a 2,500 square-foot easement on Canal View Road at Joint Base Cape Cod (JBCC) from the MA Department of Fish and Game (DFG). The purpose of the easement is to provide a potential future connection to the JBCC wastewater treatment plant to accept treated effluent from a potential leachate and/or industrial wastewater treatment works at the Facility. As the easement area was located within land subject to protection under Article 97 of the Massachusetts Constitution, the Town granted the DFG conservation restrictions on land owned by the Town totaling 77 acres in order to secure approval by the Legislature for the disposition of such Article 97 land.

GF14. The Town filed an application for DRI review of Phase 6 on October 1, 2018 with associated Attachments 1 through 6. A DRI Subcommittee held a public hearing in the town of Bourne on October 29, 2018, where the Subcommittee voted to recommend to the Commission that it adopt the draft written decision for the Project, and that the Commission approve the Project subject to the conditions in said decision. The Subcommittee voted to continue the public hearing on the Project to the full Commission meeting on November 15, 2018.

GF15. Section 7(c)(viii) of the Commission's Enabling Regulations contains the standards for DRI approval, which include finding consistency with the Cape Cod Regional Policy Plan (RPP), with District of Critical Planning Concern (DCPC) implementing regulations (as applicable), with municipal development bylaws or ordinances, and with applicable Local Comprehensive Plans (LCP). The Commission must also find that the probable benefit from the proposed development is greater than the probable detriment.

GF15A. There are no DCPC implementing regulations applicable to the Project.

GF15B. The Town of Bourne's Local Comprehensive Plan was certified by the Commission in 2007, but according to the Commission's Local Comprehensive Plan Regulations, such certification is not current. The Project is consistent with Section 19 (*Solid Waste Management*) of said plan, however, which outlines the Town's efforts to "*...continue to maximize recycling and composting of solid waste...and to dispose of the waste that cannot be recycled in an economical and environmentally sound manner.*"

GF15C. The Town has received documentation that the work associated with Phase 6 is exempt from NHESP review under the Massachusetts Endangered Species Act (MESA), and has received ATC approval from DEP. No further state or local reviews or approvals are required for Phase 6.

GF15D. Probable benefits of the Project are that it:

1. Provides for predictable waste disposal and management not only for Cape Cod but the larger Massachusetts region;
2. Provides an in-state option for managing solid waste that decreases potential costs and logistical challenges from exporting waste to other states;
3. Supports local municipalities' waste management needs; and
4. Provides disposal capacity in the event of an emergency (i.e. storm debris).

REGIONAL POLICY PLAN FINDINGS

The Project is consistent with the relevant issue areas, and corresponding goals and standards, from the applicable 2009 RPP, as amended August 2012, as those are referenced and discussed in more detail below.

LAND USE

LUF1. A landfill has operated at this location since the late 1960s. The Project is consistent and compatible with land use and development on and neighboring the Site. The proposed use and development are consistent with the Town's comprehensive approach to land use planning and regulation. The Department has permitted, managed and executed operations and construction of the Facility since 1998, including multiple phases of landfilling, which have received ATC and ATO approvals from DEP and been reviewed and approved by the Commission.

LUF2. The Project will not change the way waste is currently managed at the Facility. The operation and location of current development at the Project Site has been site-assigned by the Bourne BOH and approved by DEP, which considers a broad range of potential impacts on water resources, wildlife, public health and safety, transportation, and air quality. DEP issued an ATC permit for the construction of Phase 6 to the Department on July 16, 2018.

LUF3. Phase 6 will be located on previously disturbed land, will overlay part of Phases 3 and 4, and will contain a double composite liner with leak detection. The landfill liner will include a new primary composite liner with leachate collection system and a secondary composite liner with leak detection. By overlaying landfill material adjacent to and on top of preceding landfill Phases, and with the construction of a double composite liner system with leak detection, the Project uses land efficiently and protects sensitive resources.

ECONOMIC DEVELOPMENT

EDF1. Since 1998 the Facility has operated as an Enterprise Fund where the Department derives revenue from its various operations at the Site (largely the landfill operation), which Fund pays for all operations, debt service, insurance, and closure and post-closure accounts. In addition, the Department pays for the curbside collection and management of MSW and single-stream recyclables generated by Bourne residents. The Department also pays a Host Community Fee to the Bourne General Fund of $3.60 per ton for each ton it manages at the site. In total, the Department Enterprise Fund provides approximately $2,000,000 per year in value to the residents of Bourne.

