Application Cover Sheet

Cape Cod Commission
3225 Main Street, PO Box 226
Barnstable, MA 02630
Tel: (508) 362-3828 • Fax: (508) 362-3136

For Commission Use Only
Date Received:
Fee ($):
Check No:
File No:

A Type of Application (check all that apply)

- [X] Development of Regional Impact (DRI)
- [ ] Hardship Exemption
- [ ] Limited DRI Review
- [ ] Jurisdictional Determination
- [ ] DRI Exemption
- [ ] Request for Joint MEPA/DRI Review

B Project Information

Project Name: Town of Bourne Integrated Solid Waste Management Facility
Total Site Acreage: Approximately 112
Project/Property Location: 201 MacArthur Boulevard, Bourne, MA 02532
Zoning: B-3

Brief Project Description:
Include total square footage of proposed and existing development, gross floor area, number of lots existing or to be created, specific uses, description of existing conditions, as applicable (attach additional sheets if necessary).
The project is focused on development of the Phase 6 landfill expansion. There are two development scenarios discussed in the attached document. One scenario is 6.89 acre phase representing about 920,000 cubic yards and the other scenario is 9.82 acres representing 1,670,000 cubic yards. The application also discusses access to a small area of Article 97 land already granted by the Legislature and approved by MEPA.

C Owner(s) of Record

List the following information for all involved parcels. Provide copies of each Deed and Purchase and Sale Agreement and/or evidence of leasehold interest, if applicable, for all involved parcels. Proof of ownership/legal rights for Applicant(s) to proceed with the proposed development must be documented prior to the Commission deeming any application complete (attach additional sheets if necessary).

Map/Parcel	Owner's Name	Lot & Plan	Land Court Certificate of Title #	Registry of Deeds Book/Page #
28/13	Town of Bourne			1351/456
32/5	Town of Bourne			29639/278
32/9	Town of Bourne			13637/54

There **ARE/ARE NOT** (circle one) court claims, pending or completed, involving this property (if yes, please attach relevant information).

D Certification

I hereby certify that all information provided on this application form and in the required attachments is true and accurate to the best of my knowledge. I agree to notify the Cape Cod Commission of any changes on the information provided in this application, in writing, as soon as is practicable. I understand failure to provide the required information and any fees may result in a procedural denial of my project.
NOTE: For wireless communication facilities, a licensed carrier should be either an applicant or a co-applicant.

APPLICANT
Applicant(s) Name: Mr. Daniel T. Barrett, General Manager Tel: 508-759-0600, x. 4240 Fax: N/A
Address: Town of Bourne, ISWM Department, 24 Perry Avenue, Buzzards Bay, MA 02532
Signature: Daniel T. Barrett Date: 10/1/18

CO-APPLICANT
Co-Applicant(s) Name: Tel: Fax:
Address:
Signature: Date:

CONTACT
Contact: Same as above. Tel: Fax:
Address:
Signature: Date:

PROPERTY OWNER
Property Owner: Mr. Thomas Guerino, Town Administrator Tel: 508-759-0600, x.1308 Fax: N/A
Address: Town of Bourne, 24 Perry Avenue, Buzzards Bay, MA 02532
Signature: Thomas M. Guerino Date: 10/1/18

BILLABLE ENTITY
Name: N/A Tel: Fax:
Address:

TOWN OF BOURNE
Department of
Integrated Solid Waste Management

Mailing:
24 Perry Avenue
Buzzards Bay MA 02532
(508) 759-0600, ext. 4

Location:
201 MacArthur Blvd
Bourne MA 02532
Fax: (508) 759-0652

October 1, 2018

Ms. Michelle White
Regulatory Officer
Cape Cod Commission
P.O. Box 226
Barnstable, MA 02630

RE: Town of Bourne Integrated Solid Waste Management Facility EEA #11333. Development of Regional Impact (DRI) application for the Phase 6 landfill expansion.

Dear Ms. White,

Enclosed for your review is our application for a Development of Regional Impact (DRI) for the Phase 6 landfill expansion at the Town of Bourne, Department of Integrated Solid Waste Management (ISWM) facility located at 201 MacArthur Boulevard, Bourne, MA 02532. This DRI application also briefly discusses the Town's plans to access Article 97 land for the purposes of connecting to a clean, treated effluent pipeline on Joint Base Cape Cod which is mentioned in the filings with Massachusetts Environmental Policy Act office. However, Phase 6 is the main focus of this application.

Future development of the ISWM facility is anticipated in the coming years and ISWM plans to work closely with you and the Cape Cod Commission staff to provide updates and to coordinate future applications.

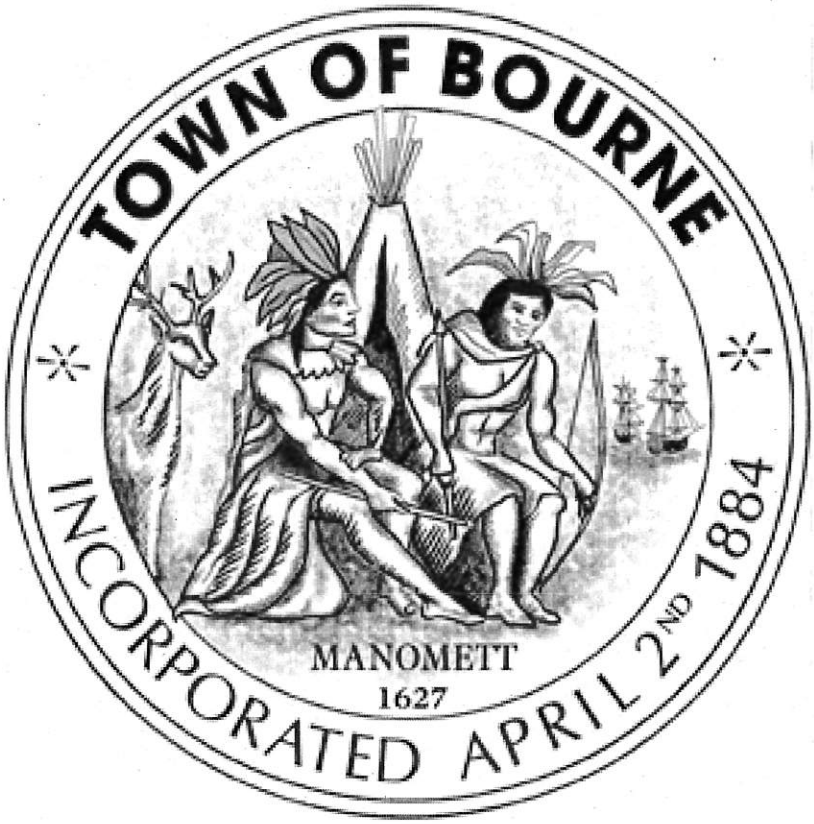
Please, feel free to contact me at 508-759-0600, extension 4240, if you need further information or have any questions. Thank you for your consideration and your assistance in the preparation of this application.

Sincerely,

Daniel T. Barrett, General Manager

Enclosures

Cc: Distribution list.



TOWN OF BOURNE, MA
DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT
DEVELOPMENT OF REGIONAL IMPACT

INTEGRATED SOLID WASTE MANAGEMENT FACILITY
201 MACARTHUR BOULEVARD
BOURNE, MA 02532

EOEA # 11333

OCTOBER 1, 2018


ISWM Facility January 2018

Town of Bourne, MA
Department of Integrated Solid Waste Management
Cape Cod Commission
Development of Regional Impact

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

EOEA # 11333

Prepared by:

Mr. Daniel T. Barrett
General Manager
Town of Bourne, MA
Department of Integrated Solid Waste Management

Mr. Philip A. Goddard
Manager of Facility Compliance and Technology Development
Town of Bourne, MA
Department of Integrated Solid Waste Management

Mr. Asa Mintz
Operations Manager
Town of Bourne, MA
Department of Integrated Solid Waste Management

With the advice and input of:

Mr. Ray Quinn, P.E., SITEC Environmental, Inc.

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PHASE 6 LANDFILL DEVELOPMENT PLANS
CHAPTER 223 OF THE ACTS OF 2016
EASEMENT PLAN OF LAND

ATTACHMENT 3

STORMWATER MANAGEMENT PLAN
EPA NPDES CGP FLOW CHART

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CERTIFIED ABUTTERS LIST
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ATTACMENT 6

BOURNE BOARD OF SELECTMEN
LETTER OF SUPPORT

Introduction

There are two reasons for submitting this Development of Regional Impact (DRI) application. First, it addresses the Town's intent to construct Phase 6 landfill expansion. This phase was contemplated and discussed in the original DRI in 1998 and is now ready to be constructed.

Second, this applications describes the plan for the Town's access, via an easement, to lands protected by Article 97 as approved by the Legislature and enacted into law by the Governor.

While the Town has received a Certificate of Compliance for its previous DRI #97031, a new DRI application is being filed because Phase 6 triggered a new Environmental Impact Report (EIR) under the Massachusetts Environmental Policy Act (MEPA) regulations, which by definition then requires submittal of a new DRI application. MEPA determined that this submittal would be in the form of a Single Supplemental Environmental Impact Report (SSEIR) which the Town submitted in May 2018 and for which it issued a Certificate on June 29, 2018.

The triggers that required an SSEIR were that the potential area of Phase 6, either in the liner construction or in the final cover system, may create more than ten acres of new impervious surface as well as conversion of Article 97 land for a potential pipeline connection to a clean, treated effluent pipeline located at Joint Base Cape Cod (JBCC) which abuts the landfill. This pipeline transports the treated effluent from the wastewater treatment plant at JBCC to an infiltration basin along Sandwich Road in Bourne near the Cape Cod Canal.

The ISWM staff has worked closely with staff at the CCC to ensure that this application contains the necessary updated information applicable to the Phase 6 landfill expansion while also recognizing this facility has had extensive review over a considerable period of time. The Town is grateful for the cooperation and guidance the CCC staff has provided.

Previous Cape Cod Commission and MEPA reviews

As has been mentioned in the introduction, the Bourne Integrated Solid Waste Management Facility (ISWM) has been extensively reviewed by the MEPA office and the CCC over a twenty-year period. Below is a timeline that lists that reviews prior to this submittal. Of note is the recent issuance of a Single Supplemental EIR (SSEIR) Certificate. The SSEIR first required the submittal of an Expanded Notice of Project Change which was distributed in November 2017. Both documents provided detail discussions on the history of the facility over the last twenty years and potential plans for future development. The CCC has both of these documents which provide excellent supplemental information to this application. Both documents are available on the Cape Cod Commission website under the Project Files section of the Regulatory home page. The URL is: http://www.capecodcommission.org/index.php?id=738.

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 the fire at the Covanta SEMASS municipal waste combustor, plans for a landfill gas-to-energy facility and a final report on the Phase 1D/Phase 5 reclamation project.

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

Phase 6 Project Description

As noted, the chief purpose of this submittal is expansion of the Bourne Landfill into Phase 6 and will comprise the bulk of the text of this submittal. Below is a detailed discussion of the proposed plans.

Background

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.

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 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
- a compost site, including yard waste and brush
- an area for asphalt, brick and concrete recycling

Bourne has invested significant resources to modernize the entire facility which began operations in 1967 and has fulfilled the intent described in the Final Environmental Impact Report (FEIR) and previous DRI to build a multi-faceted facility that would serve a regional need. Attachment 5 contains aerials from 1999 and 2018 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. A more complete history of the department, and important documents discussing its development, can be found at the ISWM website at: https://www.townofbourne.com/integrated-solid-waste-management.

Since 1998, ISWM has been operated as an Enterprise Fund, separate from the 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 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. This fee, which is currently $3.60 per ton, was originally created in the early 1980s by the General Court as a tax on privately owned and operated solid waste management facilities. In the late 1990s, Bourne successful petitioned the General Court to amend this law, via a Home Rule petition, so that it would be applicable to the Town-owned facility in Bourne. 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 $2,000,000 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.

The last Notice of Project Change (NPC), submitted in December 2015, was related to the development of the Phase 5 landfill. After receiving approval from Massachusetts Environmental Policy Act Office (MEPA) and the Cape Cod Commission (CCC), the

Town submitted an application for and Authorization to Construct (ATC) Phase 5 to Massachusetts Department of Environmental Protection (DEP) which was approved. The DEP subsequently approved the Town's application for an Authorization-to-Operate (ATO) on March 30, 2017. Phase 5 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) and Phase 4. Phase 6 is the last phase in a progressive filling plan first discussed in the EIR and DRI in 1998.

Since the writing of the original EIR and DRI, the Town has 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. This site has been site-assigned by the Bourne Board of Health (BOH) for solid waste handling and transfer operations and currently serves as the location for ISWM's administrative 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. This was later approved as a Minor Modification #2 by the CCC. 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 developed on the acreage where those structures now exist. A discussion of future planning will be addressed in future submittals and not part this application.

However, this land is <u>not needed</u> in order to complete the construction of Phase 6. Temporary stockpiles of sand created by the preparation of Phase 6 base liner elevations are being stored on the 25-acre parcel until they are needed for the liner construction or for subsequent capping projects such as for Phase 4, Stage 2 and Phase 5.

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 and ISWM offices. The development of Phase 7 and Phase 8, which would be located on the 25-acre parcel, requires several steps including separate submittals with MEPA and the CCC as well as a major modification to the site assignment by the Bourne Board of Health (BOH) for the disposal of waste.

The plans for the development of Phase 6 <u>have not</u> changed since the submittal of the SSEIR in May 2018. This section will reiterate the plans for Phase 6 as previously discussed and identify any impacts.

This submittal focuses on two scenarios for the development Phase 6 of the landfill, described as **Preferred Phase 6 (PP6)** and **No Further Build Phase 6 (NFBP6)**, which provide bookends in terms of acreage and volume ranges. Attachment 2 contains a series of plans that show these scenarios in both plan and cross-section views, which provide a particularly clear depiction of the two options.

PP6 is the Town's first choice and encompasses an approximate 6.69 acre

expansion that will yield 920,000 cubic yards of capacity and an expected site life into the early 2020s. The design of PP6 is such that it will accommodate further site development into a potential Phase 7 and Phase 8 which could yield another 1,960,000 cubic yards and 1,870,000 cubic yards respectively, potentially extending the landfill life out to 2034. This scenario is the smaller version of Phase 6, with a southern slope that will be lain over by Phase 7 as the landfill expands south. By not constructing liner over the side slope of the existing road to the south, ISWM will maintain maximum flexibility for further landfill expansion. Once a liner is constructed over the virgin soil supporting the road, it will become operationally and financially infeasible to try to reclaim the significant lost airspace underneath the road later on by removing the waste placed over it. This is why ISWM prefers PP6.

It is the intention of ISWM to explore further expansion which will be reviewed separately at a later date. As a result of constructing PP6, part of Phase 7, if constructed, will overlap the southern end of the original site assigned landfill footprint on the 74-acre parcel as shown in the plan view and cross section view for PP6 in Attachment 2. This part of Phase 7 could consume approximately 750,000 cubic yards of airspace, not counting the volume gained by removing the road, that would have been otherwise used for Phase 6 had the No Further Build option been chosen. The NFBP6 option is described in more detailed below.

In order to provide the broadest range of potential, ISWM is proposing a second scenario labeled NFBP6, which would be a 9.82-acre landfill area with an estimated capacity of 1,670,000 cubic yards that could extend the operational life of the site through approximately 2024. However, this scenario envisions that this will be the last phase of the landfill and that there would not be any further landfill development. NFBP6 shows what the maximum utilization of the original site-assigned parcel would look like. A portion of the area for this scenario was not available for solid waste operations at the time of the filing of the FEIR in 1998 because there is a 100-foot setback requirement from abutting property owners. Since the Town acquired the abutting land in 2001, this area can now be utilized for landfill operations. However, ISWM considers NFBP6 to be a contingency plan, because as discussed earlier, it intends to pursue PP6 as its preferred option. It should also be noted that Phase 6 could have an impervious final cover system that might exceed ten acres depending on the final design. This triggers an EIR threshold and is one of the reasons cited for filing a DRI at this time.

The Massachusetts Department of Environmental Protection (DEP) issued an Authorization to Construct (ATC) for Phase 6 on July 16, 2018 that complies with all design standards and regulations for a modern lined landfill including leachate collection and landfill gas 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 DEP and the CCC, which required expanded groundwater monitoring for several years as part of its DRI approval process.

Additionally, all private well owners in the path of the particle tracking were provided connections to the Bourne Water District supply system. As a precaution, the BOH passed a bylaw that prohibits the installation of any private wells or public water supply

wells in the downgradient area. Most importantly, DEP issued the Town its Final Approval for a Comprehensive Site Assessment (FCSA) on June 5, 2017, which provides an environmental monitoring plan for the facility moving forward, culminating decades of review of the site and surrounding areas. This monitoring is subject to review and modification by the DEP and ISWM communicates with DEP on a regular basis regarding trends in data.

ISWM anticipates commencing construction of landfill liner and associated appurtenances in the fall of 2018 which will allow adequate time for construction and review by the DEP prior to issuance of an ATO sometime in late 2019. The Town has already selected a contractor who will be issued a Notice to Proceed once final approval is obtained from the CCC. ISWM has been planning for Phase 6 for many years, well in advance of when it is needed. Current estimates are that ISWM will need to commence operations in Phase 6 in late 2019 or early 2020. This internal best management practice provides a smooth transition from one phase to the next and allows for any delays during construction that might occur as a result of weather, procurement related matters or other unforeseen events.

In all development scenarios, Phase 6 will be a contiguous phase connected to and overlaying Phase 4, Stage 2 and Phase 3, Stage 3 at the southern end of the original 74-acre site-assigned parcel. Until now, this acreage has primarily housed facilities and operations of the Bourne Department of Public Works (DPW) and ISWM offices. In anticipation of the development of Phase 6, a new DPW complex was constructed off-site and is now in operation. This allowed ISWM to demolish the old structure on what will become Phase 6. The ISWM offices, which consisted of rented trailers, have been replaced with new trailers and relocated further south on the site away from the footprint of Phase 6. A design for a permanent office structure is being contemplated and will be constructed at a later date once the site master planning is completed and necessary permits are obtained.

Development of Phase 6 is consistent with current operations approved by DEP and ISWM is not proposing any changes. In 2003 the Town filed an NPC to accept MSW and MCA in addition to non-MSW, which was approved by MEPA and subsequently approved as a Major Modification by CCC in 2004. ISWM has been accepting MSW since 2005.

Beginning in January 2015, the Town switched its incoming waste mix to predominantly ash under a long-term contract with the Covanta SEMASS (SEMASS) municipal waste combustor located in Rochester, MA. Per the agreement, approximately 189,000 tons per year of the permitted 219,000 tons of annual capacity is reserved exclusively for ash, which represents 86% of the annual permitted capacity through 2021. The remaining capacity will be available for MSW disposal including waste from Bourne residents and MSW from the Town of Falmouth, MA under a ten-year contract. The remaining capacity will either be held in reserve or be utilized for soils or other difficult-to-manage wastestreams. This mix of wastestreams is consistent with the state's goal that landfill airspace be utilized for the irreducible minimum or residuals.

Need

Landfill capacity projections from DEP reveal a significant reduction in the number of operational landfills 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 deposited in a landfill.

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. The Phase 6 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 the CMW landfill in Carver, where ash and bypass MSW from SEMASS also are deposited, will close by the end of 2021.

Further exacerbating the regional capacity inventory, is the recent announcement by Casella Waste Systems, Inc. that they have abandoned plans for expansion at their landfill in Southbridge, MA and will cease accepting waste by the end of 2018. This will reduce capacity in the region by at least another 300,000 tons per year. Additionally, the Fitchburg/Westminster landfill operated by Waste Management, Inc. has so far failed to obtain approval for a land swap with the state of Massachusetts so that it can expand beyond its current fill plan. If that is not obtained in the coming years, that facility will likely close in 2024 thereby removing another 390,000 tons per year of capacity.

The following is an excerpt from the DEP Solid Waste Master Plan update in April 2013:

> ***Projected loss of in-state landfill capacity***
> *Massachusetts landfill capacity is expected to decline from just under two million tons in 2010 to about 600,000 tons in 2020 as current landfills close and are not replaced. Without increased source reduction, recycling, composting, or in-state disposal capacity, net export could rise from 1.1 million tons per year in 2009 to nearly 2.0 million tons per year, or about 18 percent of the projected annual solid waste generation, in 2020.*
>
> *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.

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 MA, 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.

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, 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 SEMASS customer, dispose of multiple loads of MSW that were displaced when SEMASS was operating under reduced capacity due to routine maintenance.

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 MA. Adding to the planning challenges is that CT and RI are facing similar landfill capacity issues and will not be able to provide a closer waste export option, especially in RI where the Central Landfill is reserved for in-state capacity.

Identification of impacts

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 and 1999. Phase 6 will be located on previously disturbed land. Existing roads will provide access to and around the site. All environmental baseline impacts and mitigation have been reviewed as part of the MEPA and CCC processes for this site area. Construction and operation of Phase 6 will not change the way waste is currently managed at the facility.

A summary of the findings for each of the environmental criteria evaluated during the MEPA review process for the Bourne landfill and subsequently for obtaining DEP approval is provided below.

- Rare Species

  The Site involves previously disturbed land 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. Since the submittal of the ENPC, Natural Heritage and Endangered Species Program (NHESP) has confirmed that the Phase 6 landfill expansion is exempt from further review under Massachusetts Endangered Species Act (MESA.)

With regard to future plans, the Town is in close communication and coordination with staff of the NHESP for the development of the 25 acres, which would encompass Phase 7 and Phase 8, to confirm the areas that are exempt from further MESA review as this area has been extensively disturbed based on previous approvals. Details will be provided in a subsequent filing.

The Town also will work closely with NHESP on its plans to develop the 11.7-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 be placed under permanent protection. Based on a positive determination that these areas are suitable, ISWM will proceed with plans to gain access to the 11.7-acre parcel that are compliant with all aspects of MESA.

Additionally, should the Town move forward with connecting to the pipeline at Joint Base Cape Cod, it will confer with NHESP staff to determine the appropriate review process in order to gain access.

- 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.

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

- Land
  The development of the Landfill will involve the expansion of impervious land beyond the footprint discussed in the FEIR which did not take into account the purchase the 25-acre parcel to the south in 2001. This allows filling up to the boundary where previously there had been a 100 foot setback. Depending on the final version of Phase 6 that is built, the acreage of the liner could be 6.69 – 9.82 acres. Also, the final cover system could potentially exceed ten acres, depending on final design, which was one of the triggers requiring the filing of an SSEIR with MEPA.

- 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.

- Water

  Water use by the Project will not change from current usage rates. Employees will utilize on-site facilities at the new office trailers. A small well will continue to supply approximately 2,000 gallons per day for the sulfur removal system at the flare.

  All stormwater will be retained on-site for infiltration at existing basins. Attachment 3 has a detailed Stormwater Management Plan that was developed in conjunction with CCC staff. ISWM is fully committed to continue its efforts to properly manage stormwater on-site. Once a final landfill phasing plan is decided, ISWM will consult with CCC staff to ensure that a bioinfiltration component will be incorporated into the final design to reduce nutrient loading. As noted, all stormwater is managed on-site and therefore no National Pollution Discharge Elimination System (NPDES) permit is required. Attachment 3 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.

  As discussed previously, 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 those downgradient 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.

- Wastewater

  The wastewater from the landfill, including leachate and condensate, will continue to be managed by a groundwater protection system similar to the one installed for the current operation. Liquid is conveyed to a large on-site storage tank and will be either removed from the site via trucks or managed on-site at a proposed wastewater treatment plant if it is constructed. The Town 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, the Town will connect to a clean effluent line on JBCC via a pending easement from the MA Department of Fish and Game (DFG.) 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.

- Transportation

  The project will not result in a change in traffic. In fact, traffic has been reduced at the landfill since January 2015 as a result of ash from SEMASS becoming the primary wastestream accepted for disposal. Ash is delivered in large trailers that

contain nearly twice the tonnage per trip as do packers containing MSW. Furthermore, the only MSW accepted at the facility is from the Town of Bourne packer trucks and from contracted trucks bringing waste from the Town of Falmouth which is an abutting community. Both the ash, comprising 189,000 tons per year, and the MSW representing about 18,000 tons per year, are under long-term agreements or is generated by Bourne, which will stabilize the traffic conditions. Finally, should the Town's plans to treat leachate on-site come to fruition, there is a potential to further reduce truck traffic by approximately 2,000 trips by leachate hauling tanker trucks per year.

Please note that as a result of the Phase 1D reclamation and relocation of the residential recycling center further to the south, the site entrance has been significantly improved with a relocated scale house and scales, better traffic patterns and longer queues for both inbound and outbound traffic.

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

- 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 however, that ISWM covers the landfill daily, 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.

- 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 6, 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 of Phase 6 is subject to state regulation and permit conditions contained in the ATC issued by DEP which is contained in Attachment 1. However, considering that future disposal airspace will be consumed with approximately 86% ash, daily operations will be positively impacted. Ash is an inert, homogenous material that is unattractive to vectors, does not produce gases or odors and is easily shaped and compacted. Additionally, several years ago the Town barred acceptance of construction and demolition debris fines and residuals at the landfill that previously were the source of odors.

Benefits of the ISWM facility

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 6, will benefit the region.

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 residents from other towns. Additionally, ISMW hosts an annual regional Household Hazardous Waste collection event, a regional latex paint collection event, and has been a regional mattress recycling center for nearly three years.
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 volume removed 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 our compaction rates of in-place waste to meet modern industry standards, increased our overall efficiency of operations and reduced our 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 screening, 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, an 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 discussed 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 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.

Phase 6 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. Their existing landfill in Carver is expected to close in 2021 and by having a contract with Bourne it will ensure the continued operation of this vital regional facility.
Provide a local, in-state option 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, capacity in MA for landfills will likely shrink significantly and Bourne could be one of only 3-5 facilities remaining. This will mean exports to such far reaching areas 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 when they are needed.
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 that serves as competition to other commercial outlets keeping pricing in check. This not only includes the landfill, but also transfer stations for C&D materials, organics, mattresses, HHW and latex paint collections events and single stream recyclables. Additionally, by being on sound financial footing, ISWM can also plan ahead and invest in researching and developing its site to host potential solid waste management technologies that could serve the region well beyond the life of the landfill.
The Phase 6 capacity, which will last into the 2020s, will afford ISWM the time to work with DEP, MEPA, CCC and the entire Cape Cod community to develop a master plan for the remaining acreage at the facility in a thoughtful manner with input from stakeholders.
Provide the region with emergency capacity in the event of disruptions to regional infrastructure such as SEMASS 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.
Part of the capacity of Phase 6 will be utilized to continue to support local MSW options for disposal for municipalities on the Cape whose current short-term contracts will be expiring in the coming few years.

Legislatively-authorized Disposition of Article 97 Land for a Connection to the JBCC WWTP Clean Effluent Pipeline

As part of increasing the efficiency of its operations, reducing truck traffic and developing a partnership with the MA Army National Guard and MA Air National Guard, the Town has been exploring ways to treat its leachate on-site versus hauling it off-site to wastewater treatment facilities or the SEMASS municipal waste combustor. Originally this was to serve both the needs of the Town and that of Harvest Power, Inc. (Harvest Power) with its then proposed anaerobic digester, however, Harvest Power has since terminated its lease with the Town for land on-site for its facilities.

Any scenario involving on-site treatment will require a discharge of clean, treated effluent. Fortuitously, the clean effluent pipeline for the discharge from the wastewater treatment plant (WWTP) at Joint Base Cape Cod (JBCC) runs along Canal View Road which is adjacent to the ISWM facility. ISWM has worked with the MA Air National Guard and MA Army National Guard for over five years on gaining access to connect to this pipeline which ultimately terminates in infiltration beds a few miles to the north near the Cape Cod Canal. Since the pipeline is within the boundary of the Upper Cape Water Supply Reserve (Reserve), state conservation land protected under Article 97 of

the MA Constitution, the Town worked with its legislative delegation to get a special state law enacted that authorizes the grant of an easement to Bourne over a small area of Reserve land to construct this pipeline connection to the JBCC WWTP clean effluent pipeline. Specifically, by a 2/3 vote the MA Legislature enacted Chapter 223 of the Acts of 2016 (the Act), which authorized the grant to Bourne of an approximately 2,500 square foot easement on Canal View Road at Joint Base Cape Cod within the Reserve, by the MA Department of Fish and Game (DFG) in return for Bourne granting DFG conservation restrictions on two parcels of town land totaling 77 acres. A copy of the vote regarding the Act and a plan of the easement is included in Attachment 2.