EDF2. Local, state, and Commission regulations for waste management look to source reduction, reuse, and recycling and composting to divert certain waste streams from landfills, preserving existing landfill capacity for waste which cannot be recycled, composted, or combusted. The number of and capacity at landfills in Massachusetts is decreasing. There will be a reduction in the number of operational landfills in Massachusetts by 2021, which provide capacity for wastes including but not limited to household and commercial waste, municipal waste combustor ash, storm/disaster debris, contaminated soils, and dredge spoils. In Massachusetts, landfill capacity is expected to decrease by at least 300,000 tons per year with the anticipated closures of landfills in Southbridge by the end of 2018 and Carver in 2021.

Landfill capacity in Connecticut and Rhode Island is also decreasing and is not expected to provide a closer waste export option. Future options for waste management in Massachusetts will include increased export of Massachusetts trash to other states. There are currently no new MSW disposal facilities proposed and under review by DEP (there is also currently a moratorium on municipal waste combustor facilities in the Commonwealth). Because of the associated legal and permitting requirements, and practical and policy considerations, in pursuing such a new MSW disposal facility in the Commonwealth, it is unlikely that such a facility would be proposed or developed in the Commonwealth in the near future.

EDF3. The Facility provides for the disposal of municipal waste combustor ash from SEMASS. SEMASS must show it has several years of disposal capacity for ash generated at that facility as part of the company's operating plan. A landfill in Carver which also provides for the disposal of SEMASS combustor ash is scheduled to close in 2021.

EDF4. The Project will provide capital facilities and infrastructure in response to existing regional demand, meets community and regional needs, and expands community access to services.

WATER RESOURCES

WRF1. For prior phases of the Facility, the Town has conducted hydrogeological investigations and modeling, including particle tracking, for areas down-gradient of the Facility in coordination with DEP and the Commission. All private well owners in the path of the particle tracking were provided connections to the Bourne Water District. The Bourne BOH passed a bylaw prohibiting the installation of any private wells or public water supply wells in the area downgradient of the Facility. The Town has also installed a network of groundwater monitoring wells upgradient and downgradient of the Facility to collect water quality data.

WRF2. The Phase 6 landfill liner, which is a double composite liner with leak detection, has been designed to provide greater than four (4) feet of vertical separation between the lowest point of the liner system and the maximum observed groundwater elevations, which were determined using an existing network of groundwater monitoring wells installed throughout the Site, including a US Geological Survey (USGS) well installed in the 1970s.

WRF3. The stormwater management system includes two (2) infiltration basins, a series of drainage channels and water quality swales, and a network of catch basins and pipe conveyances. The system is unique and responsive to the current, operational status of the Facility. The system provides water quality treatment, total suspended solids (TSS) removal, and infiltration of stormwater. All Site stormwater is contained and managed on-site. Maintenance protocols for the stormwater management system are included in the Facility Operations and Maintenance Plan.

TRANSPORTATION

TF1. As required in the original DRI decision, the Town provided a monetary payment to mitigate peak hour trips on MacArthur Boulevard and through the Bourne Rotary, expanded the curbside recycling program to reduce vehicle trips to the Site, constructed deceleration and acceleration lanes at the entrance into the Facility, and has since made other improvements to the site entrance and site circulation. Phase 6 represents a continuation of existing operations at the Facility, where existing roads will provide adequate access to and around the Site and will not result in a change or degradation in traffic or trip generation patterns, or in access to the Site.

WASTE MANAGEMENT

WM1. The Facility manages solid waste using an integrated solid waste management system that includes waste reduction, recycling, and composting and meets a regional need for the processing and disposal of wastes on Cape Cod. The Facility currently manages: municipal solid waste and municipal waste combustor ash; commercial waste; a residential recycling center that accepts materials from neighboring communities, including mattresses for recycling under a DEP grant program; a construction and demolition debris transfer station; a single-stream recyclables transfer station open to commercial haulers; composting; asphalt, brick, and concrete recycling; and can accept contaminated soils, dredge spoils, storm/disaster debris, and Difficult to Manage waste. The Facility is the only solid waste disposal facility on Cape Cod.

COMMUNITY CHARACTER

CCF1. As required in the original DRI decision, the Town committed to maintain the existing 230-foot wide vegetated area along MacArthur Boulevard to screen the Facility from the roadway. The Town also supplemented this vegetated area with evergreen and deciduous trees. Supporting infrastructure for the landfill, Facility offices, and recycling and composting transfer facilities are not visible from a regional roadway (MacArthur Boulevard, Route 28).

CONCLUSION

Based on the Findings above, the Commission hereby concludes, determines, and finds further that:

1. Subject to and upon satisfaction of the conditions identified in this decision, the Project is consistent with the 2009 RPP (as amended).
2. The Project is consistent with Bourne's Local Comprehensive Plan, as applicable.
3. The Project is consistent with municipal development bylaws.
4. There are no DCPC implementing regulations applicable to the Project.
5. The probable benefit of the Project is greater than its probable detriment.

The Commission hereby grants DRI approval to the town of Bourne for Phase 6 of its Integrated Solid Waste Management Facility, subject to the following conditions:

CONDITIONS

C1. When final, this decision shall be valid and in effect and local development permits may be issued pursuant hereto for a period of seven (7) years from the date of this written decision. No development work, as the term "development" is defined or referred to in the Cape Cod Commission Act, and as approved herein, shall be undertaken until this decision is final. This decision shall be final when the appeal period set out in Section 17 of the Cape Cod Commission Act has elapsed without appeal (or if such an appeal has been filed, when the appeal has been finally settled, dismissed, adjudicated, or otherwise disposed of in favor of the Applicant), and a copy of this decision has been recorded with the Barnstable County Registry of Deeds.

C2. Phase 6 shall be undertaken, operated, and maintained consistent with the plans and other information contained in the following documents, approved, referenced, and incorporated herein:

- Town of Bourne, MA Department of Integrated Solid Waste Management Single Supplemental Environmental Impact Report, dated May 9, 2018, prepared by the Town of Bourne Department of Integrated Solid Waste Management;

- Town of Bourne Integrated Solid Waste Management Facility DRI application, dated October 1, 2018.

C3. Changes to the Project shall require that the Applicant seek a modification to this decision in accordance with the "Modification" section of the Commission's Enabling Regulations Governing Review of Developments of Regional Impact.

C4. Upon issuance of a DEP Authorization to Operate Phase 6, the Applicant shall apply for and obtain a Certificate of Compliance for the Project from the Commission. Issuance of the Certificate of Compliance is contingent on Commission staff's review and confirmation that the Project has been undertaken in accordance with this decision. As part of its review, Commission staff may make, and the Applicant hereby authorizes, site inspections upon reasonable notice to the Applicant, as such visits are needed.

C5. In the event the Town does not propose to pursue further phases and expansion of landfilling development and operations at the Site beyond Phase 6, the Town shall then prepare and submit to Commission staff for review and approval a revised stormwater management plan for the Facility that reflects such eventuality and provides water quality treatment for parking and recycling areas on the Site. In such event and upon Commission staff's review and approval, the Town shall implement and maintain such plan as so approved.

SIGNATURE PAGE FOLLOWS

SIGNATURE PAGE

Executed this 15 day of November 2018.

Signature

Harold W Mitchell Chair CC Commission
Print Name and Title

COMMONWEALTH OF MASSACHUSETTS

Barnstable, ss November 15, 2018

Before me, the undersigned notary public, personally appeared Harold W. Mitchell,

in his/her capacity as Chairman of the Cape Cod Commission, whose name is signed on the preceding document, and such person acknowledged to me that he/she signed such document voluntarily for its stated purpose. The identity of such person was proved to me through satisfactory evidence of identification, which was [ ] photographic identification with signature issued by a federal or state governmental agency, [ ] oath or affirmation of a credible witness, or [✓] personal knowledge of the undersigned.

GAIL P. HANLEY
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
September 26, 2025

Gail P. Hanley
Notary Public

My Commission Expires: 9-26-25

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630

(508) 362-3828 • Fax (508) 362-3136 • www.capecodcommission.org

CAPE COD
COMMISSION

November 15, 2018

Mr. Phillip Goddard
Manager of Facility Compliance and Technology Development
Town of Bourne, Dept. of Integrated Solid Waste Management
24 Perry Avenue
Buzzards Bay, MA 02532

RE: Bourne Integrated Solid Waste Management Facility Phase 6
201 MacArthur Boulevard, Bourne, MA
Development of Regional Impact Decision
CCC Project Number: EIR-DRI 17024

I am in receipt of:

The Development of Regional Impact Decision for the **Bourne Integrated Solid Waste Management Facility Phase 6** project that was approved by the Cape Cod Commission at its meeting on November 15, 2018.

~~Phillip Goddard~~ ASA MINTZ
Town of Bourne, Dept. of ISWM

11/15/18
Date

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630

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CAPE COD
COMMISSION

November 15, 2018

Mr. Barry H. Johnson
Town Clerk
Town of Bourne
24 Perry Avenue
Buzzards Bay, MA 02532

RE: Bourne Integrated Solid Waste Management Facility Phase 6
201 MacArthur Boulevard, Bourne, MA
Development of Regional Impact Decision
CCC Project Number: EIR-DRI 17024

I am in receipt of:

The Development of Regional Impact Decision for the **Bourne Integrated Solid Waste Management Facility Phase 6** project that was approved by the Cape Cod Commission at its meeting on November 15, 2018. The Decision was hand delivered by ASA MINTZ.