Currently, the Town is evaluating the best option for managing its leachate and has not developed a definitive timeline for an actual connection. Several factors influence the analysis of whether or not to move forward including; reduction in daily throughput without the Harvest Power influent which will increase the cost per gallon, changing regulatory and permitting conditions, technological changes and overall financial and operational risks versus continuing to haul leachate off-site. Additionally, final easements and agreements are still pending with the MA Army National Guard, MA Air National Guard, MA Department of Fish and Game, as well as the U.S. Army Corps of Engineers. Nevertheless, ISWM has invested considerable time and effort in this project and desires to maintain all options as future site development plans unfold and conditions continue to evolve.

Compliance with local policy plans and goals

The sections below will address local planning documents and goals. Relevant excerpts are contained in Attachment 5.

Bourne Local Comprehensive Plan

ISWM is compliant with the Town of Bourne Local Comprehensive Plan. The department is charged with the responsibility of meeting the policies and goals outlined in Sections 19.1, 19.2, 19.3, 19.4 and 19.5 of the plan. 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.

Cape Cod Commission Regional Policy Plan

The Town has worked closely with the CCC over the course of its development to ensure that is in concert with the Regional Policy Plan 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 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, as noted in WM2-C2, 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 recommended action in WM2-T1 has also been a focus of Bourne. ISWM is an Enterprise Fund and therefore is intimately aware of the financial implications accounting for the true costs of managing solid waste programs. ISWM is solvent and has a program in place to fund closure of its facilities and manage the post-closure care.

With respect to WM2-T2, this the very mission of ISWM whose name is Integrated Solid Waste Management. As demonstrated in this submittal, the Town has been the embodiment of this ethos and will continue to evolve in the years to come.

Finally, ISWM fully supports the standards in WM2, which states "To manage solid waste using an integrated solid waste management system that includes waste reduction, recycling and composting…" and is actively continuing to provide the infrastructure to do so. 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 a part of a DEP grant program.

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 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, let alone determining the financial model. The Phase 6 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.

Statutory and regulatory standards, required permits and approvals

As with all operations, ISWM must comply with all applicable Federal, State and local laws, regulations and obtain permits prior to commencement and operations of its facilities.

Phase 6 landfill expansion

The Town has already obtained a Certificate on the SSEIR from Secretary of the Executive Office of Energy and Environmental Affairs (EEA), under 301 Code of Massachusetts Regulations (CMR) 11. Subsequently, DEP issued and ATC per 310 CMR 19.

Additionally, while the ISWM facility already has a site-assignment from the Bourne BOH that permits landfilling on the area through Phase 6 and does not need further approvals from the BOH, it is also under BOH authority per 310 CMR 11, which gives the BOH broad authority to oversee operations at the facility including mitigation of any nuisance conditions from all of the operations on site. The Town has sought clarification from the MA Division of Fisheries and Wildlife, Natural Heritage and Endangered Species Program (NHESP) with regard to the Massachusetts Endangered Species Act (MESA) which has determined that Phase 6 qualifies for an exemption from MESA pursuant to 321 CMR 10.14.

The final approval needed in order for construction of Phase 6 to begin is a decision by the CCC regarding this DRI application. No other local permits are needed.

Landfill leachate treatment facility

There are many steps that need to be accomplished prior to operating a leachate treatment facility at the ISWM facility. At the present time this project is subordinate to the development of the landfill and other site projects as the economic case has become tenuous since Harvest Power, which would have invested in the plant, terminated their lease with the Town for unrelated reasons. Nevertheless, ISWM is still considering development of an on-site leachate treatment facility as a possibility and the broad based steps involved in development are outlined below.

First and foremost, access to the clean effluent pipeline located on Canal View Road on Joint Base Cape Cod (JBCC) must be obtained. This requires approval by the National Guard Bureau, and easement with the U.S. Army Corps of Engineers on behalf of the MA Army National Guard which controls Camp Edwards where the pipeline is located on JBCC. An easement will also need to be obtained from the DFG which oversees the particular area of the base. The MA Air National Guard controls the utilities at JBCC and prior to construction of a facility, ISWM will need to complete a utilities service agreement with the 102nd Intelligence Wing. Finally, NHESP will need to review the appropriate level of oversight for access over approximately 2,500 square feet on JBCC and a small portion of the ISWM facility that will be disturbed during connection to the pipeline. As already noted, the Governor signed legislation which exempted the area in question from Article 97 which is designed to protect natural resources of the Commonwealth.

Actual construction of the water treatment facility and discharge to the pipeline, and eventually to the infiltration basin, will be overseen by the DEP. The details of the exact permitting and oversight process will be determined once the Town receives access and decides to move forward with development of a facility.

Future filings

The Town does intend to come before the CCC with further plans to expand the landfill into a potential Phase 7 and Phase 8. The exact layout and development of these phases is still under consideration. ISWM will work closely with MEPA and CCC staff, as well as the BOH to coordinate updates and future filings. This will be a major focus of the ISWM staff in 2019.

ATTACHMENT 1

MEPA CERTIFICATES AND COMMENT LETTERS
MA DEP PHASE 6 AUTHORIZATION TO CONSTRUCT PERMIT
CERTIFICATE OF COMPLIANCE DRI #97031

The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
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Boston, MA 02114

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GOVERNOR

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January 12, 2018

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	: December 6, 2017

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 Proponent submitted an Expanded Notice of Project Change (NPC) with a request that I allow a Single Supplemental EIR to be prepared in lieu of a Draft and Final Supplemental EIR. Based on review of the NPC, the Proponent may submit a Single EIR in accordance with the limited Scope included in this Certificate.

Project Change Description

The Certificate on the Final Environmental Impact Report (FEIR), issued November 29, 1999, acknowledged that certain aspects of the landfill project, including Phase 6, were conceptual and required that the Town submit NPCs to the MEPA Office to address development of subsequent phases. The Expanded NPC provides an updated site development plan for the landfill and describes the development of Phase 6 of the landfill expansion.

Phase 6 consists of a lined landfill cell that will incorporate leachate collection and landfill gas management infrastructure. It is proposed on previously disturbed land and existing roads will provide access to and around the site. The 6.69-acre expansion will provide 920,000 cubic yards (cy) of capacity. Phase 6 is designed to support Phase 7 and Phase 8 which could yield another 3,830,000 cy of capacity

and extend the life of the landfill to 2034. The Expanded NPC also describes the plan for the Proponent's (Town of Bourne) access to lands protected by Article 97 and as required by in the FEIR Certificate.

Procedural History

Review of the Bourne Integrated Solid Waste Management Facility (ISWMF) project was initiated via submittal 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 existing Bourne Landfill located off MacArthur's Boulevard (Route 28) in Bourne. 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. A Notice of Project Change (NPC-1) submitted in April 2003 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 its 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.

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 addressed a vertical expansion proposed over Phases 1A, 1B, and 1C. MassDEP issued an Authorization to Construct (ATC) and ATO Permit in 2017.

Permits and Jurisdiction

The development of Phase 6 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 create more than 10 acres of new impervious area. The project also exceeds the ENF threshold at 301 CMR 11.03(1)(b)(3) because it includes conversion of land held for natural resources purposes in accordance with Article 97 to any purpose not in accordance with Article 97. The project requires an ATC and an ATO from MassDEP. Because it requires an EIR, the project is subject to review in accordance with the MEPA Greenhouse Gas (GHG) Emissions Policy and Protocol ("GHG Policy"). Phase 6 requires an ATC and ATO from MassDEP.

The project construction activities may disturb one or more acres of land and therefore, may require a National Pollution Discharge Elimination System NPDES Stormwater Permit for Construction Activities from the U.S. Environmental Protection Agency (EPA). The project will also require a Development of Regional Impact (DRI) modification from the Cape Cod Commission (CCC).

Because the Town is not seeking Financial Assistance, MEPA jurisdiction is limited to the subject matter of required or potentially required state Permits that have the potential to cause Damage to the Environment, as defined in the MEPA regulations. MEPA jurisdiction extends to land alteration, solid waste, Article 97 land and GHG emissions.

Single EIR Request

The Expanded NPC includes 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 provides a detailed project description, a baseline for evaluating environmental impacts and a comprehensive alternatives analysis. The Expanded NPC identifies how the project is designed to achieve consistency with regulatory standards and measures to avoid, minimize and mitigate project impacts.

Review of Expanded NPC

According to the Expanded NPC, Phase 6 will not result in increased environmental impacts compared to the project reviewed in the 1999 FEIR, nor will it require modification of any previously issued Section 61 Findings. The daily tonnage and waste composition will remain consistent. Phase 6 is proposed on site-assigned land approved by the Bourne Board of Health.

Phase 6 consists of a double composite lined landfill cell which includes constructing a new primary composite liner and leachate collection system and a secondary composite liner with leak detection and includes, from bottom to top:

- A subgrade layer of compacted soil;
- A low-permeability soil barrier layer comprised of twelve inches of compacted low permeability soil (natural soils);
- A secondary geocomposite clay liner barrier layer;
- A secondary geomembrane barrier layer consisting of a high density polyethylene (HDPE) flexible membrane liner (FML);
- A secondary geocomposite leak detection layer consisting of a hi-planar HDPE bonded on both sides with a non-woven geotextile geocomposite drainage layer; and,
- A leachate collection layer consisting of a minimum of 18-inches of sand.

The Proponent intends to commence construction of the landfill liner in the spring or summer of 2018 which will allow adequate time for construction and review by MassDEP prior to making a determination regarding an Authorization to Operate (ATO) in early 2019.

The Expanded NPC identifies the Town's analysis of an on-site leachate system. Currently, leachate is conveyed to a large on-site storage tank and is removed from the site via trucks. The Town is reviewing alternatives for the possible construction of a leachate pre-treatment system on-site. Any on-site treatment will require discharge of clean, treated effluent. The Joint Base Cape Cod (JBCC), which is adjacent to the landfill site, includes a clean effluent pipeline used for the discharge from the wastewater treatment plant at JBCC. The pipeline is located within the boundary of the Upper Cape Water Supply Reserve (the Reserve), which is state conservation land protected in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth (Article 97). The construction of a connection requires an easement over 2,500 sf of Article 97 land.

Alternative Analysis

The Expanded NPC presents two scenarios for the development Phase 6 of the landfill, described as Preferred Phase 6 (Preferred Alternative) and No Further Build Phase 6 (No Build Alternative). It includes a series of plans for each scenario, including cross-section views.

The Preferred Alternative consists of an approximate 6.69-acre expansion that will yield 920,000 cy of disposal capacity through the early 2020s. The Preferred Alternative is designed to accommodate further site development into a potential Phase 7 and Phase 8 which could yield another 3,830,000 cy of disposal capacity through 2034. The No Build Alternative analyzes a 9.82-acre landfill area with an

estimated capacity of 1,670,000 cubic yards that could extend the landfill life of the site through 2024. The No Build Alternative would be the final phase of the landfill.

The Preferred Alternative is designed to provide flexibility for additional expansion of the landfill (Phase 7 and 8). Phase 7 and 8 would be contiguous phases constructed in progression southward from Phase 6. Phase 7 would be constructed over the southern slope of Phase 6 and Phase 8 would be constructed over the southern slope of Phase 7. Both phases would be constructed using the state-of-the-art double composite lined landfill design with leak detection designed to meet regulatory requirements for liner construction. The Expanded NPC indicates that the location of Phase 7 and Phase 8 will be located in areas that are currently used for site-assigned solid waste handling activities. The Town will be required to modify its Site Assignment with the Board of Health at the appropriate time prior to developing either Phase 7 or Phase 8. In 2016, the Town acquired approximately twelve acres abutting the residential recycling center at the southern boundary of the site. If Phase 7 and 8 are pursued, the Town may relocate offices and handling facilities to the 12-acre parcel.

Under the No Build Alternative, the liner would extend over the roadway which would decrease the feasibility, and increase the cost, of reclaiming area under the road to create capacity (approximately 750,000 cy). The No Build Alternative is presented as a contingency plan in the event that the Preferred Alternative cannot be permitted or constructed.

The Expanded NPC includes a traffic assessment which indicates that the Phase 6 will not increase traffic generation. Traffic generation has been reduced since 2015 when the ash, delivered in large trailers, became the primary waste stream. The only MSW accepted at the facility is authorized through long-term contracts with the Town of Bourne and Town of Falmouth.

Article 97

The Expanded NPC identified the Article 97 land impacted by the project and indicated that the conversion was authorized by a two-thirds vote of the legislature and codified by the General Court in Chapter 223 of the acts of 2016 which was signed by Governor Baker on August 10, 2016. The legislation authorizes the Massachusetts Department of Fish and Game (DFG) to transfer an approximately 2,500 square foot (sf) easement on Canal View Road at JBCC within the Upper Cape Regional Water Supply Reserve. The authorizing legislation is limited to installation and maintenance of a pipe to connect to the JBCC Wastewater Treatment Plant.

The transfer of land held for Article 97 purposes must be carefully considered to protect these lands from development pressures and to preserve the Commonwealth's legacy of open space conservation and protection. Land protected by Article 97 may not be disposed of without authorization from the legislature. The Article 97 Policy indicates that EEA and its agencies shall not sell, transfer, lease, relinquish, release, alienate, or change the control or use of any right or interest of the Commonwealth in and to Article 97 land. The goal of the Policy is to ensure no net loss of Article 97 lands under the ownership and control of the Commonwealth and its political subdivisions.

The Expanded NPC addresses consistency with the EEA Article 97 Land Disposition Policy which guides the circumstances under which an EEA Agency may transfer Article 97 land or support a transfer of Article 97 land. These include, but are not limited to, description of the land proposed for

disposition (size, location, presence of resource areas, etc.), an alternatives analysis and identification of compensatory open space. The Town consulted with staff from the Executive Office of Energy and Environmental Affairs (EEA) regarding the potential easement prior to submitting the Expanded NPC to address the project's compliance with the Article 97 Policy. The Town of Bourne will record a permanent conservation restriction (CR) over 77 acres of municipal land managed by the Bourne Conservation Commission and the CR will be held by DFG.

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 analysis should quantify the direct and indirect CO2 emissions of the project's energy use. Direct emissions include on-site stationary sources, which typically emit GHGs by burning fossil fuel for heat, hot water, steam and other processes. Indirect emissions result from the consumption of energy, such as electricity, that is generated off-site by burning of fossil fuels, and from emissions from vehicles used by employees, vendors, customers and others. 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, the Town consulted with the MEPA Office and the Department of Energy Resources (DOER) in development of the GHG analysis.

The Expanded NPC identifies current MSW/MCA contract scenarios, the decrease in LFG associated with each, actual LFG collection system efficiency compared to industry standards, and flare efficiency. It also quantifies GHG emissions from direct (flaring and fugitive emissions) and indirect (flare and LFG collection motors) sources.

The Expanded NPC identifies the Town's efforts to reduce GHG emissions of the facility. The Town is permitted to accept up to 219,000 tons of solid waste per year and, prior to 2015, mainly accepted residential and commercial solid waste. In 2014 the Town entered a 10-year contract with Covanta SEMASS a municipal waste combustor located in Rochester, MA that requires SEMASS to deliver and the Town to accept for disposal, up to 189,000 tons per year (tpy) of non-biodegradable ash residue which began in 2015. During this ten-year contract term, the remaining 30,000 tpy of the 219,000 tons of permitted solid waste disposal capacity is reserved for residential waste from Bourne and Falmouth, soils and other difficult to manage wastes. The Town intends to extend the contract; however, if the contract is not extended, the Town can return to accepting up to 219,000 tpy of biodegradable residential and commercial waste. The latter scenario is accounted for in The Scenario 2-Baseline. Both scenarios reflect the reductions associated with aggressive measures to capture, collect and destroy landfill gas.

The Expanded NPC evaluates projects as requested by the Department of Energy Resources (DOER) including LFG conversion to pipeline natural gas; microturbines fueled by LFG; LFG-to-energy facility; and, anaerobic digestion of organic materials and biogas-to-energy. In addition, the Town is developing and/or analyzing the feasibility of:

- Recovering thermal energy;

- LFG Blower Powers with 40 horsepower motors;
- Photovoltaic (PV) Solar - potential 12.6 MW solar installation over 30-acres of landfill and on the roof of an existing facility;
- Operation of an animal crematory that would use the LFG as a fuel.
- 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.

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 EIR should be prepared in accordance with the following Scope.

SCOPE

General

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

Project Description and Permitting

The Single EIR should include a detailed description of the proposed project and describe any changes to the project since the filing of the Expanded NPC-5. The project description should identify individual components of the project and identify impacts associated with each component. The Single EIR should include updated plans as necessary to reflect modifications to infrastructure design, access roadways, and mitigation. It should provide a revised description and analysis of applicable statutory and regulatory standards and requirements, and a description of how the project will meet those standards. The Single EIR should include a list of required State permits or other State approvals and provide any relevant updates. The Single EIR should include an update on the CCC review process, including coordination efforts and anticipated compliance with regulatory and permitting standards and mitigation requirements.

The Single EIR should present plans for the leachate collection, leachate pre-treatment system and landfill gas management.

The Expanded NPC indicates that since the FEIR Certificate was granted in 1999, the Town has conducted extensive hydrogeological investigations and modeling, including particle tracking, for all areas downgradient of the site in cooperation with the CCC which required expanded groundwater monitoring for several years as part of the CCC DRI approval process. As requested by the CCC, the Single EIR should include data, if available, on groundwater testing downgradient of the JBCC wastewater treatment facility. The Single EIR should indicate if any connections to the Bourne Water

District will be provided to additional private well owners based on monitoring results.

Greenhouse Gas Emissions (GHG)

For those measures that will continue to be evaluated (i.e. solar PV, others), the Single EIR should quantify the potential GHG reduction associated with the measures based upon system assumptions (e.g., solar panel efficiency, available area, etc.), and include site plans/describing where it will be located on ISWMF facility. It should update baseline and mitigated scenarios accordingly.

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-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.

Future Submissions

The Expanded NPC indicates that the Town will submit a NPC to address development of Phase 7 and 8. The Single EIR should provide an updated conceptual development plan for Phase 7, Phase 8 and for 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. I note that subsequent phases may result in a Take of the Eastern Box Turtle (Terrapene Carolina) and require a Conservation and Management Permit from the Natural Heritage and Endangered Species Program (NHESP). The Town should consult with the MEPA Office prior to filing a NPC.

Construction

Construction period impacts and mitigation measures should be described in the Single EIR, including impacts associated with noise, dust and traffic. Measures that will be taken to minimize and mitigate construction period impacts should be detailed.

The project must comply with MassDEP Solid Waste and Air Pollution Control regulations, pursuant to M.G.L. c.40, s.54 during construction. All construction should be undertaken in compliance with the conditions of all State and local permits. The Single EIR should provide a copy of the Stormwater Pollution Prevention Plan (SWPPP) that the Town will be required to prepare in accordance with the NPDES permit which will describe the proposed work and implementation of stormwater best management practices (BMPs) to control erosion and sedimentation, spill prevention and response measures, and inspection practices during the construction period.

Responses to Comments/Circulation

The Single 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 EIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive

is not intended, and shall not be construed, to enlarge the scope of the Single EIR beyond what has been expressly identified in this certificate.

The Proponent should circulate the Supplemental EIR to those parties who commented on the Expanded NPC, 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. A copy of the Supplemental EIR should be made available for review at the Bourne public library.

January 12, 2018
Date

Matthew A. Beaton

Comments received:

12/29/2018	Massachusetts Division of Marine Fisheries (DMF)
01/03/2018	Cape Cod Commission (CCC)
01/05/2018	Natural Heritage and Endangered Species Program (NHESP)
01/05/2018	Massachusetts Department of Environmental Protection (MassDEP) – Southeast Regional Office (SERO)

MAB/ACC/acc

From:	Logan, John (FWE)
To:	Canaday, Anne (EEA)
Cc:	Potti, Pooja (FWE)
Subject:	Town of Bourne Integrated Solid Waste Management Facility, ENPC, EEA# 11333
Date:	Friday, December 29, 2017 12:42:17 PM

Secretary Matthew A. Beaton
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 Beaton:

The Division of Marine Fisheries (MA DMF) has reviewed the Expanded Notice of Project Change (ENPC) 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.

Questions regarding this review may be directed to John Logan in our New Bedford office at (508) 990-2860 ext. 141.

John Logan, Ph.D.
MA Division of Marine Fisheries
1213 Purchase Street
New Bedford, MA 02740
(508) 990-2860 x141
http://www.mass.gov/eea/agencies/dfg/dmf/
https://www.researchgate.net/profile/John_Logan

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BARNSTABLE, MASSACHUSETTS 02630

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CAPE COD
COMMISSION

By Electronic Mail

January 3, 2018

Matthew A. Beaton, Secretary
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office, Anne Canaday, Analyst
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: Expanded Notice of Project Change (ENPC)/ Expanded Environmental Notification Form (EENF) – EEA No. 11333 Town of Bourne Integrated Solid Waste Management Facility 201 MacArthur Boulevard, Bourne, MA 02532

Dear Secretary Beaton:

The Cape Cod Commission (Commission) supports the Town of Bourne's request to allow further MEPA review of the Bourne ISWMF Phase 6 by way of an SEIR.

The Commission recognizes that the Town of Bourne has been actively and continuously engaged in both long- and short-term solid waste master planning and plan implementation for more than twenty years, and proposed Phase 6 is a natural outgrowth of such efforts. To this end, the town has previously acquired and had site assigned additional land for the proposed landfill expansion. The town's solid waste planning and implementation play a significant role in regional and state solid waste management approaches, especially given the shrinking availability of landfill space in the Commonwealth.

The existing Facility has been reviewed and is subject to several permitting decisions by the Commission. Phase 6 is similarly subject to further review and permitting by the Commission, after MEPA review is completed. The document describes, in concept, potential future Phases 7 and 8, which will require further MEPA and Commission review and approval if pursued by the town.

In its review and permitting for Phase 6, there are several water quality issues that will be of interest to the Commission including:

- The Cape Cod Regional Policy Plan supports the proposal to treat leachate, and treatment at the JBCC wastewater treatment facility appears to be a good solution. The

Commission will be interested in further details about this proposal, and it may also require additional monitoring and reporting of groundwater down-gradient of the Facility;

- Stormwater management and recharge for Phase 6, and other stormwater management improvements for the Facility as feasible, should be provided on-site according to applicable MA Department of Environmental Protection and Cape Cod Commission standards. The Commission encourages low impact-type stormwater management facilities that treat for nutrients, where feasible as appropriate to the nature of the project.

Thank you for the opportunity to provide comments on the above referenced matter. Cape Cod Commission staff are available and happy to answer any questions about these comments.

Sincerely,

Patty Daley
Deputy Director

CC: Project File
Daniel Barrett, Town of Bourne (via email)
Town of Bourne Cape Cod Commission representative (via email)
Cape Cod Commission Committee on Planning and Regulation Chair (via email)
Cape Cod Commission Chair (via email)

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

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

Jack Buckley, *Director*

January 5, 2018

Matthew A. Beaton, Secretary
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
Anne Canaday, EEA No. 11333
100 Cambridge St.
Boston, Massachusetts 02114

Project Name:	*Bourne Integrated Solid Waste Management Facility*
Proponent:	*Town of Bourne, Department of Integrated Solid Waste Management (ISWM)*
Location:	*201 MacArthur Boulevard, Bourne, MA*
Project Description:	*Phase 6 Landfill Expansion, Site Development Plan, Easement on Article 97 Land*
Document Reviewed:	*Expanded Notice of Project Change*
EEA File Number:	*11333*
NHESP Tracking No.:	*17-36534*

Dear Secretary Beaton:

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 Integrated Solid Waste Management Facility's proposed Phase 6 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 proposed 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.

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). Based on information submitted in the NPC, it appears that the Phase 6 Landfill Expansion Project would involve no land alteration outside of existing developed areas associated with on-going facility operations. Re-use of existing developed areas typically enables projects to qualify for one or more MESA exemptions pursuant to 321 CMR 10.14.

However, the Division notes that future development of the proposed Future Handling Area (11.7 acres) and proposed effluent connection projects would require a direct filing with the Division for compliance with the MESA. The Proponent has initiated pre-filing consultations with the Division to discuss conceptual development plans associated with the Future Handling Area. Although a formal MESA filing

has not yet been submitted, the Division anticipates – based on previously submitted information and ongoing consultations with the Proponent – 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.

The Division notes that it may be possible to redesign proposed development plans for the Future Handling Area to avoid a Take. If redesign is not possible, please note that projects resulting in a Take of state-listed species may only be permitted if they meet the performance standards of a Conservation and Management Permit (CMP; 321 CMR 10.23). In order for a project to be considered for a CMP, a project proponent 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 state-listed species, (b) demonstrate that an insignificant portion of the local population will be impacted, and (c) develop and implement a conservation and management plan that provides a long-term net benefit to the conservation of the impacted species. The Division recommends that the Proponent continue to consult with the Division on a pre-filing basis to avoid, minimize and mitigate impacts to state-listed species and their habitats. We look forward to continued, collaborative permitting discussions with the Proponent as it proceeds through the MESA review process.

The Division will not render a final decision until the MEPA review process and associated public and agency comment period is complete, and until all required MESA filing materials are submitted to the Division. No alteration to the soil, surface, or vegetation and no work associated with the proposed Future Handling Area (11.7 acres) or proposed effluent connection projects shall occur on the property until the Division has made a final determination.

If you have any questions about this letter, please contact Jesse Leddick, Endangered Species Review Biologist, at (508) 389-6386 or jesse.leddick@state.ma.us. We appreciate the opportunity to comment on this project.

Sincerely,

Thomas W. French

Thomas W. French, 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.

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

January 5, 2018

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

RE: NPC Review. EOEEA # 111333.
BOURNE. Town of Bourne Integrated Solid Waste Management Facility at 201 MacArthur Boulevard

Dear Secretary Beaton,

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

> Since the writing of the original EIR, the Town has 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. This site has been site-assigned by the Bourne Board of Health 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 an EIR was not needed in order to develop this parcel. 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 can be developed, which will be discussed later. However, this land is <u>not needed</u> in order to complete the construction of either Phase 6 development scenario. Temporary stockpiles of sand created by the preparation of Phase 6 base liner elevations will be stored on the 25-acre parcel, or if approved, the twelve-acre parcel, until they are needed for the liner construction or for subsequent capping projects such as for Phase 4, Stage 2 and Phase 5.
>
> 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 and ISWM Department offices. The development of Phase 7 and Phase 8, which would be located on the 25-acre parcel, requires several steps including a separate, new EIR with MEPA, a Development of Regional Impact (DRI) approval from the CCC and a major modification to the site assignment by the Bourne Board of Health.

Bureau of Water Resources Comments:
Wetlands and Waterways Program Comments. The Wetlands Program has reviewed the Notice of Project Change (NPC) for the Bourne Integrated Solid Waste Management Facility and has determined to not be any wetlands jurisdiction, wetland resource area or buffer zone.

Industrial Stormwater Multi-Sector General Permit. The Proponent is reminded that the facility is subject to the U.S. EPA NPDES Industrial Stormwater Multi-Sector General Permit. The Fact Sheet for Sector L:Landfills can be found here: https://www.epa.gov/sites/production/files/2015-10/documents/sector_l_landfills.pdf

Bureau of Waste Site Cleanup Comments:
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 no listed MCP disposal sites located at or in the vicinity of the site that would appear to impact the proposed Project. Note that one closed MCP disposal site is located at the facility (Release Tracking Number 4-14181). The site was closed under a Permanent Solution on December 16, 1999, and no further reporting or response actions are required under the MCP.

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: http://public.dep.state.ma.us/SearchableSites2/Search.aspx

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 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.

Bureau of Air and Waste:
Air Quality. Construction and operation activities shall not cause or contribute to a condition of air 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 the Proponent use construction equipment with engines manufactured to Tier 4 federal emission standards, 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 the best available after-engine emission control technology, such as oxidation catalysts or diesel particulate filters, to reduce exhaust emissions. The Proponent should

provide a list of the engines, their emission tiers, and, if applicable, the best available control technology installed on each piece in the subsequent environmental filing.

Massachusetts Idling Regulation. MassDEP requests that the Proponent state specifically in the subsequent environmental filing how it plans to prohibit the excessive idling during the construction period. 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 establish permanent signage limiting idling to five minutes or less at the completed Project

Hazardous Waste Management. If any occupant of the Project generates hazardous waste and/or waste oil, that entity must notify the MassDEP of such activity and obtain an EPA Identification number, as applicable, in accordance with 310 CMR 30.000. Further information can be located on the Department's website at: http://www.mass.gov/eea/agencies/massdep/recycle/hazardous/

Solid Waste Comments: As a result of its review of the Notice of Project Change for the Bourne integrated Solid Waste Management Facility, EEA No. 11333 ("Project" or "Site"), the Massachusetts Department of Environmental Protection (MassDEP) Solid Waste Management Section (Solid Waste) provides the following comments regarding the proposed Bourne landfill expansion.

The Solid Waste Management Permitting Requirements [310 CMR 19.000] 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).

Please contact Doug Coppi at (508) 946-2833 with any questions pertaining to solid waste management requirements.

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.

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

Very truly yours,

Jonathan E. Hobill,
Regional Engineer,
Bureau of Water Resources

JH/GZ

Cc: DEP/SERO

ATTN: Millie Garcia-Serrano, Regional Director
David Johnston, Deputy Regional Director, BWR
Maria Pinaud, Deputy Regional Director, BAW
Gerard Martin, Deputy Regional Director, BWSC
Jennifer Viveiros, Deputy Regional Director, ADMIN
Jim Mahala, Chief, Wetlands and Waterways, BWR
Gary Makuch, Wetlands and Waterways, BWR
Mark Dakers, Chief, Solid Waste, BAW
Doug Coppi, Solid Waste, BAW
Allen Hemberger, Site Management, BWSC

The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Charles D. Baker
GOVERNOR

Karyn E. Polito
LIEUTENANT GOVERNOR

Matthew A. Beaton
SECRETARY

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Fax: (617) 626-1081
http://www.mass.gov/eea

June 29, 2018

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
SINGLE SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT

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	: May 23, 2018

Pursuant to the Massachusetts Environmental Policy Act (MEPA; M.G. L. c. 30, ss. 61-62I) and Section 11.08 of the MEPA regulations (301 CMR 11.00), I have reviewed the Single Supplemental Environmental Impact Report (Single Supplemental EIR) and hereby determine that it **adequately and properly complies** with MEPA and its implementing regulations.

Project Description

As described in the Single Supplemental EIR, the project consists of Phase 6 of the Bourne Integrated Solid Waste Management Facility (ISWMF) project. Phase 6 of the project consists of the construction of a lined landfill cell that will incorporate leachate collection and landfill gas management infrastructure. It is proposed on previously disturbed land. Existing roads will provide access to and around the site. The 6.69-acre expansion will provide 920,000 cubic yards (cy) of capacity.

Phase 6 is designed to support Phase 7 and Phase 8 which could yield another 3,830,000 cy of capacity and extend the life of the landfill to 2034. The Single Supplemental EIR also provides an updated conceptual development plan for Phase 7, Phase 8 and for the proposed residential recycling center and proposed relocated offices.

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, including Phase 6, 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 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.

Project Site

The Bourne ISWMF, located at 201 MacArthur Boulevard (Route 28), is comprised of a 74-acre site-assigned parcel which contains 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 to create additional landfill space. Phases 2 and 3 are both lined, closed, capped and contain leachate collection systems. Phase 4, an active landfill cell, is located in the area previously occupied by Phase 1D. Phase 5 addressed a vertical expansion proposed over Phases 1A, 1B, and 1C. MassDEP issued an Authorization to Construct (ATC) and ATO Permit in 2017.

Permits and Jurisdiction

The development of Phase 6 is undergoing MEPA review 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 create more than 10 acres of new impervious area. The project also exceeds the ENF threshold at 301 CMR 11.03(1)(b)(3) because it includes conversion of land held for natural resources purposes in accordance with Article 97 to any purpose not in accordance with Article 97. The Phase 6 requires an ATC and an ATO from MassDEP. Because it requires an EIR, the project is subject to review in accordance with the MEPA Greenhouse Gas (GHG) Emissions Policy and Protocol ("GHG Policy").

The project will also require a modification to a Development of Regional Impact (DRI) from the Cape Cod Commission (CCC).

Because the Town is not seeking Financial Assistance, MEPA jurisdiction is limited to the subject matter of required or potentially required state Permits that have the potential to cause

Damage to the Environment, as defined in the MEPA regulations. MEPA jurisdiction extends to land alteration, solid waste, Article 97 land and GHG emissions.

Review of the Single Supplemental EIR

The Single Supplemental EIR 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 Single Supplemental EIR provided a list of required local, state, and federal permits and provided an update on the status of each of these actions.

Comments from State Agencies did not identify any significant impacts that were not reviewed in the Single Supplemental EIR or identify additional alternatives for further review. The Proponent intends to commence construction of the landfill liner in the summer of 2018 which will allow adequate time for construction and review by MassDEP prior to making a determination regarding an ATO in early 2019.

According to the Single Supplemental EIR, Phase 6 will not result in increased environmental impacts compared to the project reviewed in the 1999 FEIR, nor will it require modification of any previously issued Section 61 Findings. The daily tonnage and waste composition will remain consistent. Phase 6 is proposed on site-assigned land approved by the Bourne Board of Health.

Phase 6 consists of a double composite lined landfill cell which includes constructing a new primary composite liner and leachate collection system and a secondary composite liner with leak detection and includes, from bottom to top:

- A subgrade layer of compacted soil;
- A low-permeability soil barrier layer comprised of twelve inches of compacted low permeability soil (natural soils);
- A secondary geocomposite clay liner barrier layer;
- A secondary geomembrane barrier layer consisting of a high density polyethylene (HDPE) flexible membrane liner (FML);
- A secondary geocomposite leak detection layer consisting of a hi-planar HDPE bonded on both sides with a non-woven geotextile geocomposite drainage layer; and,
- A leachate collection layer consisting of a minimum of 18-inches of sand.

The Single Supplemental EIR identifies Phase 7 and 8 as contiguous phases constructed in progression southward from Phase 6. Phase 7 would be constructed over the southern slope of Phase 6 and Phase 8 would be constructed over the southern slope of Phase 7. Both phases would be constructed using the double composite lined landfill design with leak detection designed to meet regulatory requirements for liner construction. Phase 7 and Phase 8 are proposed in areas that are currently used for site-assigned solid waste handling activities. The Town will be required to modify its Site Assignment with the Board of Health prior to developing either Phase 7 or Phase 8. In 2016, the Town acquired approximately twelve acres

abutting the residential recycling center at the southern boundary of the site. If Phase 7 and 8 proceed, the Town may also relocate offices and handling facilities to the 12-acre parcel.

Article 97

The Single Supplemental EIR identifies the Town's analysis of alternatives for construction of an on-site leachate system. Currently, leachate is conveyed to a large on-site storage tank and is removed from the site via trucks. Any on-site treatment will require discharge of clean, treated effluent. The Joint Base Cape Cod (JBCC), which is adjacent to the landfill site, includes a clean effluent pipeline used for the discharge from the wastewater treatment plant at JBCC. The pipeline is located within the boundary of the Upper Cape Water Supply Reserve (the Reserve), which is state conservation land protected in accordance with Article 97 of the Amendments to the Constitution of the Commonwealth (Article 97). The construction of a connection requires an easement over 2,500 sf of Article 97 land.

The Single Supplemental EIR identified the Article 97 land impacted by the project and indicated that the conversion was authorized by a two-thirds vote of the legislature and codified by the General Court in Chapter 223 of the acts of 2016 which was signed by Governor Baker on August 10, 2016. The legislation authorizes the Massachusetts Department of Fish and Game (DFG) to transfer an approximately 2,500 square foot (sf) easement on Canal View Road at JBCC within the Upper Cape Regional Water Supply Reserve. The authorizing legislation is limited to installation and maintenance of a pipe to connect to the Wastewater Treatment Plant.

The Single Supplemental EIR addresses consistency with the EEA Article 97 Land Disposition Policy which guides the circumstances under which an EEA Agency may transfer Article 97 land or support a transfer of Article 97 land. The goal of the Policy is to ensure no net loss of Article 97 lands under the ownership and control of the Commonwealth and its political subdivisions. The Single Supplemental EIR includes a description of the land proposed for disposition (size, location, presence of resource areas, etc.), an alternatives analysis and identification of compensatory open space. The Town of Bourne will record a permanent conservation restriction (CR) over 77 acres of municipal land managed by the Bourne Conservation Commission and the CR will be held by DFG.

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 identified current 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.

Currently, the Town 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 waste combustor ash which does not produce gases.

The Supplemental Single EIR evaluates and quantifies the potential GHG reduction associated with LFG measures based upon the following system assumptions: LFG conversion to pipeline natural gas; microturbines fueled by LFG; LFG-to-energy facility; and, anaerobic digestion of organic materials and biogas-to-energy. In addition, the Town is assessing the feasibility of and the potential development of:

- Recovering thermal energy;
- LFG Blower Powers with 40 horsepower motors;
- Photovoltaic (PV) Solar - potential 12.6 MW solar installation over 30-acres of landfill and on the roof of an existing facility;
- Operation of an animal crematory that would use the LFG as a fuel.
- 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.

Rare Species

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).

The Natural Heritage and Endangered Species Program (NHESP) has determined, in a letter dated January 19, 2018, that the Phase 6 Landfill Expansion, as currently proposed, is exempt from MESA review pursuant to 321 CMR 10.14.

Comments from NHESP indicate that the Town has consulted with NHESP regarding Phases 7 and 8. The NHESP comments indicate that it is unclear whether Phases 7 and 8 will be exempt from MESA review (321 CMR 10.14) or require a direct filing with the NHESP (321 CMR 10.18). 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 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.

Construction Period

Construction is anticipated to commence in summer 2018. The Single Supplemental EIR identified measures to prevent or minimize impacts during the construction period. The Town was asked to submit a Stormwater Pollution Prevention Plan (SWPPP) required as part of the National Pollution Discharge Elimination System (NPDES) Construction General Permit (CGP). The Single Supplemental EIR states that the Town is not required to file a NPDES CGP because all stormwater will be contained on-site within two large basins and will be infiltrated.

The Town will use ultra-low sulfur diesel (ULSD) fuel in its diesel-powered construction equipment and will require its contractors to do the same. The project will also comply with MGL c.90 §16A and MassDEP anti-idling regulations (310 CMR 7.11(1)(b)) and will comply with MassDEP Solid Waste and Air Quality Control regulations, pursuant to M.G.L. Chapter 40, Section 54, during construction. All construction activities should be undertaken in compliance with the conditions of all State and local permits.

Future Submissions

The Single Supplemental EIR indicates 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.

Conclusion

Based on a review of the Single Supplemental EIR, comment letters and consultation with State Agencies, I find that the Single EIR adequately and properly complies with MEPA and its implementing regulations. The project may proceed to permitting. State Agencies and the Town should forward copies of the final Section 61 Findings to the MEPA Office for publication in accordance with 301 CMR 11.12.

June 29, 2018
Date

Matthew A. Beaton

Comments received:

06/19/2018 Natural Heritage and Endangered Species Program (NHESP)
06/22/2018 Massachusetts Department of Environmental Protection (MassDEP) – Southeast Regional Office (SERO)

MAB/ACC/acc

MASSWILDLIFE

DIVISION OF
FISHERIES & WILDLIFE

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

Jack Buckley, *Director*

June 19, 2018

Matthew A. Beaton, Secretary
Executive Office of Energy and Environmental Affairs
Attention: MEPA Office
Anne Canaday, EEA No. 11333
100 Cambridge St.
Boston, Massachusetts 02114

Project Name:	*Bourne Integrated Solid Waste Management Facility*
Proponent:	*Town of Bourne, Department of Integrated Solid Waste Management (ISWM)*
Location:	*201 MacArthur Boulevard, Bourne, MA*
Project Description:	*Phase 6 Landfill Expansion*
Document Reviewed:	*Supplemental Single Environmental Impact Report*
EEA File Number:	*11333*
NHESP Tracking No.:	*17-36534*

Dear Secretary Beaton:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the Division) has reviewed the *Supplemental Single Environmental Impact Report* (SEIR) for the Town of Bourne Integrated Solid Waste Management Facility's proposed Phase 6 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 SEIR, 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.

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 has determined (letter dated January 19, 2018; Attachment 3 of the SEIR) that the Phase 6 Landfill Expansion, as currently proposed, appears to be exempt from MESA review pursuant to 321 CMR 10.14. The Proponent has initiated pre-filing consultations with the Division regarding Phases 7 and 8. At this time, and pending submittal of additional information by the Proponent, it is unclear whether Phases 7 and 8 will be exempt from MESA review (321 CMR 10.14) or require a direct filing with the Division (321 CMR 10.18).

As noted in the Division's previous comments (dated January 5, 2018) on the Expanded Notice of Project Change, development of the proposed Future Handling Area (11.7 acres) and proposed effluent

connection projects would require a direct filing with the Division for compliance with the MESA. The Proponent has initiated pre-filing consultations with the Division to discuss conceptual development plans associated with the Future Handling Area. Although a formal MESA filing has not yet been submitted, the Division anticipates – based on previously submitted information and ongoing consultations with the Proponent – that 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 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 with the Proponent, it is our understanding that the Proponent intends to meet the performance standards of a CMP by permanently protecting off-site land in the vicinity of the site as open space and state-listed species habitat. The Proponent has identified a candidate parcel which, based on information submitted to the Division, will likely provide an acceptable mitigation option to address the required long-term net benefit for impacts to Eastern Box Turtle associated with development of this site. 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 public and agency comment period is complete, and until all required MESA filing materials are submitted to the Division. No alteration to the soil, surface, or vegetation, and no work associated with the proposed Future Handling Area or proposed effluent connection projects, shall occur on the property until the Division has made a final determination.

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

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: Phil Goddard, Town of Bourne ISWM Department
Daniel T. Barrett, 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.

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

June 22, 2018

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

RE: SSEIR Review. EOEEA # 11333.
BOURNE. Town of Bourne Integrated Solid Waste Management Facility at 201 MacArthur Boulevard

Dear Secretary Beaton,

The Southeast Regional Office of the Department of Environmental Protection (MassDEP) has reviewed the Single Supplemental Environmental Impact Report (SSEIR) for the Town of Bourne Integrated Solid Waste Management Facility Project to be located at 201 MacArthur Boulevard, Bourne, Massachusetts (EOEEA # 11333). The Project Proponent provides the following information for the Project:

Since the writing of the original EIR, the Town has 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. This site has been site-assigned by the Bourne Board of Health 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 an EIR was not needed in order to develop this parcel. 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 can be developed, which will be discussed later. However, this land is <u>not needed</u> in order to complete the construction of either Phase 6 development scenario. Temporary stockpiles of sand created by the preparation of Phase 6 base liner elevations will be stored on the 25-acre parcel, or if approved, the twelve-acre parcel, until they are needed for the liner construction or for subsequent capping projects such as for Phase 4, Stage 2 and Phase 5.

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 and ISWM Department offices. The development of Phase 7 and Phase 8, which would be located on the 25-acre parcel, requires several steps including a separate, new EIR with MEPA, a Development of Regional Impact (DRI) approval from the CCC and a major modification to the site assignment by the Bourne Board of Health.

Bureau of Air and Waste Comments

Solid Waste Comments: The solid waste section identified an Authorization to Construct permit application and an Authorization to Operate permit as being required. These requirements were acknowledged in the SEIR, and an ATC application submitted to MassDEP.

The proponent also submitted Proposed Section 61 Findings for the solid waste program permit on page 33. The Expanded NPC Certificate stated that "The Single EIR should present plans for the leachate collection system, leachate pre-treatment system and landfill gas management." Although these were discussed in the narrative, formal design plans were not provided. Since detailed leachate collection system plans and conceptual landfill gas management plans are part of the ATC application, lack of submission of formal design plans does not appear to be an issue.

Leachate pre-treatment plans will be developed if the option to discharge on the Joint-base Cape Cod is further pursued.

Other Comments/Guidance

MassDEP staff is available to provide additional guidance to the Proponent upon request. If you have any questions regarding this comment letter please do not hesitate to contact George Zoto at (508) 946-2820.

Very truly yours,

Jonathan E. Hobill,
Regional Engineer,
Bureau of Water Resources

JH/GZ

Cc: DEP/SERO

ATTN: Millie Garcia-Serrano, Regional Director
David Johnston, Deputy Regional Director, BWR
Maria Pinaud, Deputy Regional Director, BAW
Gerard Martin, Deputy Regional Director, BWSC
Jennifer Viveiros, Deputy Regional Director, ADMIN
Dan Connick, Solid Waste, BAW
Mark Dakers, Chief, Solid Waste, BAW
Doug Coppi, Solid Waste, BAW
Allen Hemberger, Site Management, BWSC

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CLEAN WATER ACTION

MASSPIRG Education Fund

MASSACHUSETTS SIERRA CLUB

TOXICS ACTION CENTER

Via Email

June 22, 2018

Matthew A. Beaton,
Secretary of Energy and Environmental Affairs
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
Anne Canaday, Environmental Analyst
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: Town of Bourne ("Bourne"), Department of Integrated Solid Waste Management, Integrated Solid Waste Management Facility ("Facility"), Single Supplemental Environmental Impact Report, EEA No. 11333

To Whom It May Concern:

Conservation Law Foundation, Clean Water Action, MASSPIRG, Massachusetts Sierra Club and Toxics Action Center strongly oppose the expansion of the Facility in the Town of Bourne, Massachusetts as proposed by its Department of Integrated Solid Waste Management ("Bourne") in its Single Supplemental Environmental Impact Report, EEA No. 11333, dated May 9, 2018 ("EIR"). **Bourne's proposed expansion of 6.69 acres and approximately 920,000 thousand cubic yards of capacity to its current facility would be a danger to public health, safety and the environment, would undermine the need to responsibly manage waste through source reduction, recycling and composting, and for the reasons set forth herein, should be denied.**

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CLF is a nonprofit, member-supported, environmental organization working to conserve natural resources, protect public health, and promote thriving communities for all in the New England region, including Massachusetts. CLF has a long history of advocating for clean air, clean water, and healthy communities, including addressing the environmental and community impacts of solid waste disposal, and by advocating waste management strategies focused on waste reduction and recycling as opposed to landfilling and incineration. Likewise, Clean Water Action, MASSPIRG, Massachusetts Sierra Club and Toxics Action Center are nonprofit environmental organizations working to protect public health and the environment in Massachusetts and New England, with a long history of advocating for Zero Waste solutions to the dangerous problems our current solid waste system poses.

I. Background

A. The Bourne Landfill's History and Development

The Bourne Landfill is comprised of a 99-acre parcel located at 201 MacArthur Boulevard in Bourne, Massachusetts.[1] Landfill operations began at the Facility in 1967 with Phase 1 (approximately 31 acres).[2] In 1998, the Town of Bourne, Department of Integrated Solid Waste Management was created and began overseeing the management and operation of the landfill.[3] The current Facility operations include: the active lined landfill, construction and demolition debris transfer station, residential recycling center, single stream recyclable collection and transfer, and composting.[4]

The Facility contains both lined and unlined waste disposal areas. The oldest portion of the landfill is comprised of Phases 1A, 1B, 1C and 1D, all of which are unlined cells.[5] Phases 1A, 1B, and 1C (approximately 23-acres) have been closed and capped. Phase 1D (5.7 acres) was excavated under a pilot landfill reclamation project with MassDEP in order to create additional landfill space.[6] Phase 2 (approximately 7.3 acres) is a closed, lined and capped landfill cell and Phase 3 (approximately 12 acres) is a closed, double composite lined landfill cell. Both Phase 2 and 3 have leachate collection systems.[7] Phase 2A/3A (approximately 17.1 acres) is an inactive double composite lined landfill area. Phase 4 (approximately 9.9 acres) is a currently active landfill area and is located in the area previously occupied by Phase 1D. MassDEP issued the Authorization to Operate Phase 5 (approximately 6.2 acres) of the landfill on March 30, 2017, and it addresses vertical expansion over Phases 1A, 1B, and 1C.[8]

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[1] Final Comprehensive Site Assessment ("CSA"), Dated June 5, 2017, Page 2.
[2] CSA, Page 3.
[3] Town of Bourne, Single Supplemental Environmental Impact Report, May 2018, Page 7.
[4] CSA, Page 2.
[5] NPC, Page 3.
[6] NPC, Page 3.
[7] NPC, Page 3.
[8] NPC, Page 3.

In 2001, Bourne purchased a 25-acre parcel immediately abutting the landfill to the south.[9] This parcel has been site-assigned for solid waste handling and transfer operations.[10] Thus far, this parcel has only been used for recycling and transfer operations since its purchase.[11] In 2016, Bourne purchased 11.7-acre parcel to the south of the 25-acre parcel.[12]

B. Waste Disposal and Capacity

Prior to 1998, the landfill accepted residential and commercial waste from Bourne and the immediate surrounding area.[13] From 1998 through to 2014, the landfill operated as a large regional disposal facility accepting residential and commercial solid waste that was largely MSW but with an increasing percentage comprised of ash.[14] In 2005, the landfill began accepting MSW in addition to non-MSW.[15]

In 2015, Bourne signed a long-term contract with Covanta SEMASS ("SEMASS"), a municipal waste combustor located in Rochester, MA, which shifted the landfill's waste stream to predominantly ash.[16] Under the contract, approximately 86% of the landfill's permitted annual capacity (189,000 tons out of 219,000 tons per year) is reserved exclusively for ash through 2021.[17] The remaining capacity will be available for MSW disposal for residents of Bourne and Falmouth under a ten-year contract.[18] Any further remaining capacity will either be held in reserve or be utilized for soils or other difficult-to-manage waste streams.[19]

C. The Proposed Expansion

In November of 2017, Bourne submitted an Expanded Notice of Project Change ("ENPC") to function as an Expanded Environmental Notification Form ("EENF") for the development of Phase 6 of the landfill.[20] The Secretary of the Executive Office of Energy and Environmental Affairs issued a Certificate on the ENPC on January 12, 2018, that requires the preparation of a Single Supplemental Environmental Impact Report ("EIR") in lieu of Draft and Final Supplemental Environmental Impact Reports. Bourne submitted the EIR May 9, 2018.

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[9] EIR, Page 8.
[10] EIR, Page 8.
[11] Certificate of the Secretary of Energy and Environmental Affairs on the Expanded Notice of Project Change, January 12, 2018, EEA#11333, Page 3. (Expanded NPC Certificate).
[12] EIR, Page 8.
[13] EIR, Page 21.
[14] EIR, Page 21.
[15] EIR, Page 10.
[16] EIR, Page 10.
[17] EIR, Page 10-11.
[18] EIR, Page 11.
[19] EIR, Page 11.
[20] EIR, Page 6.

The EIR identifies two scenarios for the development of the Phase 6 expansion of the landfill, the Preferred Phase 6 ("PP6") and No Further Build Phase 6 ("NFBP6").[21] In either scenario, Phase 6 will be a contiguous phase connected to and overlaying Phase 3 Stage 3 and Phase 4 Stage 2, at the southern end of the original 74-acre site assigned parcel.[22]

Bourne's preferred option, PP6, involves a 6.69-acre expansion that would increase capacity by 920,000 cubic yards. PP6 has been designed to accommodate further expansion of the landfill, called Phases 7 and 8, which would yield a collective 3,830,000 cubic yards of capacity and extend the operational life of the landfill to 2034. This EIR filing explains ISWM's current plan for Phases 7 and 8, but those phases are not to be evaluated as part of this filing.

The second proposed option, NFBP6, involves a 9.82-acre expansion that would increase capacity by 1,670,000 cubic yards and extend the operational life of the landfill to 2024. This scenario is being proposed as the last phase of the landfill, and there would be no further development of the landfill if NFBP6 is chosen.

D. The Proposed Expansion would be Unnecessary if Zero Waste Programs Were Enforced and Expanded

Bourne is asserting that there is a need for additional capacity at the Facility due to future reductions in regional capacity. Increasing regional capacity, however, runs directly counter to the State's plan to reduce solid waste disposal from 6,550,000 tons to 4,550,000 by 2020.[23]

In Massachusetts, the following are Waste Ban Items, meaning that they are not allowed to be buried in a landfill or burned in an incinerator (310 CMR 19.00):

- Asphalt pavement, brick and concrete
- Cathode ray tubes
- Clean gypsum wallboard
- Commercial food material
- Ferrous and non-ferrous metals
- Glass and metal containers
- Lead acid batteries
- Leaves and yard waste
- Recyclable paper, cardboard and paperboard
- Single-resin narrow-necked plastic containers
- Treated and untreated wood and wood waste (banned from landfills only)
- White goods (large appliances)
- Whole tires (banned from landfills only; shredded tires acceptable)

[21] EIR, Page 9.
[22] EIR, Page 9.
[23] SWMP, page vi.

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These materials are banned from disposal because it has been determined that: (a) disposal of the material presents a potential adverse impact to human health, safety or the environment; (b) a restriction or prohibition will result in the extension of the useful life or capacity of a facility or class of facilities or reduce its environmental impact; or (c) a restriction or prohibition will promote reuse, waste reduction, or recycling.[24] Unfortunately, according to MassDEP, almost 40%, or over 2 million tons, of disposed items in Massachusetts are Waste Ban Items[25]. There are no longer dedicated Waste Ban inspectors at MassDEP, and enforcement has been spotty at best. **No disposal facility should be expanded in Massachusetts until MassDEP reduces disposal by enforcing existing Waste Ban regulations.**

As recently as March of last year, MassDEP authorized Bourne to commence operations at the most recent landfill cell, Phase 5.[26] As opposed to seeking further expansions, Bourne should be actively reducing the amount of waste buried in the landfill.

Furthermore, expanding Bourne Landfill enables other facilities to shirk their responsibility to reduce solid waste disposal. For example, Bourne has contracted with SEMASS to accept ash generated from incinerating waste. SEMASS burned over 1.1 million tons of waste in 2016, producing more than 250,000 tons of ash.[27] **As can be seen from the chart below, which SEMASS submitted as part of a report to MassDEP in February of 2017, almost 80% of what SEMASS is burning could be recycled and composted.[28]** Rather than needing to bury 250,000 tons of ash, SEMASS would then only need to dispose of 50,000 tons of ash each year.

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[24] Section 19.017, 310 CMR 19.000

[25] Massachusetts Waste Bans as a Tool to Drive Waste Reduction, June 2016, MassDEP https://uszwbc.org/wpcontent/uploads/2016/06/Fischer-waste-ban-presentation-USZWBC-June-2016.pdf This excludes the commercial organics Waste Ban.

[26] NPC, Page 3.

[27] http://www.mass.gov/eea/docs/dep/recycle/solid/wcs16sem.pdf, page 2-1.

[28] Id. at 3-1.

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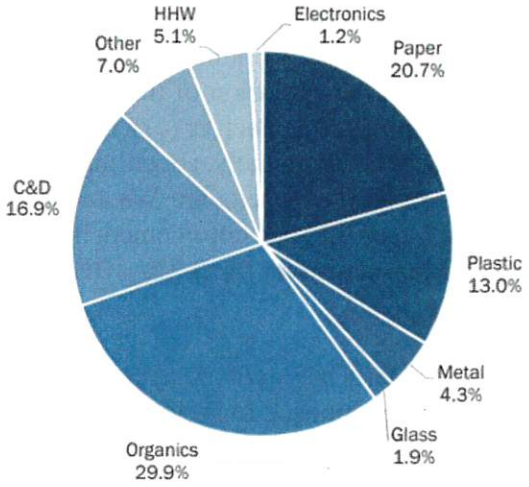
Figure 3-1 Overall Waste Composition by Material Group



Much of the waste burned at SEMASS – paper/cardboard, metal, glass, some plastic, some construction and demolition material, and some organics, are also Waste Ban Items. If the Waste Ban materials alone were diverted from the incinerator, SEMASS could burn at least 40% less, again, extending the life of the landfills where it buries its ash. See MSW Consultants, Covanta SEMASS 2016 Waste Characterization Study in Support of Class II Recycling Program (Feb. 13, 2017), http://www.mass.gov/eea/docs/dep/recycle/solid/wcs16sem.pdf.

Minimizing the ash and MSW going into the Bourne Landfill would extend its life and render expansion moot. For these reasons, we recommend that the Waste Bans be enforced, and comprehensive recycling and composting programs be instituted rather than expanding Bourne Landfill.

II. Dangers of Landfill Expansion

A. Incinerator Ash

Bourne's contract to accept ash from SEMASS runs through to the end of 2021, with options to extend.[29] As a result, if the Phase 6 expansion is permitted, 86% of the Facility's waste stream will continue to be comprised of toxic incinerator ash. Incinerator ash is dangerous to human health, public safety, and the environment.

[29] EIR, Page 11.

The incineration process produces two types of ash: fly ash from the air pollution control equipment, and bottom ash, which is the non-combustible residue remaining after combustion. Fly ash in particular has a high concentration of toxic compounds, and over the years has become more contaminated as improved air filtration equipment effectively removes more pollutants prior to emission. These toxic compounds include dioxins, which have been described as the most toxic chemicals known to mankind and are recognized human carcinogens. Heavy metals such as lead, which is known to cause cognitive and behavioral development in children, and mercury, which is known for impacts to the central nervous system, kidneys, and developing fetus, are also present in the ash. Other compounds and metals such as polychlorinated biphenyls ("PCBs"), polychlorinated naphthalenes ("PCNs"), cadmium, and arsenic have also been discovered in bottom and fly ash, all of which are known to be toxic to humans and animals. A collection of relevant health studies is provided, with links, in the "Exhibits" section at the end of this letter.

Ash generated by municipal solid waste incinerators constitutes hazardous waste, but EPA allows for the highly toxic fly ash to be mixed with lime and bottom ash prior to toxicity testing. Diluting the fly ash allows incinerators to avoid hazardous waste regulations, but the ash itself is no less dangerous – the same toxic chemicals are merely spread out over a larger volume of combined ash. Further, incineration increases the mobility and bioavailability of toxic metals compared with raw municipal waste. The potential for leaching is also greatest under acidic conditions, which occur when solid waste breaks down into organic acids. Given that the Bourne Facility was originally used for solid waste, soil acidification has likely already taken place and may continue to take place, increasing the risk of leaching.

The larger the Bourne Landfill is, the more dangerous, toxic incinerator ash it stores - permanently. For this reason, we oppose the expansion of the Bourne Landfill.

B. All Landfills Leak

In the 1950s, landfills, or sanitary dumps, were just holes in the ground where the waste was covered by a layer of soil to reduce odors and vermin. In the 1970s compacted soil and clay liners were proposed for waste containment.[30] This technology was ultimately abandoned as ineffective at preventing the leachate from escaping the landfill – a clay liner that is a foot thick will be breached in less than five years.[31]

In the 1980s landfills had begun installing plastic liners. However, plastic liners, or plastic sheeting flexible membrane liners, inevitably fail as well. Many times they develop holes during installation, and they develop holes and stress cracks over time. Free-radicals, permeability to low

[30] Overview of Subtitle D Landfill Design, Operation, Closure and Postclosure Care, January 2004Page 2. http://www.gfredlee.com/Landfills/LFoverviewMSW.pdf

[31] Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste, G. Fred Lee & Associates, Updated January 2015, Page 13.

molecular weights, and their inherent diffusion based qualities will also cause plastic liners to ultimately become non-functional.[32]

Over time, regulations evolved to require composite liner systems – originally in the form of a two-foot thick clay liner and a 60 mil-thick layer of plastic sheeting (about the thickness of paperboard). Today, landfill developers are using a geosynthetic clay liner as a substitute for clay. A geosynthetic clay liner is approximately a quarter of an inch thick. While there are pipes to collect the leachate and landfill gas buried in the waste, and a second liner system is now also required, the total thickness of the two liner systems may be a few inches.[33]

In 1991, the United States Environmental Protection Agency promulgated regulations for landfilling municipal solid waste ("MSW") as part of the Resource Conservation Recovery Act ("RCRA"), Subtitle D. Originally Subtitle D required a single composite (plastic sheeting and compacted clay/geosynthetic) liner, and it was eventually amended to require two liner systems for all new landfill cells.

The theory behind Subtitle D Landfills, or Dry Tomb Landfills, is to entomb the landfill in plastic sheeting, thereby keeping water away from the MSW. This was meant to minimize leachate production and the migration of that leachate through the soil and groundwater surrounding the landfill. In theory it also would minimize the production of landfill gas, especially methane, which, in order to form, requires the presence of water (see more below). Another goal of the regulations was to prevent offsite groundwater pollution by landfill leachate. Subtitle D mandated the collection of leachate from the landfill. Subtitle D also required a groundwater monitoring program whereby the extent of the inevitable groundwater pollution could be detected, and the polluted groundwater remediated (cleaned up) before it migrated to adjacent properties.

Unfortunately, the failure of these double composite liner systems is not only inevitable, it can be rapid. Rowe et al. (2003) tested the life of liner systems using a lagoon. They stated:

> A geomembrane – compacted clay composite liner system used to contain municipal solid waste (MSW) landfill leachate for 14 years is evaluated. Field observations of the geomembrane revealed many defects, including holes, patches, and cracks… Contaminant modelling of the entire lagoon liner suggests that the geomembrane liner most likely stopped being effective as a contaminant barrier to ionic species sometime between 0 and 4 years after the installation.[34]

While one or two composite liners may or may not delay the release of leachate into the environment, they do not prevent it.

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[32] Id. at 11.
[33] Id. at 10.
[34] Id. at 12, citing Rowe, R. K.; Sangam, H. P. and Lake, C. B., "Evaluation of an HDPE Geomembrane after 14 Years as a Leachate Lagoon Liner," Can. J. Geotech./Rev. Can. Geotech. 40(3): 536-550 (2003) (emphasis added). http://www.ingentaconnect.com/content/nrc/cgj/2003/00000040/00000003/art00004.

As acknowledged repeatedly by USEPA,[35] leachate generation potential will continue for thousands of years (landfills developed by the Roman Empire, 2,000 years ago are still producing leachate).[36] After the plastic cap is installed, and the landfill cell is closed, the landfill company is required under RCRA to monitor the site for 30 years. Unfortunately, the caps break down in the same manner as the plastic liners. As a result, the landfill company often walks away from the site, the cap fails, precipitation enters the landfill cell, and a whole new wave of leachate production begins, without the leachate collection or monitoring that took place while the cell was accepting waste.[37]

Dr. Lee reports that John Skinner, Executive Director of the Solid Waste Association of North America and former USEPA official was quoted in the July/August 2001 MSW Management Journal as saying:

> The problem with the dry-tomb approach to landfill design is that it leaves the waste in an active state for a very long period of time. If in the future there is a breach in the cap or a break in the liner and liquids enter the landfill, degradation would start and leachate and gas would be generated. Therefore, dry-tomb landfills need to be monitored and maintained for very long periods of time (some say perpetually), and someone needs to be responsible for stepping in and taking corrective action when a problem in detected.[38]

There is evidence that this has already begun at the Bourne Landfill. Fifty-one monitoring wells have been installed on-site and off-site to monitor the entire Facility and determine the vertical and horizontal extent of the impacts of contamination on groundwater. Bourne's reports state that:

> The nature of the groundwater contamination at the Facility is nitrates, volatile organic compounds and heavy metals. Historically, eight compounds (arsenic, cadmium, lead, benzene, 1,2-dichloroethane, 1,4-dichlorobenzene, naphthalene and vinyl chloride) have ben detected in groundwater samples at concentrations exceeding the GW-1 standards. Historically, four compounds (iron, manganese, total dissolved solids, and chloride) have been detected in groundwater samples at concentrations exceeding Secondary Maximum Contaminant Levels ("SMCL"). Sodium has been detected at concentrations exceeding the Massachusetts Drinking Water Guideline.[39]

As explained above, all landfill liners eventually leak. All landfills therefore release dangerous contaminants into the environment. This one has already begun to pollute the groundwater. For this reason, we oppose the expansion of the Bourne Landfill.

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[35] Flawed Technology of Subtitle D Landfilling of Municipal Solid Waste, G. Fred Lee & Associates, Updated January 2015, Page 6.
[36] Id. at Page 8.
[37] Id.
[38] Id.
[39] CSA, Page 5-6.

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C. Danger to ACEC & Wetlands

Areas of Critical Environmental Concern ("ACEC") are areas within the Commonwealth "where unique clusters of natural and human resource values exist, and which are worthy of a high level of concern and protection." 301 CMR 12.02. Nominations for ACECs are reviewed and designated by the state's EEA Secretary. Id. at 12.04 – 12.09. The Secretary considers nine factors in making his or her finding: threat to the public health through inappropriate use; quality of the natural characteristics; productivity; uniqueness of area; irreversibility of impact; imminence of threat to the resource; magnitude of impact; economic benefits; and supporting factors. Id. at 12.08.

The purpose of the designation process "is to determine if the nominated area is of regional, state, or national importance or contains significant ecological systems with critical interrelationships among a number of components. After designation, the aim is to preserve and restore these areas and all EOEEA [Executive Office of Energy and Environmental Affairs] agencies are directed to take actions with this in mind." Id. at 12.02. Accordingly, "[a]ll EOEEA agencies shall subject the projects of federal, state, and local agencies and private parties to the closest scrutiny to assure that the above standards are met for any action subject to their jurisdiction." Id. at 12.11(2).

The Massachusetts site assignment regulations, recognizing the significance of an ACEC designation, require that

> [n]o 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) . . . . ; 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.

310 CMR 16.40(4)(d). State wetlands protection regulations similarly afford heightened protections to ACECs. See 310 CMR 10.24.

The proposed expansion is very close to wetlands and an ACEC. As explained in Bourne's Final Comprehensive Site Assessment ("CSA"), Dated June 5, 2017:

> Environmental receptors downgradient of the Facility are the Back River Estuary-Area of Critical Environmental Concern (ACEC), Mill Pond and Eel Pong, and cranberry bogs. The ACEC is located less than 500 feet west of the Facility. The Back River estuarine system includes upstream freshwater wetlands within the drainage basin, Mashnee Island Dike and the adjacent waters of Phinney's harbor. Wetland habitat and species are located approximately 3000 feet west northwest of the Facility.[40]

As explained above, all landfills eventually leak. All landfills therefore release dangerous contaminants into the environment. This could have a detrimental impact on the ACEC and

[40] CSA, Page 4.

other wetland resources in the area. For this reason, we oppose the expansion of the Bourne Landfill.

D. Climate Resiliency

A study released in February 2016 indicates that sea levels along the Massachusetts coastline (and other areas of New England) are expected to continue rising and that sea level rise in our region will outpace other parts of the world.[41] The study found that while the global sea level rose by about 5.4 inches between 1900 and 2000, in Revere, the water rose 9.3 inches. Throughout New England and beyond, coastal management agencies and public officials are working diligently to identify and minimize environmental and public health risks associated with facilities and/or infrastructure that could be negatively impacted by climate change and sea level rise. Efforts to protect public health, the environment, and coastal infrastructure from impacts of climate change are also well underway in parts of the Cape Cod Watershed. The proposed expansion of the Bourne ISWM landfill in a highly vulnerable location is completely out of step with these efforts.

Given its location adjacent to the Back River Estuary, the Bourne ISWM Facility is extremely vulnerable to climate change impacts. Coastal impacts such as erosion from sea level rise, increasingly intense coastal storms, and damaging storm surge create a significant risk of toxic contamination from the landfill washing into the surrounding rivers and coastal wetlands.

The focus should be on how to effectively permanently close the landfill and protect the surrounding communities and environment, not on how to expand the landfill's capacity. For this reason, we oppose the expansion of the Bourne Landfill.

E. Air Pollution

i. Landfill Gas

Landfill Gas is produced by anaerobic bacteria (in the absence of air) which consume organic matter in the MSW. Landfill Gas is made up of methane (about 55%, flammable), carbon dioxide (45%), and small amounts of oxygen, nitrogen, and other dangerous gases like volatile organic compounds and hydrogen sulfide.[42] Landfill Gas is very dangerous, not only because it is flammable and has trace amounts of toxic gases, but because it migrates through soils, and accumulates in confined spaces.[43] It also can cause very strong odors. As such, it can cause asthma and other health problems.[44]

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[41] *See* Matt Rocheleau, *The seas are rising fast — and even faster in Mass.*, BOSTON GLOBE (Feb. 25, 2016), https://www.bostonglobe.com/metro/2016/02/25/sea-level-rise-here-was-quicker-century-than-elsewhere-and-that-bodes-ill-for-future/t7XOCWqGsnW1kPKH84W5BJ/story.html.

[42] Standard Permit Application for Solid Waste Management Facility, Volume 2, TLR_III South Area, dated May, 2017, Gas Monitoring Plan, TLR South Area, May 2017, Page 1.

[43] Id.

[44] https://ensia.com/features/methane-landfills/

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Methane is 28 times more potent a greenhouse gas than carbon dioxide. Landfills are the largest anthropomorphic source of methane, and it is significant. In 2014, U.S. landfills released about 163 million tons of CO2 equivalent of methane.[45] Considering the shorter life span of methane, reducing the methane from landfills, should be a priority.

It is impossible to know how much methane is produced by a landfill, or what percentage of it is captured in a flare or landfill gas to energy system (LFGTE). Kerry Kelly, senior director of federal affairs for Waste Management "says it's simply not possible to accurately assess methane leakage. "You can measure how much gas you're collecting. You can't measure how much gas the landfill actually generates," she said.[46]

Estimates by USEPA and scientists outside of the waste industry run from 10 to 90 percent gas capture over the life of the landfill – a large margin for error. The best practice is to prohibit all organics – food, textiles, paper and cardboard from the landfill. Only then will methane production be halted.

Bourne has landfill gas probed and gas flares. Flare is the primary pollution control device for mitigating emissions of LFG. The larger the landfill, and the more waste it accepts, especially organics, which make up more than half of MSW, the more methane it will produce and release into the environment. While much of the air pollution associated with this site is emitted at SEMASS, and Bourne has decreased the amount of MSW they are now accepting, MassDEP and Bourne should continue to work together to eliminate all food, yard waste, textiles, cardboard and paper from this facility. These materials, as explained above, should also not be burned at SEMASS. In this way, the existing capacity of the Bourne Landfill would be extended and pollution reduced.

In order to eliminate methane emissions, carbon based wastes should not be disposed of at the Bourne Landfill. For this reason, we oppose the expansion of the Bourne Landfill.

III. Conclusion

Expanding a facility that will negatively impact the public health of the region, negatively impact the environmental resources in the area, and have a negative impact on the economy and sustainability of all of New England is short-sighted, unwise, and irresponsible.

For the reasons stated above, among others, the signatories respectfully request that MassDEP deny this request to expand the Bourne ISWM Facility. Thank you for the opportunity to comment on this proposal and your attention to this matter.

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[45] https://ensia.com/features/methane-landfills/

[46] https://ensia.com/features/methane-landfills/

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Very truly yours,

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EXHIBITS

EXHIBIT 1: USGS SITE LOCUS MAP

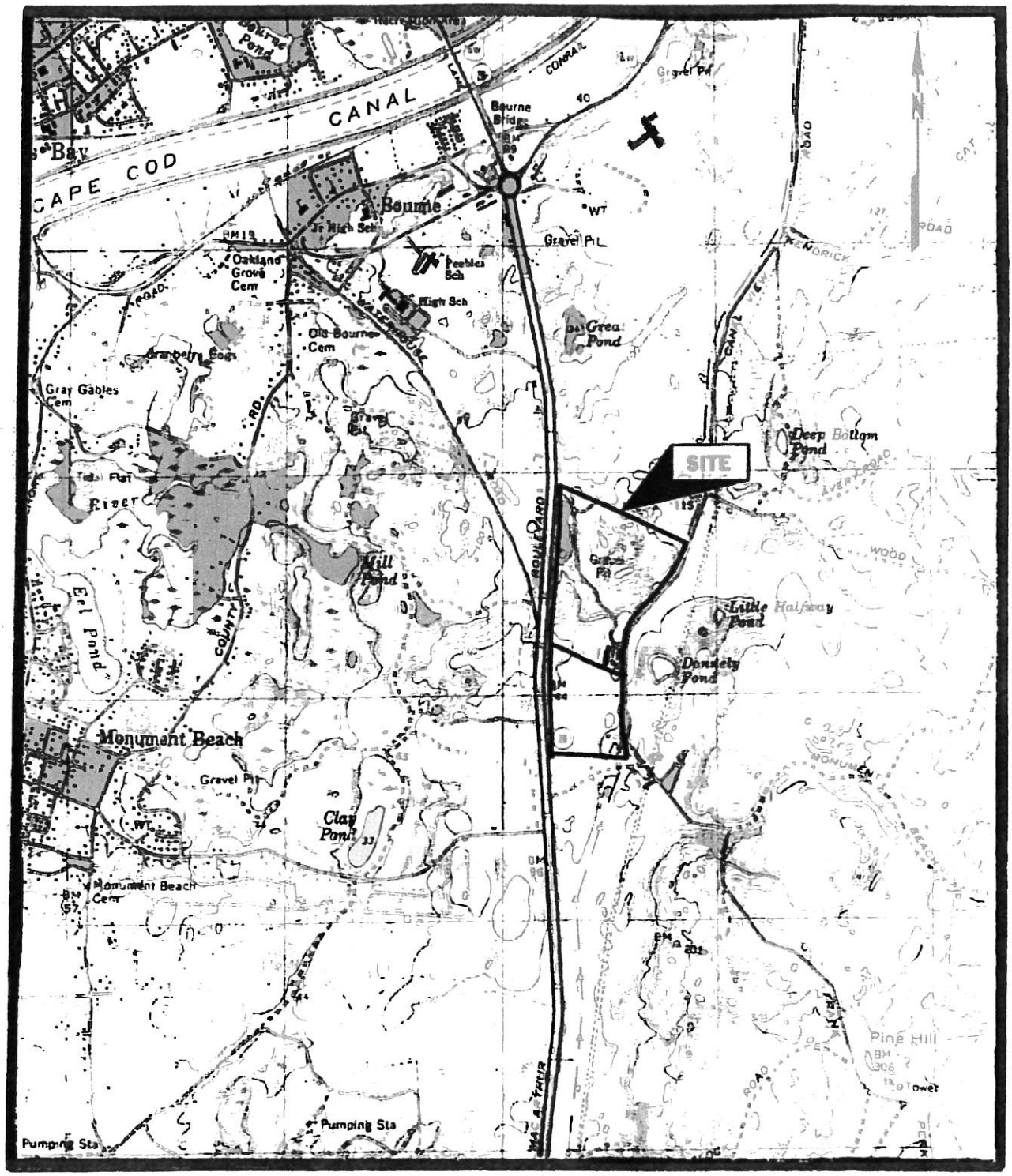
EXHIBIT 2: PHASE 6 LANDFILL DEVELOPMENT PLAN

EXHIBIT 3: MASSACHUSETTS AREAS OF CRITICAL ENVIRONMENTAL CONCERN MAP

EXHBIT 4: RELEVANT HEALTH STUDIES

EXHIBIT 1:

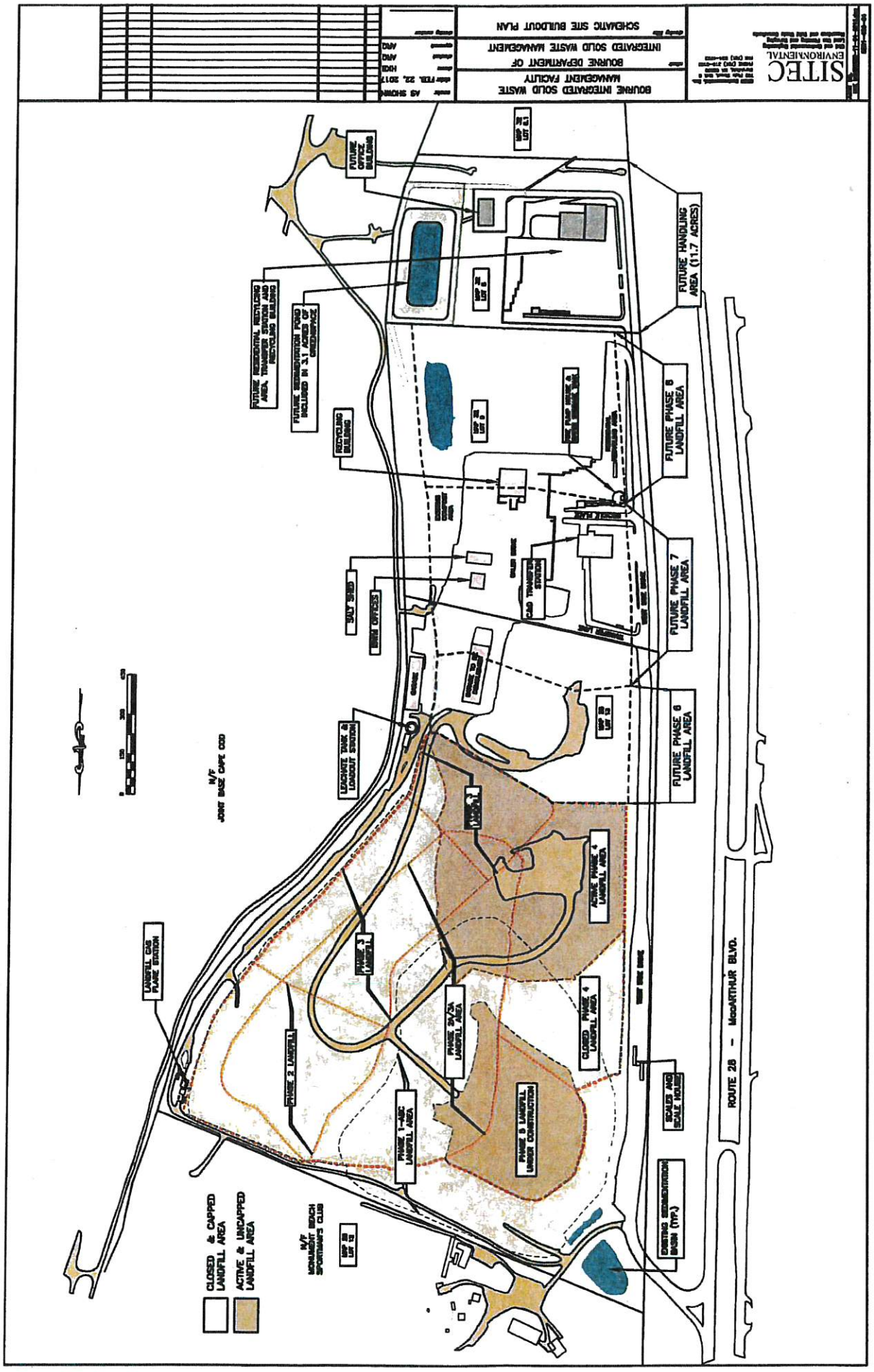
USGS SITE LOCUS MAP



SCALE 1:25,000
1 centimeter on the map represents
250 meters on the ground.
1 inch on the map represents
2,083 feet on the ground.
Contour Interval 10 feet

Town of Bourne
Bourne Landfill Expansion
Bourne, MA

EXHIBIT 2:


SCHEMATIC SITE BUILDOUT PLAN
INTEGRATED SOLID WASTE MANAGEMENT
BOURNE DEPARTMENT OF
BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY
SITEC ENVIRONMENTAL
FUTURE OFFICE BUILDING
FUTURE HANDLING AREA (11.7 ACRES)
FUTURE PHASE 8 LANDFILL AREA
FUTURE PHASE 7 LANDFILL AREA
FUTURE PHASE 6 LANDFILL AREA
RECYCLING BUILDING
SALT SHED
BRMI OFFICES
LEACHATE TANK & LOADOUT STATION
LANDFILL GAS FLARE STATION
PHASE 2 LANDFILL
PHASE 1—HDC LANDFILL AREA
PHASE 3/3A LANDFILL AREA
PHASE 5 LANDFILL UNDER CONSTRUCTION
ACTIVE PHASE 4 LANDFILL AREA
CLOSED PHASE 4 LANDFILL AREA
SCALES AND SCALE HOUSE
EXISTING SEDIMENTATION BASIN (TYP.)
ROUTE 28 - MacARTHUR BLVD.
N/F JOINT BASE CAPE COD
N/F MONUMENT BEACH SPORTSMAN'S CLUB
CLOSED & CAPPED LANDFILL AREA
ACTIVE & UNCAPPED LANDFILL AREA

Massachusetts Areas of Critical Environmental Concern (ACECs)

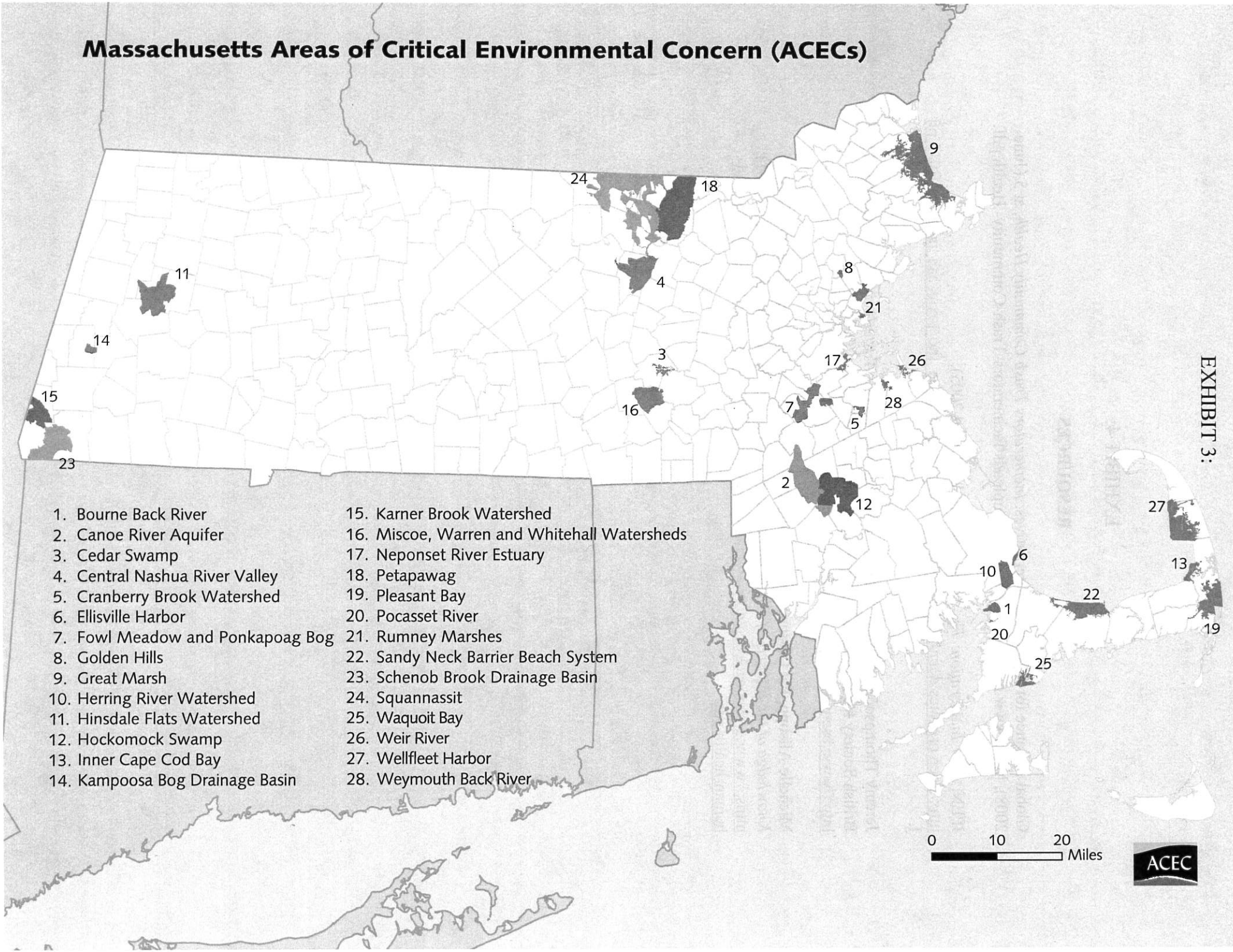


EXHIBIT 3:

EXHIBIT 4:

RESOURCES

Global Alliance for Incinerator Alternatives, *Incinerators Trash Community Health*, at 5 (June 2008), http://www.no-burn.org/wp-content/uploads/Incinerators-Trash-Community- Health.pdf.

IPEN, *After Incineration: The Toxic Ash Problem* (April 2005), http://ipen.org/sites/default/files/documents/After_incineration_the_toxic_ash_problem_2015.pdf.

Jeremy Thompson and Honor Anthony, *The Health Effects of Waste Incinerators*, Report of the British Society for Ecological Medicine, 2nd ed, at 42-44, (June 2008), http://www.bsem.org.uk/uploads/IncineratorReport_v3.pdf.

Michelle Allsopp, Pat Costner and Paul Johnston, *Incineration and Human Health: State of Knowledge of the Impacts of Waste Incinerators,* Greenpeace Research Laboratories (2001), https://www.greenpeace.org/norway/Global/norway/p2/other/report/2001/incineration-and-human-health.pdf.

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

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

July 16, 2018

Mr. Daniel Barrett
Bourne Department of Integrated Solid Waste Management
24 Perry Avenue
Buzzards Bay, MA 02532

RE: PERMIT APPROVAL
Application for: BWPSW26
AUTHORIZATION TO CONSTRUCT
LARGE LANDFILL EXPANSION
PHASE 6 LINED LANDFILL

AT: Bourne Integrated Solid Waste Management Facility
MacArthur Boulevard
Bourne, MA
Facility No. 39101 Regulated object No. 172356

Transmittal Number: X272912

Dear Mr. Barrett:

The Massachusetts Department of Environmental Protection, ("MassDEP"), has completed its review of the permit application ("Application") listed above in regard to the construction of Phase 6 Landfill area of the Bourne Sanitary Landfill ("Landfill") and determined the Application is administratively and technically complete. Accordingly, the Application to Construct the Phase 6 Landfill is approved with the conditions herein.

I. APPLICATION SUMMARY

The Application was prepared by Sitec Environmental, Inc. ("Sitec"), Marshfield, Massachusetts and electronically submitted on MassDEP's EIPAS system on April 20, 2018, on behalf of the Town of Bourne ("Town"). The Application consisted of a Notice with assigned Application number 18-SW26-000001, a Transmittal Form assigned No. X272912, a completed BWP-SW-26 application form, a set of 14 design drawings dated April 3, 2018, and a document entitled:

Transmittal X272912
BWP SW 26 - Application for Authorization to Construct
Phase 6 Landfill Expansion
Bourne Integrated Solid Waste Management Facility
Bourne, Massachusetts
April 3, 2018

Supplemental Application information was submitted on July 3, 2018, including a design change to the Phase 4, Phase 6 hydraulic connection.

II. APPLICATION REVIEW AND DECISION PROCESS:

The Application was submitted and reviewed pursuant to the provisions of 310 CMR 19.029(2): Applicable Permit Procedures and 310 CMR 19.033: Permit Procedure for an Application for a Permit Modification or Other Approval. According to these review procedures, MassDEP's decision regarding the proposed activities shall be either: a "Provisional Decision" pursuant to 310 CMR 19.033(4)(a); or a non-provisional decision pursuant to 310 CMR 19.033(4)(b). MassDEP has determined that non-provisional decision is appropriate for this Application.

MassDEP has reviewed the Application pursuant to 310 CMR 19.000: *Solid Waste Regulations*, 310 CMR 19.038: *Review Criteria for a New or Expanded Facility Permit or Permit Modification*; 310 CMR 19.041: *Authorization to Construct*, and MassDEP's *Landfill Technical Guidance Manual, May 1997* (the "Manual").

III. PROJECT BACKGROUND

The Landfill is owned and operated by the Town and is located off MacArthur Boulevard (Route 28) in Bourne, Massachusetts on a 74-acre parcel of land. Landfill operations conducted to date have proceeded in the following order: Phase1 Landfill (sub-phases A, B, C and D), Phase 2 Landfill, Phase 3 Landfill, Phase 2A/3A Landfill, and the currently active Phase 4 Landfill and Phase 5 Landfill areas. The proposed Phase 6 landfill The Phase 6 area will overlay existing landfill areas and expand onto an unlined area to the south of the existing Landfill operations area.

Other ongoing operations at the Landfill site include composting, recycling, and operation of a residential recycling and waste transfer area, and operation of a Construction and Demolition debris transfer station.

The Landfill is abutted to the north by the Monument Beach Sportsmen's Club; to the south by a 25-acre parcel that is used by ISWM for solid waste handling/transfer operations and soil stockpiling and beyond that woodland that has recently been acquired by the Town of Bourne; to the east by primarily undeveloped land on the Joint Base Cape Cod ("JBCC") facility; and to the west by Route 28 and commercial and residential properties on the opposite side of the highway.

Site Assignment

On June 16, 1972, the Bourne Board of Health issued a site assignment for a 74-acre site pursuant to Massachusetts General Laws, Chapter 111, Section 150A.

MEPA Review

Pursuant to the Massachusetts Environmental Policy Act ("MEPA") statute M.G.L. C. 30, S. 61-62H and regulations 301 CMR 11.00, a Final Environmental Impact Report ("FEIR") was prepared for the Landfill and a Certificate (EOEA #11333) of the Secretary of the Executive Office of Environmental Affairs ("formerly EOEA, currently EEA") was issued on November 29, 1999, stating that the FEIR adequately and properly complied with MEPA. The FEIR was prepared for the partial build-out of the Landfill including the processing, recycling, composting, and disposal aspects of the project at the anticipated maximum daily tonnage rate of 825 tons per day ("tpd").

In June 2003, ISWM submitted a Notice of Project Change ("NPC") to MEPA that requested that the landfill be allowed to accept municipal solid waste ("MSW") and municipal combustor ash ("MCA") for disposal. On August 7, 2003, the Secretary issued a Certificate which stated that no further MEPA review was required for this change.

ISWM submitted a NPC to the EEA on November 8, 2017, providing an update of the planned development for the entire site. Alternative development plans were described, including the "Preferred Phase 6" with potential further development of Phase 7 and Phase 8 landfill and the "No Further Build Phase 6" alternatives. The Secretary issued a Certificate on January 12, 2018 which determined that a Single Supplemental Environmental Impact Report ("SSEIR") was required. An SEIR dated May 9, 2018 was submitted to EEA and published in the Monitor on May 23, 2018 (EEA No. 11333). On June 29, 2018, the Secretary issued a Certificate on the SEIR and determined that the SEIR adequately and properly complies with MEPA and its implementing regulations.

ISWM will submit a future NPC to address development of Phase 7 and Phase 8 of the Landfill.

IV. Phase 6 Design Description

The Application details the design and construction of two alternatives for the Phase 6 Landfill. The Phase 6 area will overlay 4.9 acres of the southern sideslopes of the Phase 3, Stage 3 and Phase 4, Stage 2 Landfills as well as either 6.69 acres or 9.82 acres of new land located to the south of the existing Landfill operations area. The actual extent of liner construction will be dependent upon the development and approval of further landfill expansion (Phase 7) that is not a part of the current Application. If Phase 7 is not approved, Phase 6 will terminate with a southern side slope rising from the Landfill base elevation to existing grade level and encompass 9.82 acres. If proposed Phase 7 Landfill was approved, it would extend south from the limit of Phase 6. In order to maximize available air space capacity, the southern sideslope of Phase 6 would be excavated and lined as part of Phase 7, with Phase 6 operations (fill area) terminating to the north of this southern sideslope and encompass 6.69 acres. The alternative implemented will be based upon the status of Phase 7 permitting at the time of Phase 6 construction. Phase 7 will require MEPA review, modification of the existing site assignment for the on-site transfer station, and an Authorization to Construct permit.

The project will also include the construction of a 125,000 gallon, glass coated steel, above ground tank and truck load out structure, located adjacent to and south of the southwest corner of Phase 6 and interconnected to the existing leachate storage tank and force main system.

Phase 6 Landfill Disposal Volume

The construction of the preferred landfill expansion will add a minimum Phase 6 capacity of approximately 920,000 cubic yards (570 acre-feet) of gross air space capacity (including cover materials) to the Facility, to be followed by Phase 7 capacity. If the expansion of the Landfill is limited to Phase 6, the total air space generated by its build out capacity is approximately 1,670,000 cubic yards (1,050 acre-feet). The preferred alternative is designed to accommodate further site development into potential Phase 7 and Phase 8, which would yield another 3,830,00 cy of disposal capacity.

Pursuant to the March 30, 2017, Phase 5 Landfill Authorization to Operate permit (BWP SW 10, Transmittal No. X272125) the Landfill is permitted to operate seven days per week and accept an annual average of 600 tons per day of waste, with a maximum of 700 tons per day not to exceed 4,900 tons per week. Waste approved to be disposed at the Landfill includes municipal solid waste ("MSW"), residual C&D material, waste-to-energy incinerator ash, and other non-MSW material. The definition of non-MSW for the purpose of the landfill operating permit includes construction and demolition waste residuals from a C&D processing facility, bulky waste, difficult to manage waste, and other special wastes that have received prior written approval from MassDEP and only in accordance with MassDEP policy. The overall Facility tonnage, including recycling, composting, and disposal was approved at a maximum materials acceptance rate of 825 tons per day as established during the FEIR process.

The Landfill currently accepts combustion ash from the Covanta waste-to-energy facility located in Rochester, Massachusetts, which currently constitutes the majority of the waste material accepted at the Landfill. Assuming that all of the gross volume will be utilized by ash, which has an in-place density of approximately 2,000 pounds per cubic yard (1.0 ton per cubic yard), the Phase 6 Expansion will have a maximum disposal capacity of approximately 1,670,000 tons. Currently, the Facility is accepting ash for disposal and daily cover, at a rate of approximately 230,000 tons per year. At that rate the life expectancy of the Phase 6 Landfill will be about seven years, three months. Should the Phase 6 capacity be reduced to allow for the development of Phase 7, the life expectancy of the Phase 6 Landfill will be about four years. Should ash acceptance cease or decrease, the Landfill life will be dependent upon the rate of MSW acceptance.

Due to accepting waste combustion ash as its primary waste stream, the Landfill has recently experienced plugging of the leachate collection piping, including the force main to the storage tank. The Landfill's operators have determined that the chemical REDUX-300, is effective in keeping the leachate from coagulating and plugging the collection system. The design for the Phase 6 liner system includes a chemical injection system in the primary sump as detailed below.

Landfill Liner and Leachate Collection Systems

The Phase 6 Expansion area is generally located within an excavated valley area with steep side slopes (2.5:1 slope) along the perimeter. The liner system for the Phase 6 Landfill expansion will consist a new double composite liner system with leak detection that will be constructed over areas that have not previously been landfilled or lined and tied-in to the existing Phase 3, Stage 3 and Phase 4 Stage, 2 Landfill double composite liner systems.

The double composite liner system will include, from bottom to top:

- A subgrade layer placed where needed to provide structural support to the overlying liner system. The subgrade layer preparation work will include the excavation and grading of existing, in-situ soils, overlain by
- A low permeability soil layer comprised of 12 inches of compacted low permeability soil having a maximum in-place, saturated hydraulic conductivity of 1 x 10^{-7} centimeters per second. The project will be bid with the alternative of the low permeable soil layer being natural soils or an admixture of soil and sodium bentonite, overlain by
- A secondary geosynthetic clay liner ("GCL") fabricated of a layer of granular sodium bentonite encapsulated between two sheets of needle-punched geotextile will be placed above the low permeability layer. On side slopes greater than 4:1. (4'horizontal to 1 foot vertical), this layer will extend only to a height that is 5 feet vertically above areas with a slope of less than 4:1, overlain by
- A secondary geomembrane made of 60-mil thick textured high-density polyethylene ("HDPE") placed on top of the secondary GCL or low permeable soil and extend over the entire liner area, overlain by
- A bi-planar, geocomposite drainage layer, consisting of an HDPE geonet bonded on both sides with a non-woven geotextile, placed on the secondary geomembrane covering the entire liner area, overlain by
- A primary GCL placed above the geocomposite drainage layer covering the entire liner area, overlain by
- A primary geomembrane made of a 60-mil thick textured HDPE placed above the primary GCL covering the entire liner area, overlain by
- A primary drainage/protection layer placed above the primary geomembrane and will consist of an 18-inch thick layer of clean sand having a minimum hydraulic conductivity of 1 x 10^{-2} centimeters per second, covering the entire liner area.

Should the alternative admixture of soil and sodium bentonite be selected for liner construction, MassDEP is requiring that a detailed protocol be submitted for review and approval. (refer to Condition No. 3),

The Phase 6 Landfill liner will be connected to the existing Landfill liners by exposing the existing base liner materials as necessary to connect each element of the new liner system to the corresponding element of the existing liner system. All connections of the HDPE geomembranes will be completely welded along the entire length.

Groundwater elevations were determined using the existing network of groundwater monitoring wells installed throughout the site. The Phase 6 Landfill liner was designed to provide greater than 4 feet of vertical separation between the lowest point of the liner system (the low permeable soil layer in the leachate sump) and the maximum observed groundwater elevations.

Leachate Production

The Hydrologic Evaluation of Landfill Performance ("HELP") modeling program (version 3.07), developed by the U.S. Army Waterways Experiment Station for the USEPA was utilized to predict the performance of the proposed groundwater protection systems, leachate collection and

removal systems, and final cover configurations by performing a water balance analysis of the Landfill at varying stages of operations based on typical rainfall and the maximum day rainfall event for a 25 year, 24 hour (5.70 inch) storm event. The HELP Model was used to demonstrate conformance with MassDEP's performance standard of maintaining a depth of leachate of less than 12-inches above the primary geomembrane liner except during storm events and be designed to drop below one foot within seven days of the 25 year storm event.

Primary Leachate Collection System

The primary leachate collection system consists of the sand drainage layer and 6 inch diameter HDPE perforated pipes installed within the sand drainage layer leading to the leachate collection sump located along the toe of the western sideslope. The drainage pipes will be embedded in ¾ inch to 1-1/2 inch washed, round stone placed above a filter fabric to prevent damage to the primary geomembrane layer.

The Landfill liner system base is graded with shallow swales that radiate from the leachate collection sump, to promote leachate drainage in the sand layer to the collection piping. The primary leachate header piping is to be installed along the centerline of the swale areas at a 1.0% (0.01 ft/ft) minimum slope to direct leachate to the sump. Also there are lateral collection pipes located across the 2% liner base that connect to the header pipes. The lateral pipes are to be placed at a minimum slope of 0.5% and a maximum spacing of 60 feet.

In response to the plugging of leachate collection and transport lines due to the ash waste stream, the design for the Phase 6 liner system includes a chemical injection system. A series of perforated 1 inch diameter HDPE tubing will be installed along the collection header pipes and around the leachate sump area, which individually connect to solid wall pipes that run to the pump control panel area, where a chemical can be injected by a metering pump into each distribution line.

Secondary Leachate Collection System

The secondary leachate collection system will be installed between the primary and secondary liners to collect any leachate that leaks through the primary liner system and convey this leakage to the secondary leachate collection sump. The secondary leachate collection system will consist of bi-planar geocomposite drainage material and 4 inch diameter HDPE perforated pipes embedded in ¾ inch to 1-1/2 inch washed, round stone placed above a filter fabric to prevent damage to the secondary geomembrane layer. The collection pipes will be located in the center of the troughs constructed approximately twenty feet wide and one foot deep with 12% side slopes.

Notification Leakage Rates and Action Leakage Rates were established for the current Landfill operation and will be incorporated into the authorization to operate permit for the Phase 6 Landfill operation.

Leachate Sump

Leachate from both the primary and secondary leachate collection systems will flow to an internal sump located on the west side of the base liner area, where submersible pumps will lift and transport leachate to either of the aboveground leachate storage tanks. The pump units will

be supplied with liquid level sensors and controls and recording flow monitors. Both the primary and the secondary leachate collection system flow rate will be recorded so that leachate generation volumes can be monitored and liner leachate leakage rates can be calculated.

Perforated 24-inch diameter HDPE piping will be installed within the primary collection sump and the secondary sump. The 24-inch diameter pipes will transition to 18-inch diameter solid wall riser pipes that will extend up the side slope to the top of the perimeter waste containment berm. The submersible pump units, along with 3-inch diameter flexible discharge hose for the primary system and 2-inch diameter flexible hose for the secondary system, electrical and liquid level sensor leads will be inserted down the riser pipes and positioned within the sumps.

The pump discharge lines will be connected to the existing dual 4 inch force mains that are located along the western side line of the Landfill, which run to the existing leachate storage tank located to the east of the Phase 3, Stage 3 Landfill, and to a proposed new 125,000 gallon above ground storage tank, to be located south of the southwest corner of Phase 6.

The primary collection system pump unit will have a capacity of 130 gallons per minute ("gpm") or about 187,000 gallons per day ("gpd"), based on a peaking factor of 3 being applied to the calculated maximum daily leachate flow of approximately 62,245 gpd as determined by the HELP Model calculations . The secondary collection system pump unit will have a capacity of 40 gpm or about 57,600 gpd based on a peaking factor of 3 being applied to an assumed maximum secondary leachate (leakage) flow rate of 1,000 gpd per acre of landfill liner (18,700 gallons per day).

Phased Liner Construction

Phase 6 will be divided into at least two separate liner construction stages (Stage 1 and Stage 2 by the construction of a temporary berm that will allow for the phased construction of the Phase 6 liner and reduce the volume of leachate that is produced during the initial operating period of the Phase 6 Landfill. The berm will prevent leachate generated in the active stages from flowing across the liner into the inactive stages and will also prevent uncontaminated stormwater in the inactive stages from flowing into the leachate collection system of the active stages. MassDEP is requiring that a Construction Certification Report be submitted to MassDEP for each stage of construction prior to disposal of waste in the respective stage. (refer to Condition #8)

Stormwater Management System

Proposed Phase 6 landfilling operations will prevent stormwater run-off from areas outside the Phase 6 Landfill from draining into the Phase 6 Landfill area. This run-off will be diverted to the south to existing Stormwater Basin No. 2 located on the 25 acre parcel that is to the south of the Landfill parcel. Control of stormwater runoff along the western side of the Landfill area will be managed by existing facilities that discharge to Stormwater Basin No. 1, located in the northwest corner of the property. The design stormwater flow rates were analyzed for the stormwater retention basins utilizing HydroCAD Stormwater Modeling program, which utilizes the TR-20 method for run-off calculations.

Stormwater Basin No. 1 will provide about 585,400 cubic feet of storage, which exceeds the storage volume required to accommodate the run-off from a 25 year-24 hour storm event (approximately 235,700 cubic feet) and is sufficient for managing the stormwater run-off from a 100-year storm event (approximately 379,800 cubic feet of storage) or from back-to back rainfall events.

Stormwater Basin No. 2 will provide about 777,400 cubic feet of storage, which exceeds the storage volume required to accommodate the run-off from a 25 year-24 hour storm event (approximately 382,000 cubic feet) and is sufficient for managing the stormwater run-off from a 100-year storm event (approximately 551,700 cubic feet of storage) or from back-to back rainfall events.

Landfill Gas Collection System

Landfill gas generated at the Landfill is collected, treated, and combusted on-site. The existing landfill gas collection system is comprised of vertical gas extraction wells connected to a main header system.

A conceptual design for the management of gas generated within the Phase 6 Landfill was submitted and includes the installation of 24 vertical landfill gas extraction wells with a 100 foot radius of influence, two temporary horizontal landfill gas collectors, gas condensate traps, and associated header pipes and control valves. The design also includes the installation of a new 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 final details for construction of the horizontal collectors and their inter-connection to the existing landfill gas collection header pipe system will be submitted in a separate permit application prior to installation.

V. Approval With Conditions

MassDEP has determined that the Application is satisfactory and in accordance with the authority granted pursuant to Massachusetts General Laws, Chapter 111, Section 150A, hereby approves the Phase 6 Landfill construction subject to the following conditions.

1. Notification. The Town shall notify MassDEP in writing when the Phase 6 Landfill construction begins so that periodic inspections can be scheduled.

2. Health and Safety: The Town and their contractor(s) are responsible to ensure all necessary precautions are taken to protect the health and safety of workers and the general public during both construction and operation of the Landfill. A copy of the site-specific Health and Safety Plan for the construction of Phase 6 Landfill shall be submitted to MassDEP (for its files) prior to the beginning of any construction work which shall include protocols for monitoring of landfill gas (i.e. methane, hydrogen sulfide, etc.) as needed, protocols for modifying work practices if landfill gas is detected at levels deemed unsuitable. The Health and Safety Plan shall address, in detail, the

hazards posed by landfill gas and hydrogen sulfide and include protocols for entering utility vaults and other confined spaces by qualified workers.

3. Soil Sodium Bentonite Mixture Protocol: The Town has proposed the potential use of a soil/bentonite mixture for use in the liner system in lieu of natural low permeability soils. If this option is selected, the Town must submit, for MassDEP review and approval, a detailed protocol for: the testing of source materials, the mixing of materials, the methods and frequent testing of mixed materials, and the enhanced frequency of testing of placed materials. The protocols and follow-up testing must demonstrate that the available materials, mixing procedures and placement procedures result in a suitable 12 inch thick low permeability liner layer meeting all low permeability soil specifications.

4. Regulatory Compliance. The Town shall proceed with the Phase 6 Landfill construction in compliance with MassDEP regulations, requirements, MassDEP's Landfill Technical Guidance Manual, revised May 1997, or as specified by this permit. MassDEP shall be consulted prior to any deviations from the approved design. MassDEP may require a permit modification application for significant design modifications.

5. Standard Conditions. The Town shall comply with 310 CMR 19.130 *Operation and Maintenance Requirements* and 310 CMR 19.043 *Standard Conditions*, during the Phase 6 Landfill construction.

6. Nuisance Conditions. The Town shall keep odors, dust, erosion, noise or other nuisance conditions to a minimum during the construction process. In the event a nuisance condition develops, abatement measures shall be implemented immediately.

7. Stormwater Controls. The Town shall install perimeter silt-fence barriers and other stormwater and erosion control devices, including the containment berms and swales, at the Landfill prior to initiating construction activities. During construction, the Town shall ensure that the existing stormwater basins remain functional at all times.

8. Construction Certification. The Town shall submit a Construction Certification Report ("Report") to MassDEP in accordance with 310 CMR 19.107 upon completion of each stage of the Phase 6 Landfill construction prior to disposal of waste in the respective stage. The Report shall include as-built drawings, quality assurance/quality control data, and written certification from the supervising engineer demonstrating that the construction was performed in accordance with MassDEP regulations, requirements, the Manual, and the approved design. The Town should review the Manual, Table 2-2, "Elements of Construction Documentation Report" and Chapter 2 Section IV. C regarding FML certification.

9. Authorization to Operate. The Town shall submit a BWP SW 10, Authorization to Operate ("ATO") permit application to MassDEP for review and approval in accordance with 310 CMR 19.042 prior to beginning operations in each stage of Phase 6 Landfill. At a minimum, the ATO permit application must include the Certification Report, proof that

appropriate financial assurance has been secured in accordance with 310 CMR 19.051, and proof of receipt of all applicable state, local and federal permits for the facility.

VI. Permit Limitations

The issuance of this conditional approval is limited to the construction of Phase 6 Landfill and does not relieve the Town from the responsibility to comply with all other regulatory or permitting requirements. MassDEP reserves all rights to suspend, modify or rescind this permit, should the conditions of this permit not be met, should the Landfill create nuisance conditions or threats to public health, safety or the environment.

VII. Right to Appeal

This approval has been issued pursuant to M.G.L. Chapter 111, Section 150A, and 310 CMR 19.033: Permit Procedure for an Application for a Permit Modification or Other Approval, of the "Solid Waste Management Regulations". Pursuant to 310 CMR 19.033(5), any person aggrieved by the final permit decision, except as provided for under 310 CMR 19.033(4)(b), may file an appeal for judicial review of said decision in accordance with the provisions of M.G.L. Chapter 111, Section 150A and M.G.L. Chapter 30A no later than thirty days of issuance of the final permit decision to the applicant. The standing of a person to file an appeal and the procedures for filing such an appeal shall be governed by the provisions of M.G.L. c. 30A. Unless the person requesting an appeal requests and is granted a stay of the terms and conditions of the permit by a court of competent jurisdiction, the permit decision shall be effective in accordance with the terms of 310 CMR 19.033(3).

Notice of Appeal: Any aggrieved person intending to appeal a final permit decision to the Superior Court shall first provide notice of intention to commence such action. Said notices of intention shall include MassDEP Transmittal No. X272912 and shall identify with particularity the issues and reason why it is believed the final permit decision was not proper. Such notice shall be provided to the Office of General Counsel of MassDEP and the Regional Director for the regional office which processed the permit application, if applicable at least five days prior to filing of an appeal. The appropriate addresses to send such notices are:

Office of General Counsel
Department of Environmental Protection
One Winter Street
Boston, MA 02108

Regional Director
Department of Environmental Protection
20 Riverside Drive
Lakeville, MA 02347

No allegation shall be made in any judicial appeal of a final permit decision unless the matter complained of was raised at the appropriate point in the administrative review procedures established in 310 CMR 19.000, provided that a matter may be raised upon showing that it is material and that it was not reasonably possible with due diligence to have been raised during such procedures or that matter sought to be raised is of critical importance to the environmental impact of the permitted activity.

If you have any questions or comments regarding this approval letter, feel free to contact me at (508) 946-2847 or Dan Connick at (508) 946-2884 or at the letterhead address.

Very truly yours,

Mark Dakers

Mark Dakers, Chief
Bureau of Air and Waste
Solid Waste Management Section

D/DC
P:\A-B\Bourne\Phase 6\Phase 6 ATC.doc

cc: Board of Selectmen
24 Perry Avenue
Buzzards Bay, Massachusetts 02532

Bourne Department of Public Works
24 Perry Avenue
Buzzards Bay, MA 02532

ec: Bourne Board of Health
TGuarino@townofbourne.com

Bourne Integrated Solid Waste Management
pgoddard@townofbourne.com

Cape Cod Commission
jidman@capecodcommission.org

Sitec Environmental, Inc.
rquinn@sitec-engineering.com

DEP-BOSTON
ATTN: R. Blanchet

DEP – SERO
ATTN: M. Pinaud
M. Dakers

CAPE COD COMMISSION

3225 MAIN STREET
P.O. BOX 226
BARNSTABLE, MA 02630
(508) 362-3828
FAX (508) 362-3136
E-mail: frontdesk@capecodcommission.org

FILE COPY

Final Certificate of Compliance

DATE: May 6, 2008

TO: Brent T. Goins, General Manager
Department of Integrated Solid Waste Management
24 Perry Avenue
Buzzards Bay, MA 02532

FROM: Cape Cod Commission

PROJECT: Integrated Solid Waste Management Facility
DRI # 97031

PROJECT LOCATION: 210 MacArthur Boulevard, Bourne, MA

OWNER: Town of Bourne
C/o Board of Selectmen
24 Perry Avenue
Buzzards Bay, MA 02532

BOOK/PAGE: Book 1351 Pages 456 & 457

Description of Certificate of Compliance

I hereby certify that the Board of Selectmen, on behalf of the Town of Bourne, Applicant on the above-referenced project, has properly complied with the conditions noted below of the Cape Cod Commission's (Commission) February 17, 2000 Development of Regional Impact (DRI) decision, as modified by decisions dated August 21, 2001, March 4, 2004 and April 30, 2007.

The Applicant has complied with conditions G8, G10, Trans-2, CC2, WR1, WR2, WR3, WR4 and WR5 of the February 17, 2000 DRI decision as modified.

As detailed in Finding WR3 of the March 4, 2004 modification decision, the quality of groundwater down gradient from the landfill will continue to be monitored through 2008. Following joint review of the monitoring results by ISWMF and Commission staff, a joint determination by ISWMF and Commission staff will be made regarding the potential

value of further monitoring.

Issuance of the Final Certificate of Compliance

As regards requirements set forth by the Cape Cod Commission, the Town of Bourne has satisfied conditions in order for a Final Certificate of Compliance to be issued.

Paul Niedzwiecki, Executive Director

5/6/08
Date

COMMONWEALTH OF MASSACHUSETTS

Barnstable, ss 5/6, 2008

Before me, the undersigned notary public, personally appeared Paul Niedzwiecki, in his capacity as Executive Director of the Cape Cod Commission, whose name is signed on the preceding document, and such person acknowledged to me that he signed such document voluntarily for its stated purpose. The identity of such person was proved to me through satisfactory evidence of identification, which was personal knowledge of the undersigned.

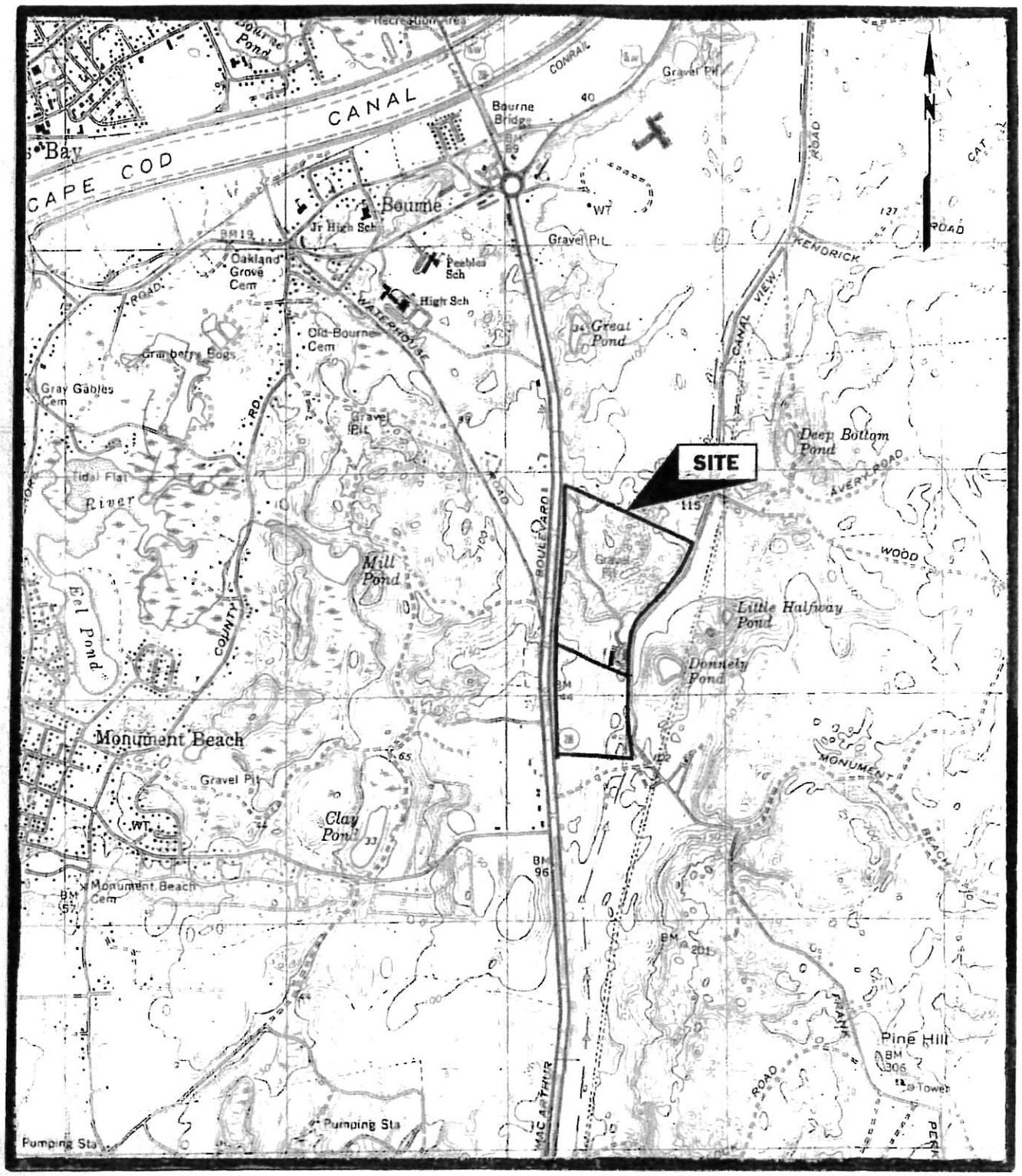
Gail P. Hanley
Notary Public

My Commission Expires:
10/13/11

ATTACHMENT 2

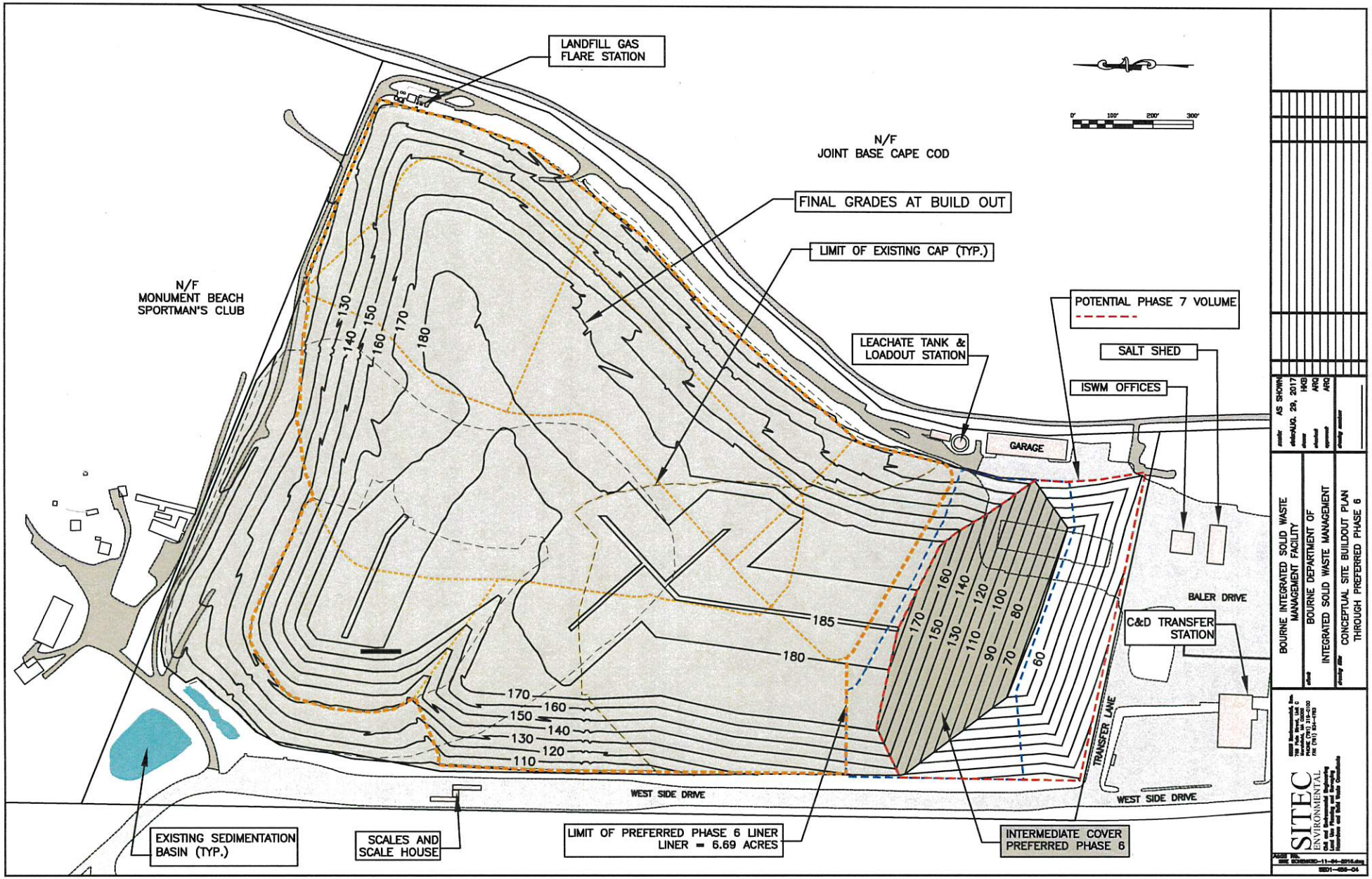
SITE LOCUS
PHASE 6 LANDFILL DEVELOPMENT PLANS
CHAPTER 223 OF THE ACTS OF 2016
EASEMENT PLAN OF LAND

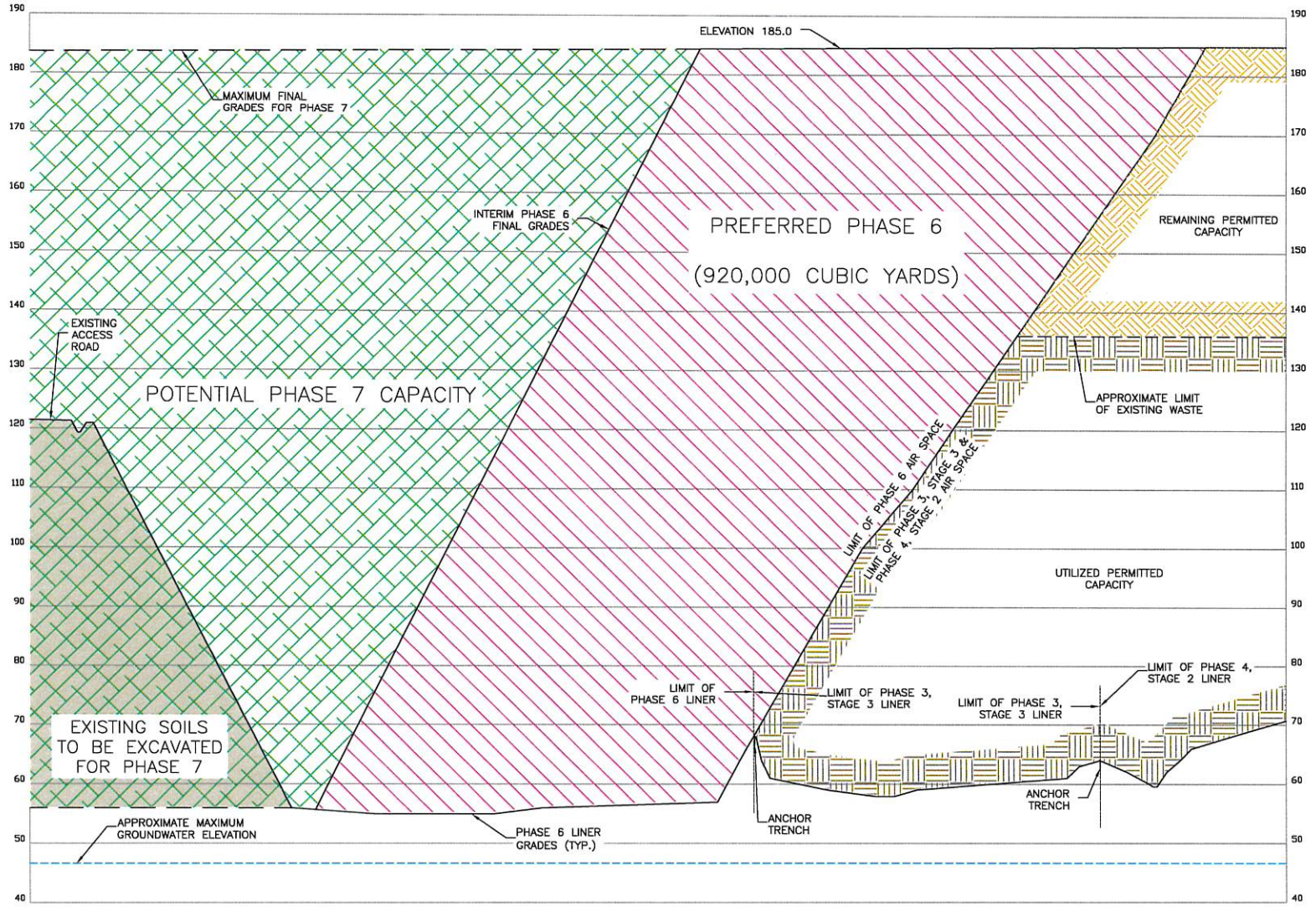
USGS SITE LOCUS MAP



Town of Bourne
Bourne Landfill Expansion
Bourne, MA

SCALE 1:25,000
1 centimeter on the map represents
250 meters on the ground.
1 inch on the map represents
2,083 feet on the ground.
Contour Interval 10 feet


LANDFILL GAS FLARE STATION
N/F JOINT BASE CAPE COD
FINAL GRADES AT BUILD OUT
LIMIT OF EXISTING CAP (TYP.)
N/F MONUMENT BEACH SPORTMAN'S CLUB
POTENTIAL PHASE 7 VOLUME
LEACHATE TANK & LOADOUT STATION
SALT SHED
ISWM OFFICES
GARAGE
BALER DRIVE
C&D TRANSFER STATION
TRANSFER LANE
WEST SIDE DRIVE
WEST SIDE DRIVE
EXISTING SEDIMENTATION BASIN (TYP.)
SCALES AND SCALE HOUSE
LIMIT OF PREFERRED PHASE 6 LINER
LINER = 6.69 ACRES
INTERMEDIATE COVER PREFERRED PHASE 6
0' 100' 200' 300'
BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY
BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT
CONCEPTUAL SITE BUILDOUT PLAN THROUGH PREFERRED PHASE 6
SITEC ENVIRONMENTAL



scale: AS SHOWN
date: JULY 27, 2017
drawn: ARQ
checked: ARQ
approved:
drawing number:

project: BOURNE LANDFILL PHASE 6 LANDFILL EXPANSION

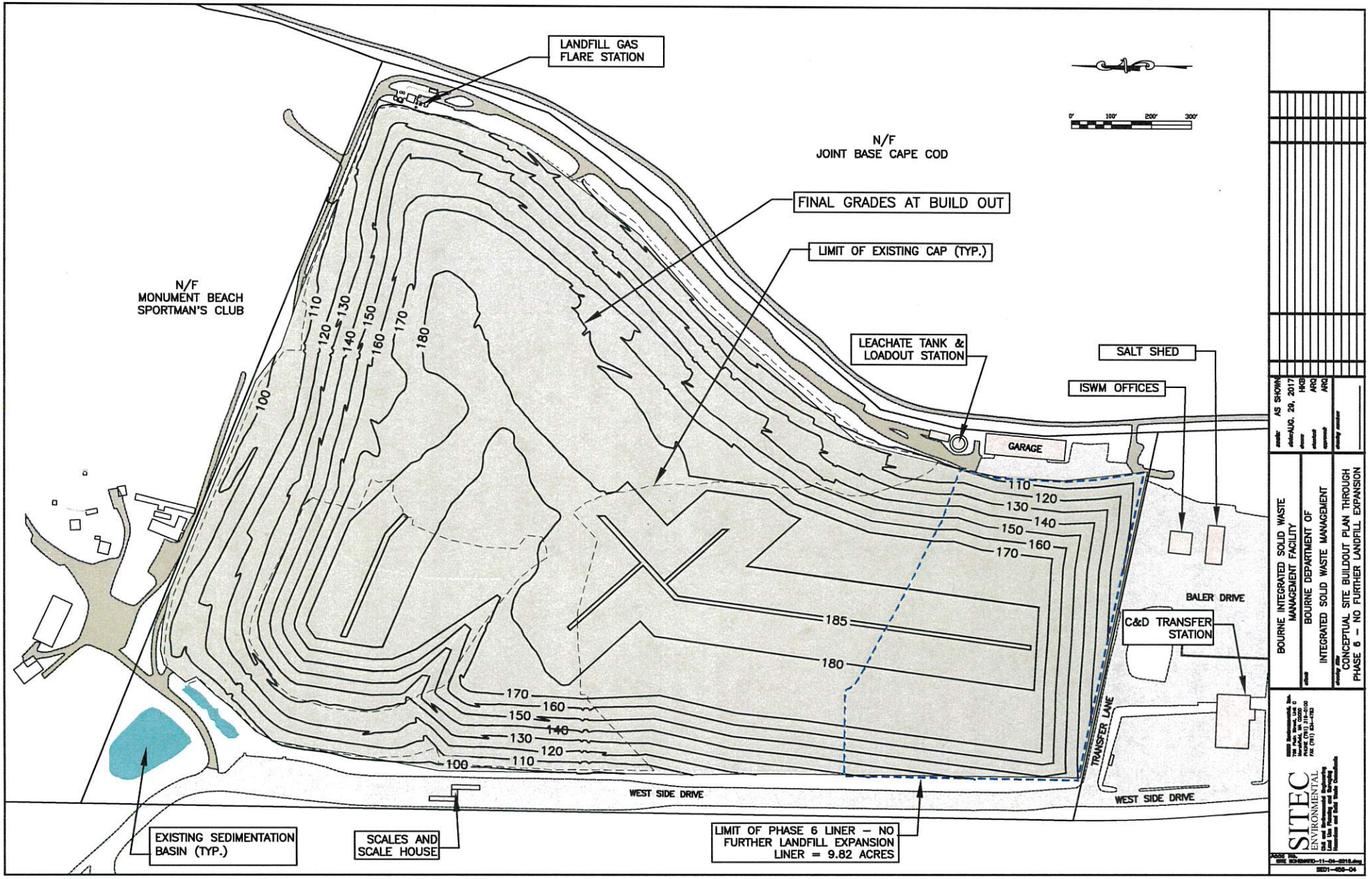
client: TOWN OF BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

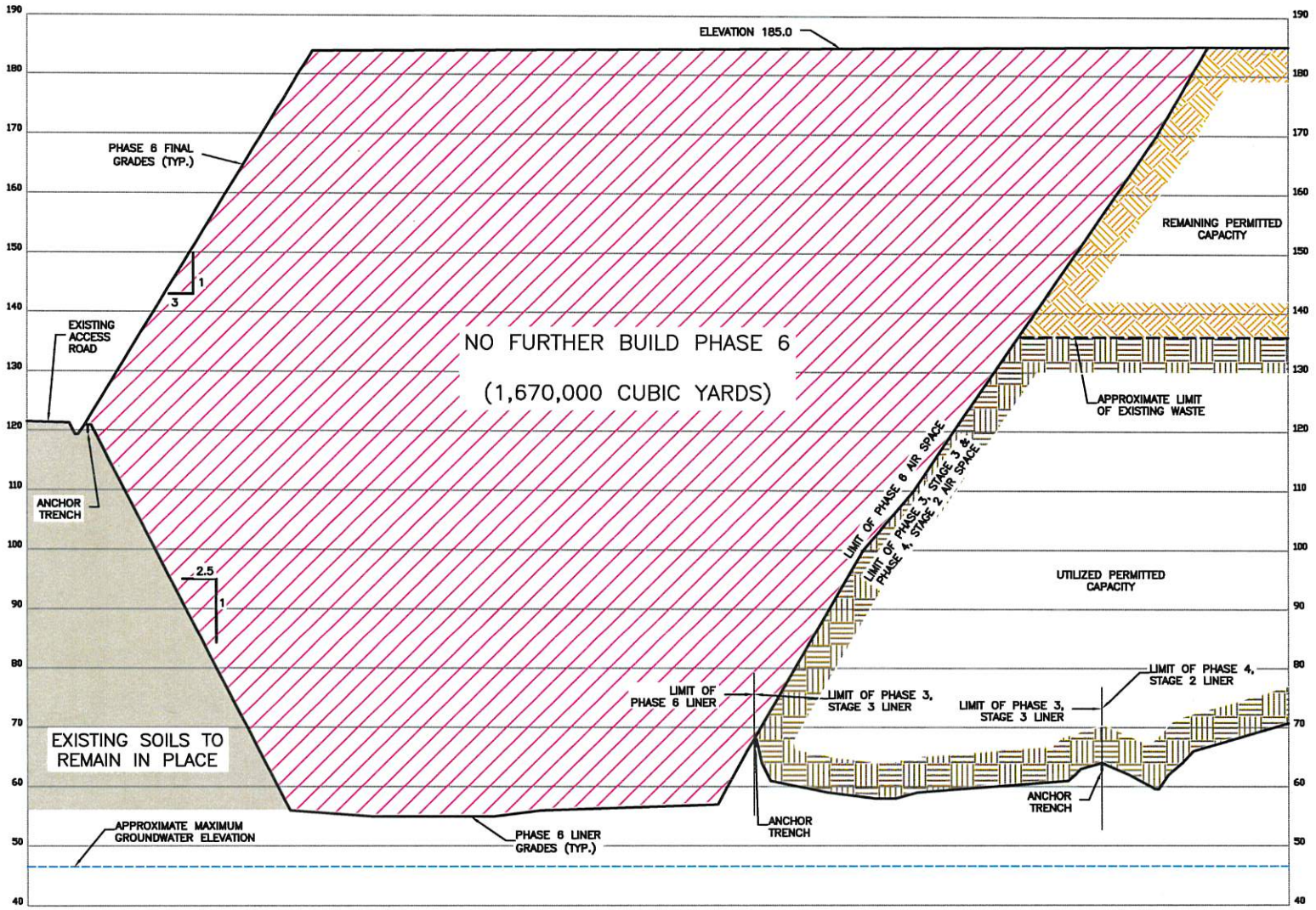
drawing title: ALTERNATIVE PHASE 6 BUILDOUT PROFILES PREFERRED PHASE 6

SITEC ENVIRONMENTAL

SITEC Environmental, Inc.
Civil and Environmental Engineering
Landfill Design and Permitting
Hazardous and Solid Waste Consultants

Acad No. PHASE 6 CONCEPT.dwg
SE01-456-11


LANDFILL GAS FLARE STATION
N/F
JOINT BASE CAPE COD
FINAL GRADES AT BUILD OUT
LIMIT OF EXISTING CAP (TYP.)
N/F
MONUMENT BEACH
SPORTMAN'S CLUB
LEACHATE TANK & LOADOUT STATION
SALT SHED
ISWM OFFICES
GARAGE
BALER DRIVE
C&D TRANSFER STATION
TRANSFER LANE
WEST SIDE DRIVE
WEST SIDE DRIVE
EXISTING SEDIMENTATION BASIN (TYP.)
SCALES AND SCALE HOUSE
LIMIT OF PHASE 6 LINER – NO FURTHER LANDFILL EXPANSION LINER = 9.82 ACRES
100
110
120
130
140
150
160
170
180
185
0'
100'
200'
300'
BOURNE INTEGRATED SOLID WASTE MANAGEMENT FACILITY
BOURNE DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT
CONCEPTUAL SITE BUILDOUT PLAN THROUGH PHASE 6 – NO FURTHER LANDFILL EXPANSION
SITEC ENVIRONMENTAL



project: BOURNE LANDFILL
PHASE 6 LANDFILL EXPANSION

client: TOWN OF BOURNE
DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT

drawing title: ALTERNATIVE PHASE 6 BUILDOUT PROFILES
NO FURTHER BUILD PHASE 6

scale: AS SHOWN
date: JULY 27, 2017
drawn: ARQ
checked: ARQ
approved: ARQ
drawing number:

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

PHASE 6 CONCEPT.dwg
22071-009-11

H 4516

Chapter 223
of the Acts of 2016

THE COMMONWEALTH OF MASSACHUSETTS

In the One Hundred and Eighty-Ninth General Court

AN ACT AUTHORIZING THE DEPARTMENT OF FISH AND GAME TO GRANT AN EASEMENT TO THE TOWN OF BOURNE IN EXCHANGE FOR A CONSERVATION RESTRICTION ON TOWN LAND.

Whereas, The deferred operation of this act would tend to defeat its purpose, which is to authorize forthwith the grant of an easement to the town of Bourne to allow the town to connect an effluent pipe to an existing wastewater treatment system on the Upper Cape Water Supply Reserve, therefore it is hereby declared to be an emergency law, necessary for the immediate preservation of the public convenience.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

SECTION 1. Notwithstanding chapter 30B of the General Laws and sections 32 to 38, inclusive, of chapter 7C of the General Laws or any other general or special law to the contrary, the division of fisheries and wildlife in the department of fish and game may grant to the town of Bourne an easement on land under its care and control on the Upper Cape Water Supply Reserve for the town to construct, operate and maintain a town-owned effluent pipe to connect to an adjoining force main of an existing wastewater treatment system on the reserve, owned by the Air National Guard. The easement area on the reserve is shown on a plan of land entitled "Easement Plan of Land in Bourne, MA," prepared by SITEC and dated June 30, 2016, which plan is on file with the department.

SECTION 2. In consideration of and as a condition for the grant of the easement authorized in section 1, the town of Bourne may grant to the department of fish and game a conservation restriction on 2 parcels of land owned by the town and recorded in the Barnstable county registry of deeds at book 20587, page 279 and book 20587, page 288, located on the easterly side of Head of Bay road in the Buzzards Bay section of the town of Bourne.

SECTION 3. The costs and expenses associated with the transactions authorized by this act, including engineering, survey, recording, appraisals and other professional services shall be borne by the town of Bourne.

SECTION 4. The department of fish and game shall submit a report on the transactions authorized in this act to the inspector general for review and comment. Within 15 days following submittal, the inspector general shall file a report with the commissioner of fish and game, the house and senate committees on ways and means and the senate and house committees on bonding, capital expenditures and state assets.

H 4516

House of Representatives, July 31, 2016.

Preamble adopted, Speaker.

In Senate, July 31, 2016.

Preamble adopted, , President.

House of Representatives, July 31, 2016.

Bill passed to be enacted, Acting Speaker.

In Senate, July , 2016.

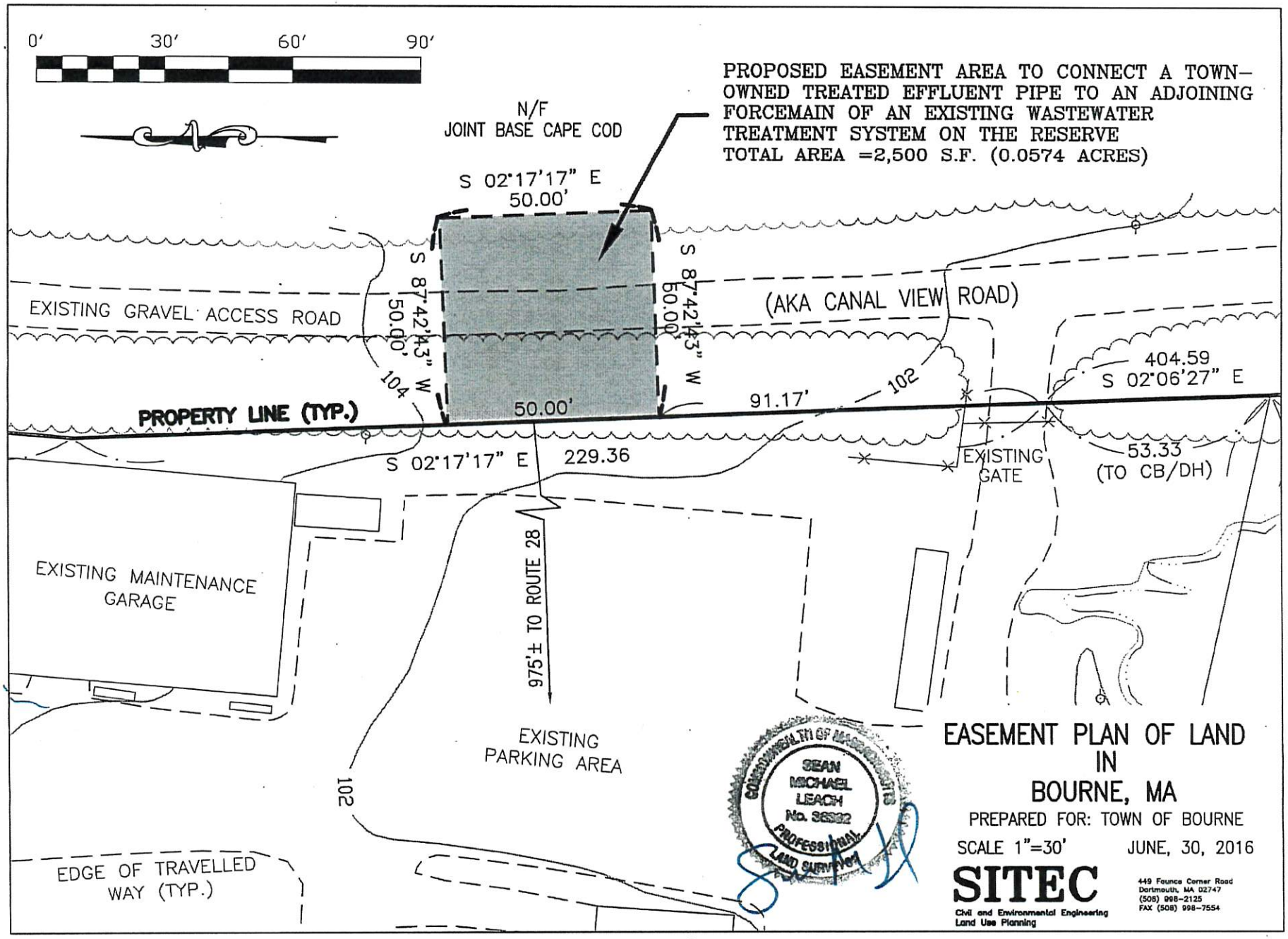
Bill passed to be enacted, , President.

August 10, 2016.

Approved,

at 4 o'clock and 41 minutes, P. M.

Governor.


0'
30'
60'
90'
PROPOSED EASEMENT AREA TO CONNECT A TOWN-OWNED TREATED EFFLUENT PIPE TO AN ADJOINING FORCEMAIN OF AN EXISTING WASTEWATER TREATMENT SYSTEM ON THE RESERVE
TOTAL AREA =2,500 S.F. (0.0574 ACRES)
N/F
JOINT BASE CAPE COD
S 02°17'17" E
50.00'
S 87°42'43" W
50.00'
S 87°42'43" W
50.00'
EXISTING GRAVEL ACCESS ROAD
(AKA CANAL VIEW ROAD)
404.59
S 02°06'27" E
PROPERTY LINE (TYP.)
104
50.00'
91.17'
102
S 02°17'17" E
229.36
EXISTING GATE
53.33
(TO CB/DH)
EXISTING MAINTENANCE GARAGE
975'± TO ROUTE 28
EXISTING PARKING AREA
102
EDGE OF TRAVELLED WAY (TYP.)
COMMONWEALTH OF MASSACHUSETTS
SEAN MICHAEL LEACH
No. 38382
PROFESSIONAL LAND SURVEYOR
EASEMENT PLAN OF LAND
IN
BOURNE, MA
PREPARED FOR: TOWN OF BOURNE
SCALE 1"=30'
JUNE, 30, 2016
SITEC
Civil and Environmental Engineering
Land Use Planning
449 Faunce Corner Road
Dartmouth, MA 02747
(508) 998-2125
FAX (508) 998-7554

ATTACHMENT 3

STORMWATER MANAGEMENT PLAN
EPA NPDES CGP FLOW CHART

STORMWATER MANAGEMENT PLAN
PHASE 6 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

August 9, 2018

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STORMWATER MANAGEMENT PLAN
PHASE 6 LANDFILL EXPANSION

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 Phase 6 Landfill Expansion at the Bourne Landfill located in Bourne, Massachusetts. The proposed expansion is located on the southerly portion of the Landfill property. The total footprint of the filled area will encompass approximately 14.7 acres, which overlays both previously lined and landfilled areas and areas not previously lined or landfilled. The area (9.8 acres) that has not previously been landfilled will be lined. The area (4.9 acres) that has been previously lined and landfilled, overlays portions of the Phase 3, Stage 3 and Phase 4, Stage 2 Landfills. The actual extent of liner construction that will be conducted as part of the Phase 6 Landfill Expansion is dependant on the development and approval of further landfill expansion (Phase 7 and Phase 8) that are not a part of this SMP, but are considered in the overall plan for the facility. As later discussed, future Phase 7 and Phase 8 Landfills will extend south from the limit of Phase 6. In order to maximize available air space capacity, the southern sideslope of Phase 6 would be excavated and lined as part of Phase 7, with Phase 6 operations (fill area) terminating to the north of this southern sideslope. If Phase 6 is to be built out to its extent without further development of Phase 7 and Phase 8, the available volume for Phase 6 would be approximately 1,670,000 cubic yards. If the Phase 6 operations extend to the limit of the development of Phase 7, the available volume associated with Phase 6 will be 920,000 cubic yards, with the difference being incorporated into the operating volume of Phase 7.

2.0 STORMWATER MANAGEMENT SYSTEM

2.1 General

The Phase 6 expansion is proposed for construction over the southern sideslopes of the Phase 3, Stage 3 and Phase 4, Stage 2 Landfills and the area to the south of those two landfill cells, which has not previously been landfilled. The area that is to be incorporated into Phase 6, and has not previously been used for landfilling, has been a large catchment area for stormwater run-off from the southern sideslope areas, as well as the capped and closed eastern sideslope and plateau areas of the Phase 2, Phase 3 and Phase 2A/3A Landfills. This catchment area had formerly been designated as Stormwater Basin No. 3. The runoff from the capped and closed eastern sideslope and plateau areas haS been diverted by the construction of a drainage interceptor along the eastern toe of slope of both the existing and proposed landfill areas.

The proposed Phase 6 Landfill design and operations will prevent stormwater run-off from areas outside the Phase 6 Landfill from draining into the Phase 6 Landfill area. This SMP includes the

diversion of runoff, that formerly discharged to the area that is to become part of the Phase 6 Landfill (Stormwater Basin No. 3), to the south and to an existing sedimentation pond (Stormwater Basin No. 2) located on the 25-acre parcel that is to the south of the landfill parcel. This diversion has been accomplished by the construction of an interceptor drain line located to the east of the toe of the existing and proposed landfill areas. The existing Sedimentation Basin No. 2 will be improved and maintained by further grading work. Future development of Phase 7 and Phase 8 will result in the abandonment of Sedimentation Basin No. 2, the extension of the drainage interceptor 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. 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.

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 have been out of service for over twenty years and quarterly groundwater monitoring has shown a consistent improvement in groundwater quality, downgradient from the former lagoon's locations.

The following sections describe the proposed stormwater management controls including the two stormwater retention basins implemented in the SWP. The attached Drainage Areas sketch in Appendix 1 presents the drainage areas that will contribute to each of the retention basins. The design 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 and graphs for each drainage area and control structure. The complete Stormwater Calculations are attached 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 receives stormwater runoff from the westerly sideslopes and the plateau areas of the Phase 1ABC, Phase 2A/3A, Phase 4 and Phase 5 Landfills and the northerly sideslopes of the Phase 2 and Phase 2A/3A Landfills. Stormwater run-off from the site's access road areas also drain into Stormwater Basin No. 1. The Drainage Areas sketch included in Appendix 1 shows the contributing area from the Phase 6 No Further Expansion scenario that will discharge to this retention pond. The construction of the Phase 6 Landfill 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

Stormwater Basin No. 3, after the Phase 6 Landfill has reached its 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 grading of Phase 6. A perimeter drainage channel, or swale, was constructed along the western toe of the Phase 4 sideslope and most of the Phase 6 area, as part of the Phase 4 site construction work and will be extended as part of the Phase 6 construction. The drainage channel conveys, along with a series of water quality swales that cross the closed sideslopes and let-down channels, stormwater run-off from the tributary areas to the expanded Stormwater Basin No. 1.

Stormwater Basin No. 1 has been designed to accommodate the run-off from the 25 year-24 hour rainfall event. 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 area, according to the Massachusetts Stormwater Handbook (Volume 3, Table 2.3.3). Basin No. 1 provides approximately 585,400 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 235,700 cubic feet, with the build out of the Phase 6 Landfill. This basin will also accommodate the run-off from greater magnitude storms (a 100-year storm will require approximately 379,800 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 the 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

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. As discussed above, 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.

As it is currently configured, Stormwater Basin No. 2 has 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 777,400 cubic feet of storage capacity from the bottom of the basin at elevation 80 to the top of the basin, which is at elevation 100. The available capacity within the basin greatly 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 382,000 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 551,700 cubic feet of storage) or from back-to-back rainfall events and for the containment of run-off during winter weather and frost conditions.

As previously discussed the area that is occupied by Stormwater Basin No. 2 is proposed for the development of the Phase 7 and Phase 8 Landfill Expansions. This will require that Stormwater Basin No. 2 be abandoned and a new basin constructed to the south, on the undeveloped 12-acre parcel. The new basin will be designed to provide similar storage capacity as Stormwater Basin No. 2, with the potential addition of supplemental bioretention capacity.

3.0 STORMWATER PERFORMANCE STANDARDS

3.1 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 Phase 6 Expansion, as well as future planning for the Phase 7 and Phase 8 Landfill Expansions. It may be noted that the facilities, as they relate to Phase 6, are all existing and have been previously approved. The facilities for the future Phase 7 and Phase 8 expansions will be new and be subject to additional review. 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 drainage pipes, channels and swales which direct all of the site's runoff to one of two stormwater basins. 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 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 Worksheet in Appendix 3, which is consistent with 310 CMR 10 and the Massachusetts Stormwater Management Handbook. The Worksheet demonstrates that initial treatment with water quality swales provides a total suspended solids (TSS) removal rate of 70% and that the final TSS removal rate is 98%. In addition to TSS removal, nutrients will also be removed from the runoff by treatment that will be provided by these facilities.

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 are no new building roofs proposed as part of the Phase 6 Landfill Expansion, consequently this Standard is not applicable.

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 conditions provide vegetated water quality swales that collect practically all of the stormwater runoff from the closed landfill sideslope and plateau areas. That runoff along with runoff collected from building, parking and roadway areas is transported through a system of pipes, or drainage channel and forebay systems. The facilities, as they relate to Phase 6, are all existing, have been previously approved and are subject to future change as the site continues to develop, therefore this Standard is not applicable. The facilities for Phase 7 and 8 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 including bioretention features into the pond that will replace Stormwater Basin No. 2.

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 design to be consistent with the Massachusetts Stormwater Standards under 310 CMR 10 and the Massachusetts Storm Water Management Handbook.*

The large sedimentation basins (infiltration devices) can accommodate frozen flow conditions and storms that exceed 25-year 24-hour storm, as described above. 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 Phase 6 operations will utilize the existing impervious surfaces, which have been previously approved and are the minimum needed for those operations. There will be no further expansion of impervious surface area relative to Phase 6, therefore this Standard is not applicable.

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.*

The large, structured, sedimentation basins (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.*

Sedimentation Basin Nos. 1 and 2 are existing and have been previously approved. Any replacement basin for Sedimentation Basin No. 2 will meet the Standard. Historically high groundwater elevations in the area of the replacement basin are projected to be in the range of 47 to 48 feet. The ground surface elevations in this area are in the range of 90 feet to 100 feet, providing more than sufficient depth to maintain a minimum two foot separation between the bottom of a future sedimentation pond 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 at the Phase 6 Landfill site 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.

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 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 can not 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. In addition Phase 6 will only utilize existing, previously approved roads, therefore this Standard is not applicable.

3.2 MassDEP Stormwater Management Standards

The DEP 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 Phase 6 Expansion, as well as future planning for the Phase 7 and Phase 8 Landfill Expansions. 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 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 drainage pipes, channels and swales which will direct the runoff to one of two stormwater basins. 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 and there will be no discharge of flows to the surface waters. Consequently, no pre-development peak discharge rates were calculated. SITEC Environmental has prepared stormwater discharge calculations for post-development build out conditions in the Phase 6 Expansion area 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 existing and 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	70.58	125.35
Stormwater Basin No. 2	148.84	194.57

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 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 control 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 or 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, sediment forebay & infiltration basin. MassDEP has developed a standard methodology for calculating TSS removal rates. This methodology has been applied to the existing and proposed stormwater management facilities that will be incorporated into the Phase 6 facilities, with a resultant calculated TSS removal rate of approximately 96 %. 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 existing infiltration basins, 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 structural BMPs that control the site's runoff and sediment, demonstrate that the Phase 6 Landfill Expansion 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 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 Phase 6 Landfill Expansion 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 at the Phase 6 Landfill site 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.

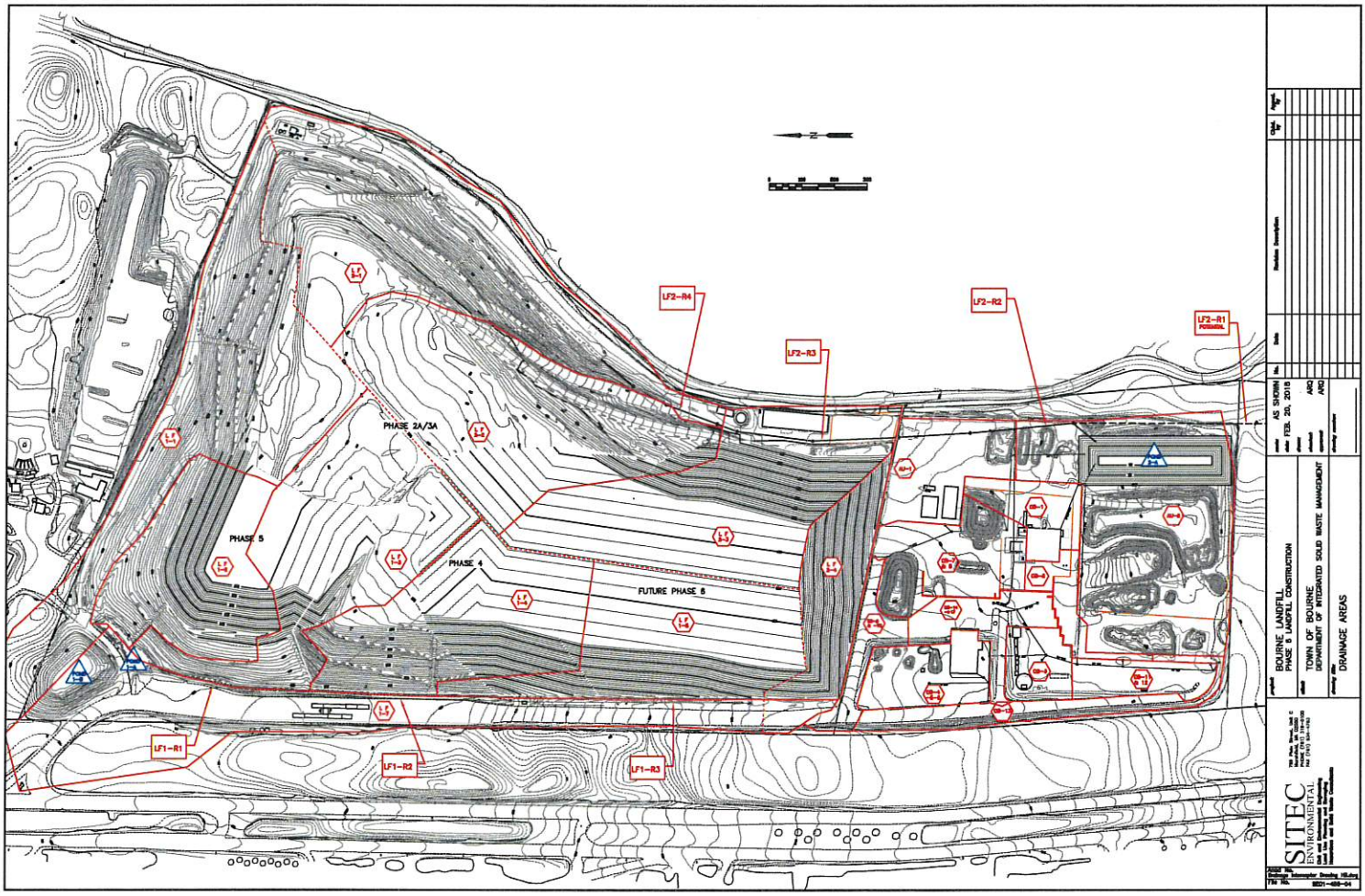
A stormwater management system operation and maintenance plan is part of the Facility's overall Operation & Maintenance Plan, which is part of its Operating Permit, as approved by MassDEP. The relevant portion (Section 6.0 - Storm Water Management) of the Operation & Maintenance Plan is included as Appendix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

APPENDIX 1

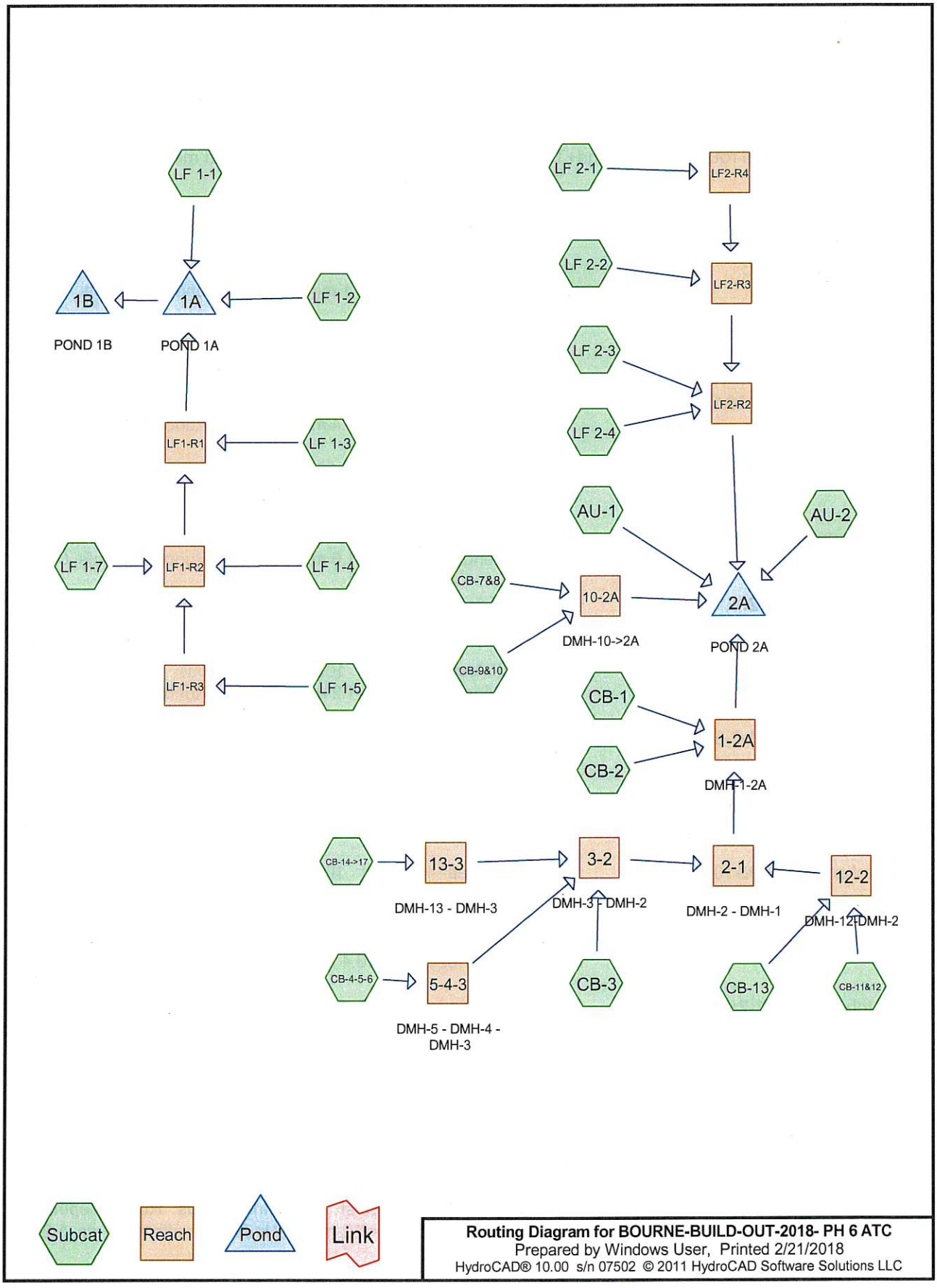
DRAINAGE AREAS SKETCH


LF2-R4
LF2-R2
LF2-R1
POTENTIAL
LF2-R3
PHASE 2A/3A
PHASE 5
PHASE 4
FUTURE PHASE 6
LF1-R1
LF1-R2
LF1-R3
BOURNE LANDFILL
PHASE 6 LANDFILL CONSTRUCTION
TOWN OF BOURNE
DEPARTMENT OF INTEGRATED SOLID WASTE MANAGEMENT
DRAINAGE AREAS
AS SHOWN
FEB. 20, 2018
SITEC
ENVIRONMENTAL

APPENDIX 2

STORMWATER CALCULATIONS

25-YEAR STORM EVENT



Routing Diagram for BOURNE-BUILD-OUT-2018- PH 6 ATC
Prepared by Windows User, Printed 2/21/2018

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

Subcatchment AU-1: Runoff Area=100,600 sf 54.08% Impervious Runoff Depth>3.93"
Flow Length=250' Slope=0.0400 '/' Tc=1.0 min CN=85 Runoff=11.66 cfs 0.756 af

Subcatchment AU-2: Runoff Area=369,000 sf 71.27% Impervious Runoff Depth>4.46"
Flow Length=540' Slope=0.0200 '/' Tc=3.1 min CN=90 Runoff=45.80 cfs 3.145 af

Subcatchment CB-1: Runoff Area=55,240 sf 100.00% Impervious Runoff Depth>5.36"
Flow Length=252' Tc=1.7 min CN=98 Runoff=7.54 cfs 0.567 af

Subcatchment CB-11&12: Runoff Area=30,900 sf 100.00% Impervious Runoff Depth>5.36"
Flow Length=207' Tc=1.4 min CN=98 Runoff=4.26 cfs 0.317 af

Subcatchment CB-13: Runoff Area=66,870 sf 50.10% Impervious Runoff Depth>2.85"
Flow Length=1,275' Tc=3.7 min CN=74 Runoff=5.45 cfs 0.365 af

Subcatchment CB-14->17: Runoff Area=60,440 sf 100.00% Impervious Runoff Depth>5.36"
Flow Length=303' Tc=1.6 min CN=98 Runoff=8.26 cfs 0.620 af

Subcatchment CB-2: Runoff Area=34,850 sf 100.00% Impervious Runoff Depth>5.36"
Flow Length=514' Tc=2.9 min CN=98 Runoff=4.75 cfs 0.357 af

Subcatchment CB-3: Runoff Area=42,823 sf 100.00% Impervious Runoff Depth>5.36"
Flow Length=195' Tc=1.2 min CN=98 Runoff=5.96 cfs 0.439 af

Subcatchment CB-4-5-6: Runoff Area=74,800 sf 100.00% Impervious Runoff Depth>5.36"
Flow Length=397' Tc=1.9 min CN=98 Runoff=10.22 cfs 0.767 af

Subcatchment CB-7&8: Runoff Area=116,200 sf 83.82% Impervious Runoff Depth>4.23"
Flow Length=439' Tc=14.7 min CN=88 Runoff=9.81 cfs 0.941 af

Subcatchment CB-9&10: Runoff Area=44,240 sf 100.00% Impervious Runoff Depth>5.36"
Flow Length=798' Tc=2.8 min CN=98 Runoff=6.04 cfs 0.454 af

Subcatchment LF 1-1: Runoff Area=456,500 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=1,620' Tc=10.4 min CN=69 Runoff=24.90 cfs 2.095 af

Subcatchment LF 1-2: Runoff Area=227,400 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=800' Tc=6.7 min CN=69 Runoff=13.99 cfs 1.045 af

Subcatchment LF 1-3: Runoff Area=349,500 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=880' Tc=8.4 min CN=69 Runoff=20.24 cfs 1.605 af

Subcatchment LF 1-4: Runoff Area=286,000 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=825' Tc=7.8 min CN=69 Runoff=16.93 cfs 1.313 af

Subcatchment LF 1-5: Runoff Area=271,200 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=635' Tc=7.2 min CN=69 Runoff=16.41 cfs 1.246 af

Subcatchment LF 1-7: Runoff Area=375,800 sf 59.21% Impervious Runoff Depth>3.03"
Flow Length=1,330' Slope=0.0330 '/' Tc=6.5 min CN=76 Runoff=29.75 cfs 2.182 af

Subcatchment LF 2-1: Runoff Area=492,800 sf 0.00% Impervious Runoff Depth>2.48"
Flow Length=1,725' Tc=14.0 min CN=70 Runoff=25.21 cfs 2.342 af

Subcatchment LF 2-2: Runoff Area=414,900 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=1,335' Tc=8.7 min CN=69 Runoff=23.62 cfs 1.905 af

Subcatchment LF 2-3: Runoff Area=357,300 sf 5.74% Impervious Runoff Depth>2.58"
Flow Length=1,340' Tc=8.3 min CN=71 Runoff=22.43 cfs 1.761 af

Subcatchment LF 2-4: Runoff Area=118,900 sf 0.00% Impervious Runoff Depth>2.40"
Flow Length=735' Tc=3.1 min CN=69 Runoff=8.26 cfs 0.547 af

Reach 1-2A: DMH-1-2A Avg. Flow Depth=2.01' Max Vel=9.99 fps Inflow=42.62 cfs 3.430 af
30.0" Round Pipe n=0.013 L=290.0' S=0.0110 '/' Capacity=43.02 cfs Outflow=41.23 cfs 3.429 af

Reach 2-1: DMH-2 - DMH-1 Avg. Flow Depth=1.60' Max Vel=9.58 fps Inflow=31.82 cfs 2.507 af
30.0" Round Pipe n=0.013 L=309.0' S=0.0110 '/' Capacity=43.03 cfs Outflow=30.82 cfs 2.506 af

Reach 3-2: DMH-3 - DMH-2 Avg. Flow Depth=1.58' Max Vel=8.97 fps Inflow=23.88 cfs 1.826 af
24.0" Round Pipe n=0.013 L=91.0' S=0.0120 '/' Capacity=24.76 cfs Outflow=23.73 cfs 1.826 af

Reach 5-4-3: DMH-5 - DMH-4 - DMH-3 Avg. Flow Depth=0.94' Max Vel=10.32 fps Inflow=10.22 cfs 0.767 af
15.0" Round Pipe n=0.013 L=171.0' S=0.0300 '/' Capacity=11.19 cfs Outflow=10.10 cfs 0.767 af

Reach 10-2A: DMH-10->2A Avg. Flow Depth=1.02' Max Vel=7.64 fps Inflow=12.33 cfs 1.395 af
24.0" Round Pipe n=0.013 L=410.0' S=0.0111 '/' Capacity=23.83 cfs Outflow=12.24 cfs 1.394 af

Reach 12-2: DMH-12-DMH-2 Avg. Flow Depth=1.21' Max Vel=5.98 fps Inflow=9.39 cfs 0.682 af
18.0" Round Pipe n=0.013 L=410.0' S=0.0078 '/' Capacity=9.27 cfs Outflow=8.68 cfs 0.681 af

Reach 13-3: DMH-13 - DMH-3 Avg. Flow Depth=1.00' Max Vel=6.56 fps Inflow=8.26 cfs 0.620 af
18.0" Round Pipe n=0.013 L=158.0' S=0.0100 '/' Capacity=10.50 cfs Outflow=8.11 cfs 0.620 af

Reach LF1-R1: Avg. Flow Depth=2.22' Max Vel=3.88 fps Inflow=74.70 cfs 6.332 af
n=0.033 L=450.0' S=0.0050 '/' Capacity=257.98 cfs Outflow=71.77 cfs 6.318 af

Reach LF1-R2: Avg. Flow Depth=1.95' Max Vel=3.71 fps Inflow=58.89 cfs 4.737 af
n=0.033 L=400.0' S=0.0052 '/' Capacity=264.35 cfs Outflow=55.66 cfs 4.727 af

Reach LF1-R3: Avg. Flow Depth=0.57' Max Vel=5.38 fps Inflow=16.41 cfs 1.246 af
n=0.033 L=700.0' S=0.0420 '/' Capacity=747.69 cfs Outflow=15.24 cfs 1.242 af

Reach LF2-R2: Avg. Flow Depth=2.36' Max Vel=8.67 fps Inflow=67.33 cfs 6.547 af
48.0" Round Pipe n=0.010 L=630.0' S=0.0030 '/' Capacity=102.28 cfs Outflow=66.26 cfs 6.539 af

Reach LF2-R3: Avg. Flow Depth=2.01' Max Vel=7.86 fps Inflow=45.44 cfs 4.245 af
42.0" Round Pipe n=0.010 L=570.0' S=0.0030 '/' Capacity=71.64 cfs Outflow=44.51 cfs 4.240 af

Reach LF2-R4: Avg. Flow Depth=1.55' Max Vel=6.81 fps Inflow=25.21 cfs 2.342 af
36.0" Round Pipe n=0.010 L=270.0' S=0.0030 '/' Capacity=47.49 cfs Outflow=24.91 cfs 2.340 af

Pond 1A: POND 1A Peak Elev=92.05' Storage=73,232 cf Inflow=102.86 cfs 9.458 af
Outflow=70.58 cfs 8.900 af

Pond 1B: POND 1B Peak Elev=84.73' Storage=235,679 cf Inflow=70.58 cfs 8.900 af
Outflow=5.21 cfs 5.576 af

Pond 2A: POND 2A Peak Elev=93.79' Storage=381,968 cf Inflow=148.84 cfs 15.263 af
Outflow=9.15 cfs 10.093 af

Summary for Subcatchment AU-1:

Runoff = 11.66 cfs @ 12.01 hrs, Volume= 0.756 af, Depth> 3.93"

Runoff by SCS TR-20 method, UH=SCS, 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
46,200	69	50-75% Grass cover, Fair, HSG B
54,400	98	Paved parking & roofs
100,600	85	Weighted Average
46,200		45.92% Pervious Area
54,400		54.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	250	0.0400	4.06		**Shallow Concentrated Flow, PAVEMENT & ACROSS LAND** Paved Kv= 20.3 fps

Summary for Subcatchment AU-2:

Runoff = 45.80 cfs @ 12.05 hrs, Volume= 3.145 af, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, 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
106,000	69	50-75% Grass cover, Fair, HSG B
263,000	98	Paved parking & roofs
369,000	90	Weighted Average
106,000		28.73% Pervious Area
263,000		71.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	540	0.0200	2.87		**Shallow Concentrated Flow, PAVEMENT** Paved Kv= 20.3 fps

Summary for Subcatchment CB-1:

Runoff = 7.54 cfs @ 12.03 hrs, Volume= 0.567 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, 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
55,240	98	Paved parking & roofs
55,240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	232	0.0140	2.40		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.1	20	0.0150	5.56	4.36	**Pipe Channel, CB-1 TO DMH-8** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
1.7	252	Total			

Summary for Subcatchment CB-11&12:

Runoff = 4.26 cfs @ 12.02 hrs, Volume= 0.317 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, 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
30,900	98	Paved parking & roofs
30,900		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	193	0.0125	2.27		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.0	14	0.0150	5.56	4.36	**Pipe Channel, CB-11 TO DMH-11** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
1.4	207	Total			

Summary for Subcatchment CB-13:

Runoff = 5.45 cfs @ 12.06 hrs, Volume= 0.365 af, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, 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
33,500	98	Paved parking & roofs
33,370	49	50-75% Grass cover, Fair, HSG A
66,870	74	Weighted Average
33,370		49.90% Pervious Area
33,500		50.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	1,250	0.0210	5.72	38.62	**Trap/Vee/Rect Channel Flow, GRASSED SWALE** Bot.W=0.00' D=1.50' Z= 3.0 '/' Top.W=9.00' n= 0.030
0.1	25	0.0100	5.26	6.46	**Pipe Channel, CB-13 TO DMH-12** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'

n= 0.013

3.7	1,275	Total

Summary for Subcatchment CB-14->17:

Runoff = 8.26 cfs @ 12.02 hrs, Volume= 0.620 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, 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
60,440	98	Paved parking & roofs
60,440		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	235	0.0200	2.87		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.2	68	0.0120	5.77	7.08	**Pipe Channel, CB-16 TO DMH-13** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
1.6	303	Total			

Summary for Subcatchment CB-2:

Runoff = 4.75 cfs @ 12.05 hrs, Volume= 0.357 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, 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
34,850	98	Paved parking & roofs
34,850		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	500	0.0200	2.87		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.0	14	0.0150	7.28	12.87	**Pipe Channel, CB-2 TO DMH-1** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
2.9	514	Total			

Summary for Subcatchment CB-3:

Runoff = 5.96 cfs @ 12.02 hrs, Volume= 0.439 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, 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
42,823	98	Paved parking & roofs
42,823		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	178	0.0170	2.65		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.1	17	0.0100	5.26	6.46	**Pipe Channel, CB-3 TO DMH-3** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
1.2	195	Total			

Summary for Subcatchment CB-4-5-6:

Runoff = 10.22 cfs @ 12.03 hrs, Volume= 0.767 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, 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
74,800	98	Paved parking & roofs
74,800		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	350	0.0260	3.27		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.1	47	0.0100	5.26	6.46	**Pipe Channel, CB-5 TO DMH-6** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
1.9	397	Total			

Summary for Subcatchment CB-7&8:

Runoff = 9.81 cfs @ 12.20 hrs, Volume= 0.941 af, Depth> 4.23"

Runoff by SCS TR-20 method, UH=SCS, 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
97,400	98	Paved parking & roofs
18,800	39	>75% Grass cover, Good, HSG A
116,200	88	Weighted Average
18,800		16.18% Pervious Area
97,400		83.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	170	0.0500	0.22		**Sheet Flow, GRASS AREA** Grass: Short n= 0.150 P2= 2.00"
1.5	247	0.0190	2.80		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.1	22	0.0100	5.26	6.46	**Pipe Channel, CB-8 TO DMH-10** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
14.7	439	Total			

Summary for Subcatchment CB-9&10:

Runoff = 6.04 cfs @ 12.04 hrs, Volume= 0.454 af, Depth> 5.36"

Runoff by SCS TR-20 method, UH=SCS, 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
44,240	98	Paved parking & roofs
44,240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	590	0.0460	4.35		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.5	208	0.0200	7.44	9.14	**Pipe Channel, CB-9 TO DMH-10** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
2.8	798	Total			

Summary for Subcatchment LF 1-1:

Runoff = 24.90 cfs @ 12.15 hrs, Volume= 2.095 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, 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
410,600	69	50-75% Grass cover, Fair, HSG B
45,900	72	Dirt roads, HSG A
456,500	69	Weighted Average
456,500		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"
3.1	290	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	130	0.0800	14.08	302.69	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.033
0.2	200	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
2.0	950	0.0160	7.86	94.34	**Channel Flow, DRAINAGE SWALE** Area= 12.0 sf Perim= 10.0' r= 1.20' n= 0.027
10.4	1,620	Total			

Summary for Subcatchment LF 1-2:

Runoff = 13.99 cfs @ 12.10 hrs, Volume= 1.045 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, 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
227,400	69	50-75% Grass cover, Fair, HSG B
227,400		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"
0.5	50	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.5	120	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.7	420	0.0250	9.62	206.81	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.1	160	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
6.7	800	Total			

Summary for Subcatchment LF 1-3:

Runoff = 20.24 cfs @ 12.12 hrs, Volume= 1.605 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, 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
349,500	69	50-75% Grass cover, Fair, HSG B
349,500		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"
2.9	270	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.3	270	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	290	0.2200	16.12	338.49	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
8.4	880	Total			

Summary for Subcatchment LF 1-4:

Runoff = 16.93 cfs @ 12.12 hrs, Volume= 1.313 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, 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
286,000	69	50-75% Grass cover, Fair, HSG B
286,000		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"
2.1	200	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
0.5	445	0.0670	15.75	338.57	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.0	50	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
7.8	825	Total			

Summary for Subcatchment LF 1-5:

Runoff = 16.41 cfs @ 12.11 hrs, Volume= 1.246 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, 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
271,200	69	50-75% Grass cover, Fair, HSG B
271,200		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"
1.8	170	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.4	390	0.1000	15.74	338.42	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.033
7.2	635	Total			

Summary for Subcatchment LF 1-7:

Runoff = 29.75 cfs @ 12.10 hrs, Volume= 2.182 af, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, 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
222,500	98	Paved parking & roofs
153,300	43	Woods/grass comb., Fair, HSG A
375,800	76	Weighted Average
153,300		40.79% Pervious Area
222,500		59.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0330	1.16		**Sheet Flow, PAVEMENT SHEET FLOW** Smooth surfaces n= 0.011 P2= 2.00"
5.8	1,280	0.0330	3.69		**Shallow Concentrated Flow, PAVEMENT** Paved Kv= 20.3 fps
6.5	1,330	Total			

Summary for Subcatchment LF 2-1:

Runoff = 25.21 cfs @ 12.20 hrs, Volume= 2.342 af, Depth> 2.48"

Runoff by SCS TR-20 method, UH=SCS, 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
347,100	69	50-75% Grass cover, Fair, HSG B
145,700	72	Dirt roads, HSG A
492,800	70	Weighted Average
492,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0200	0.12		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
4.0	240	0.0200	0.99		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
1.1	170	0.1400	2.62		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	260	0.0850	17.74	381.34	**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
14.0	1,725	Total			

Summary for Subcatchment LF 2-2:

Runoff = 23.62 cfs @ 12.13 hrs, Volume= 1.905 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, 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
359,100	69	50-75% Grass cover, Fair, HSG B
55,800	72	Dirt roads, HSG A
414,900	69	Weighted Average
414,900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0410	0.16		**Sheet Flow, plateau flow** Grass: Short n= 0.150 P2= 2.00"
2.6	220	0.0410	1.42		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	85	0.0470	7.45	156.45	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
0.6	920	0.0570	27.33	1,311.94	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
0.0	60	0.1750	32.33	57.13	**Pipe Channel, Lateral Culvert** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010
8.7	1,335	Total			

Summary for Subcatchment LF 2-3:

Runoff = 22.43 cfs @ 12.12 hrs, Volume= 1.761 af, Depth> 2.58"

Runoff by SCS TR-20 method, UH=SCS, 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
299,400	69	50-75% Grass cover, Fair, HSG B
37,400	72	Dirt roads, HSG A
20,500	98	Paved parking & roofs
357,300	71	Weighted Average
336,800		94.26% Pervious Area
20,500		5.74% 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"
1.8	170	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.9	700	0.0460	13.05	280.53	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.1	120	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
0.6	300	0.0050	8.10	388.56	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
8.3	1,340	Total			

Summary for Subcatchment LF 2-4:

Runoff = 8.26 cfs @ 12.05 hrs, Volume= 0.547 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, 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
118,900	69	50-75% Grass cover, Fair, HSG B
118,900		100.00% Pervious 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"
0.1	25	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
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
0.1	60	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	200	0.0400	22.90	1,099.02	**Channel Flow, PERIMETER SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
3.1	735	Total			

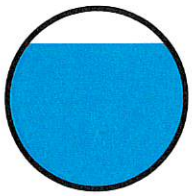
Summary for Reach 1-2A: DMH-1-2A

Inflow Area = 8.400 ac, 90.88% Impervious, Inflow Depth > 4.90" for 25 Year Storm event
Inflow = 42.62 cfs @ 12.05 hrs, Volume= 3.430 af
Outflow = 41.23 cfs @ 12.07 hrs, Volume= 3.429 af, Atten= 3%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.99 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.63 fps, Avg. Travel Time= 1.3 min

Peak Storage= 1,226 cf @ 12.06 hrs
Average Depth at Peak Storage= 2.01'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 43.02 cfs

30.0" Round Pipe
n= 0.013
Length= 290.0' Slope= 0.0110 '/'
Inlet Invert= 101.55', Outlet Invert= 98.36'



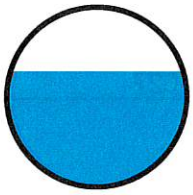
Summary for Reach 2-1: DMH-2 - DMH-1

Inflow Area = 6.332 ac, 87.90% Impervious, Inflow Depth > 4.75" for 25 Year Storm event
Inflow = 31.82 cfs @ 12.05 hrs, Volume= 2.507 af
Outflow = 30.82 cfs @ 12.06 hrs, Volume= 2.506 af, Atten= 3%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.58 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.30 fps, Avg. Travel Time= 1.6 min

Peak Storage= 1,022 cf @ 12.05 hrs
Average Depth at Peak Storage= 1.60'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 43.03 cfs

30.0" Round Pipe
n= 0.013
Length= 309.0' Slope= 0.0110 '/'
Inlet Invert= 105.00', Outlet Invert= 101.60'



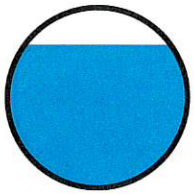
Summary for Reach 3-2: DMH-3 - DMH-2

Inflow Area = 4.088 ac,100.00% Impervious, Inflow Depth > 5.36" for 25 Year Storm event
Inflow = 23.88 cfs @ 12.03 hrs, Volume= 1.826 af
Outflow = 23.73 cfs @ 12.04 hrs, Volume= 1.826 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.97 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.20 fps, Avg. Travel Time= 0.5 min

Peak Storage= 242 cf @ 12.04 hrs
Average Depth at Peak Storage= 1.58'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 24.76 cfs

24.0" Round Pipe
n= 0.013
Length= 91.0' Slope= 0.0120 '/'
Inlet Invert= 109.09', Outlet Invert= 108.00'



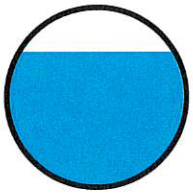
Summary for Reach 5-4-3: DMH-5 - DMH-4 - DMH-3

Inflow Area = 1.717 ac,100.00% Impervious, Inflow Depth > 5.36" for 25 Year Storm event
Inflow = 10.22 cfs @ 12.03 hrs, Volume= 0.767 af
Outflow = 10.10 cfs @ 12.04 hrs, Volume= 0.767 af, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.32 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.63 fps, Avg. Travel Time= 0.8 min

Peak Storage= 169 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.94'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.19 cfs

15.0" Round Pipe
n= 0.013
Length= 171.0' Slope= 0.0300 '/'
Inlet Invert= 117.85', Outlet Invert= 112.72'



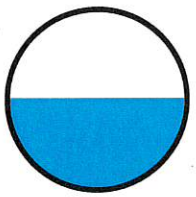
Summary for Reach 10-2A: DMH-10->2A

Inflow Area = 3.683 ac, 88.28% Impervious, Inflow Depth > 4.54" for 25 Year Storm event
Inflow = 12.33 cfs @ 12.18 hrs, Volume= 1.395 af
Outflow = 12.24 cfs @ 12.18 hrs, Volume= 1.394 af, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.64 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 2.76 fps, Avg. Travel Time= 2.5 min

Peak Storage= 657 cf @ 12.20 hrs
Average Depth at Peak Storage= 1.02'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 23.83 cfs

24.0" Round Pipe
n= 0.013
Length= 410.0' Slope= 0.0111 '/'
Inlet Invert= 102.40', Outlet Invert= 97.85'



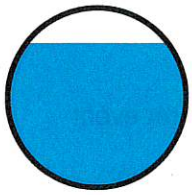
Summary for Reach 12-2: DMH-12-DMH-2

Inflow Area = 2.244 ac, 65.87% Impervious, Inflow Depth > 3.64" for 25 Year Storm event
Inflow = 9.39 cfs @ 12.04 hrs, Volume= 0.682 af
Outflow = 8.68 cfs @ 12.08 hrs, Volume= 0.681 af, Atten= 8%, Lag= 2.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.98 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.05 fps, Avg. Travel Time= 3.3 min

Peak Storage= 624 cf @ 12.06 hrs
Average Depth at Peak Storage= 1.21'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 9.27 cfs

18.0" Round Pipe
n= 0.013
Length= 410.0' Slope= 0.0078 '/'
Inlet Invert= 110.50', Outlet Invert= 107.31'



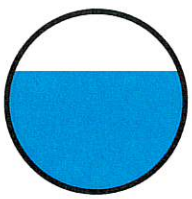
Summary for Reach 13-3: DMH-13 - DMH-3

Inflow Area = 1.388 ac,100.00% Impervious, Inflow Depth > 5.36" for 25 Year Storm event
Inflow = 8.26 cfs @ 12.02 hrs, Volume= 0.620 af
Outflow = 8.11 cfs @ 12.04 hrs, Volume= 0.620 af, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.56 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.26 fps, Avg. Travel Time= 1.2 min

Peak Storage= 199 cf @ 12.03 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.50 cfs

18.0" Round Pipe
n= 0.013
Length= 158.0' Slope= 0.0100 '/'
Inlet Invert= 111.13', Outlet Invert= 109.55'



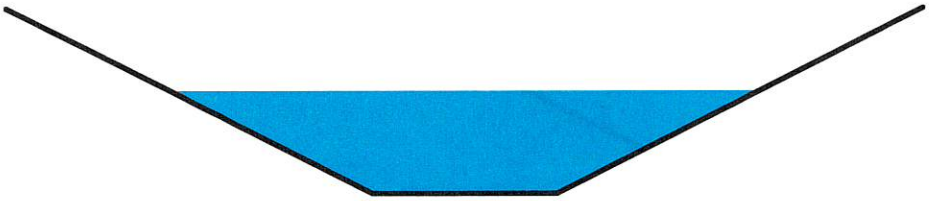
Summary for Reach LF1-R1:

Inflow Area = 29.442 ac, 17.35% Impervious, Inflow Depth > 2.58" for 25 Year Storm event
Inflow = 74.70 cfs @ 12.16 hrs, Volume= 6.332 af
Outflow = 71.77 cfs @ 12.22 hrs, Volume= 6.318 af, Atten= 4%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.88 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.46 fps, Avg. Travel Time= 5.1 min

Peak Storage= 8,448 cf @ 12.19 hrs
Average Depth at Peak Storage= 2.22'
Bank-Full Depth= 4.00' Flow Area= 48.0 sf, Capacity= 257.98 cfs

4.00' x 4.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 20.00'
Length= 450.0' Slope= 0.0050 '/'
Inlet Invert= 94.50', Outlet Invert= 92.25'



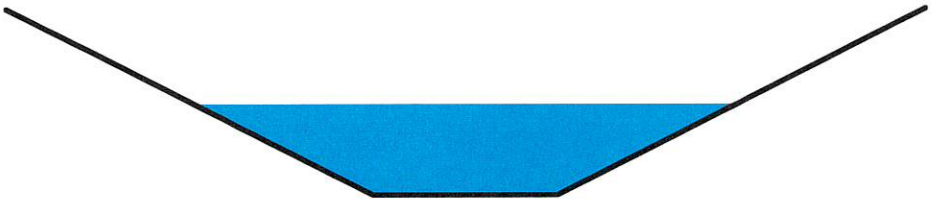
Summary for Reach LF1-R2:

Inflow Area = 21.419 ac, 23.85% Impervious, Inflow Depth > 2.65" for 25 Year Storm event
Inflow = 58.89 cfs @ 12.12 hrs, Volume= 4.737 af
Outflow = 55.66 cfs @ 12.18 hrs, Volume= 4.727 af, Atten= 5%, Lag= 3.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.71 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.35 fps, Avg. Travel Time= 4.9 min

Peak Storage= 6,180 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.95'
Bank-Full Depth= 4.00' Flow Area= 48.0 sf, Capacity= 264.35 cfs

4.00' x 4.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 20.00'
Length= 400.0' Slope= 0.0052 '/'
Inlet Invert= 96.60', Outlet Invert= 94.50'



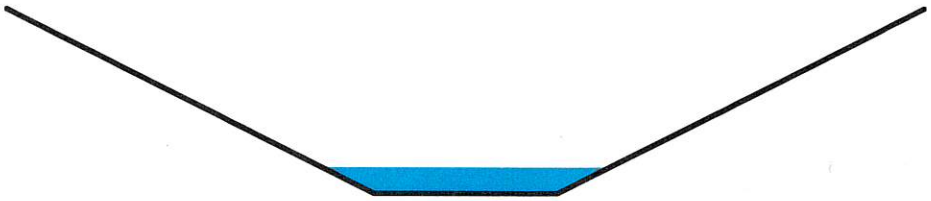
Summary for Reach LF1-R3:

Inflow Area = 6.226 ac, 0.00% Impervious, Inflow Depth > 2.40" for 25 Year Storm event
Inflow = 16.41 cfs @ 12.11 hrs, Volume= 1.246 af
Outflow = 15.24 cfs @ 12.18 hrs, Volume= 1.242 af, Atten= 7%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.38 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.80 fps, Avg. Travel Time= 6.5 min

Peak Storage= 2,038 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 4.00' Flow Area= 48.0 sf, Capacity= 747.69 cfs

4.00' x 4.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 20.00'
Length= 700.0' Slope= 0.0420 '/'
Inlet Invert= 126.00', Outlet Invert= 96.60'



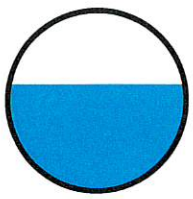
Summary for Reach LF2-R2:

Inflow Area = 31.770 ac, 1.48% Impervious, Inflow Depth > 2.47" for 25 Year Storm event
Inflow = 67.33 cfs @ 12.17 hrs, Volume= 6.547 af
Outflow = 66.26 cfs @ 12.21 hrs, Volume= 6.539 af, Atten= 2%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.67 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 3.63 fps, Avg. Travel Time= 2.9 min

Peak Storage= 4,852 cf @ 12.19 hrs
Average Depth at Peak Storage= 2.36'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 102.28 cfs

48.0" Round Pipe
n= 0.010
Length= 630.0' Slope= 0.0030 '/'
Inlet Invert= 95.01', Outlet Invert= 93.12'



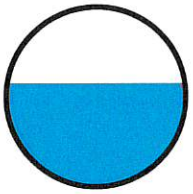
Summary for Reach LF2-R3:

Inflow Area = 20.838 ac, 0.00% Impervious, Inflow Depth > 2.44" for 25 Year Storm event
Inflow = 45.44 cfs @ 12.17 hrs, Volume= 4.245 af
Outflow = 44.51 cfs @ 12.21 hrs, Volume= 4.240 af, Atten= 2%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.86 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 3.28 fps, Avg. Travel Time= 2.9 min

Peak Storage= 3,258 cf @ 12.19 hrs
Average Depth at Peak Storage= 2.01'
Bank-Full Depth= 3.50' Flow Area= 9.6 sf, Capacity= 71.64 cfs

42.0" Round Pipe
n= 0.010
Length= 570.0' Slope= 0.0030 '/'
Inlet Invert= 97.22', Outlet Invert= 95.51'



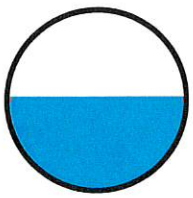
Summary for Reach LF2-R4:

Inflow Area = 11.313 ac, 0.00% Impervious, Inflow Depth > 2.48" for 25 Year Storm event
Inflow = 25.21 cfs @ 12.20 hrs, Volume= 2.342 af
Outflow = 24.91 cfs @ 12.22 hrs, Volume= 2.340 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.81 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.81 fps, Avg. Travel Time= 1.6 min

Peak Storage= 998 cf @ 12.21 hrs
Average Depth at Peak Storage= 1.55'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 47.49 cfs

36.0" Round Pipe
n= 0.010
Length= 270.0' Slope= 0.0030 '/'
Inlet Invert= 98.53', Outlet Invert= 97.72'



Summary for Pond 1A: POND 1A

Inflow Area = 45.142 ac, 11.32% Impervious, Inflow Depth > 2.51" for 25 Year Storm event
Inflow = 102.86 cfs @ 12.20 hrs, Volume= 9.458 af
Outflow = 70.58 cfs @ 12.37 hrs, Volume= 8.900 af, Atten= 31%, Lag= 10.2 min
Primary = 70.58 cfs @ 12.37 hrs, Volume= 8.900 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= 92.05' @ 12.37 hrs Surf.Area= 12,917 sf Storage= 73,232 cf (70,232 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= 53.1 min calculated for 8.813 af (93% of inflow)
Center-of-Mass det. time= 17.5 min (864.1 - 846.6)

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=70.41 cfs @ 12.37 hrs HW=92.03' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 70.41 cfs @ 9.96 fps)
└—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 1B: POND 1B

Inflow Area = 45.142 ac, 11.32% Impervious, Inflow Depth > 2.37" for 25 Year Storm event
Inflow = 70.58 cfs @ 12.37 hrs, Volume= 8.900 af
Outflow = 5.21 cfs @ 16.21 hrs, Volume= 5.576 af, Atten= 93%, Lag= 230.2 min
Primary = 5.21 cfs @ 16.21 hrs, Volume= 5.576 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Starting Elev= 74.00' Surf.Area= 11,000 sf Storage= 32,400 cf
Peak Elev= 84.73' @ 16.21 hrs Surf.Area= 27,210 sf Storage= 235,679 cf (203,279 cf above start)
Flood Elev= 93.50' Surf.Area= 58,225 sf Storage= 559,525 cf (527,125 cf above start)

Plug-Flow detention time= 335.5 min calculated for 4.822 af (54% of inflow)
Center-of-Mass det. time= 94.9 min (959.0 - 864.1)

Volume	Invert	Avail.Storage	Storage Description
#1	70.00'	735,600 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.00	5,800	0	0
72.00	7,800	13,600	13,600
74.00	11,000	18,800	32,400
76.00	13,800	24,800	57,200
78.00	16,500	30,300	87,500
80.00	19,700	36,200	123,700
82.00	23,000	42,700	166,400
84.00	26,000	49,000	215,400
86.00	29,300	55,300	270,700
88.00	33,000	62,300	333,000
90.00	36,300	69,300	402,300
92.00	41,800	78,100	480,400
94.00	63,700	105,500	585,900
96.00	86,000	149,700	735,600

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=5.21 cfs @ 16.21 hrs HW=84.73' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 5.21 cfs)

Summary for Pond 2A: POND 2A

Inflow Area = 54.634 ac, 34.12% Impervious, Inflow Depth > 3.35" for 25 Year Storm event
Inflow = 148.84 cfs @ 12.07 hrs, Volume= 15.263 af
Outflow = 9.15 cfs @ 15.29 hrs, Volume= 10.093 af, Atten= 94%, Lag= 193.3 min
Primary = 9.15 cfs @ 15.29 hrs, Volume= 10.093 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Starting Elev= 82.00' Surf.Area= 14,400 sf Storage= 24,200 cf
Peak Elev= 93.79' @ 15.29 hrs Surf.Area= 47,813 sf Storage= 381,968 cf (357,768 cf above start)
Flood Elev= 100.00' Surf.Area= 79,400 sf Storage= 777,400 cf (753,200 cf above start)

Plug-Flow detention time= 309.2 min calculated for 9.517 af (62% of inflow)
Center-of-Mass det. time= 150.7 min (956.8 - 806.1)