Barry Johnson, Bourne Town Clerk

11/16/18
Date

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630

(508) 362-3828 • Fax (508) 362-3136 • www.capecodcommission.org

CAPE COD COMMISSION

January 10, 2020

Town of Bourne
Department of Integrated Solid Waste Management
C/O Daniel T. Barrett
General Manager
201 Macarthur Boulevard
Bourne, MA 02532

RE: Certificate of Compliance
Bourne Integrated Solid Waste Management Facility – Phase 6
(File No: 17024)

Dear Mr. Barrett

Enclosed please find the Certificate of Compliance for Bourne Integrated Solid Waste Management Facility – Phase 6, 201 MacArthur Boulevard, Bourne, MA 02532.

Once you record this decision, please forward a copy to our office.

Thank you and please do not hesitate to call if you have any questions.

Sincerely,

Lisa Dillon
Commission Clerk

Enclosure

cc: Coreen V. Moore, Town Planner, Town of Barnstable

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630

(508) 362-3828 • Fax (508) 362-3136 • www.capecodcommission.org

CAPE COD
COMMISSION

CERTIFICATE OF COMPLIANCE

PROJECT: BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY – PHASE 6
201 MACARTHUR BOULEVARD, BOURNE, MA 02532 (CCC FILE NO. 17024)

TO: APPLICANT/ TOWN OF BOURNE,
DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT
C/O DANIEL T. BARRETT, GENERAL MANAGER
201 MACARTHUR BOULEVARD, BOURNE, MA 02532

TITLE REFERENCE: BOOK 1351 PAGE 456, BOOK 29639 PAGE 278, BOOK 13637 PAGE 54
DRI DECISION RECORDED IN BOOK 31737 PAGE 257

DATE: JANUARY 10, 2020

The Cape Cod Commission hereby issues this Certificate certifying that the Applicant has completed Phase 6 (the Project) in accordance with the terms and conditions set out in the above-referenced Development of Regional Impact Decision, dated November 15, 2018. This Certificate incorporates by reference the "as-built" site plans for the Project.[1]

Signature page follows

[1] As-Built Survey (Subgrade) Town of Bourne Phase 6 Landfill Expansion, 201 MacArthur Boulevard, Bourne Massachusetts (Barnstable County), prepared by Welch Associates Land Surveyors, Inc., stamped and dated April 24, 2019; As-Built Survey (Low Permeability Soil Layer) Town of Bourne Phase 6 Landfill Expansion, 201 MacArthur Boulevard, Bourne Massachusetts (Barnstable County), prepared by Welch Associates Land Surveyors, Inc., stamped and dated December 18, 2019; As-Built Survey (Primary Geomembrane Liner) Town of Bourne Phase 6 Landfill Expansion, 201 MacArthur Boulevard, Bourne Massachusetts (Barnstable County), prepared by Welch Associates Land Surveyors, Inc., stamped and dated December 18, 2019; As-Built Survey (Sand Drainage Layer) Town of Bourne Phase 6 Landfill Expansion, 201 MacArthur Boulevard, Bourne Massachusetts (Barnstable County), prepared by Welch Associates Land Surveyors, Inc., stamped and dated December 18, 2019; Pipe As-Built Worksheet (Primary Leachate Collection) Town of Bourne Phase 6 Landfill Expansion, 201 MacArthur Boulevard, Bourne Massachusetts (Barnstable County), prepared by Welch Associates Land Surveyors, Inc., consisting of three sheets, stamped and dated December 23, 2019.

SIGNATURE PAGE

Executed this 10th day of January 2020.

For the Cape Cod Commission by:

Jonathon Idman, Chief Regulatory Officer

COMMONWEALTH OF MASSACHUSETTS

Barnstable, ss. January 10, 2020

Before me, the undersigned notary public, personally appeared Jonathon Idman, whose name is signed on the preceding document, and such person acknowledged to me that he signed such document voluntarily for its stated purpose in his capacity as Chief Regulatory Officer of the Cape Cod Commission. The identity of such person was proved to me through satisfactory evidence of identification, which was [ ] photographic identification with signature issued by a federal or state governmental agency, [ ] oath or affirmation of a credible witness, or [X] personal knowledge of the undersigned.

LISA P. DILLON
NOTARY PUBLIC
Commonwealth of Massachusetts
My Commission Expires
August 28, 2026

8-28-26

SEAL

Notary Public:
My Commission Expires: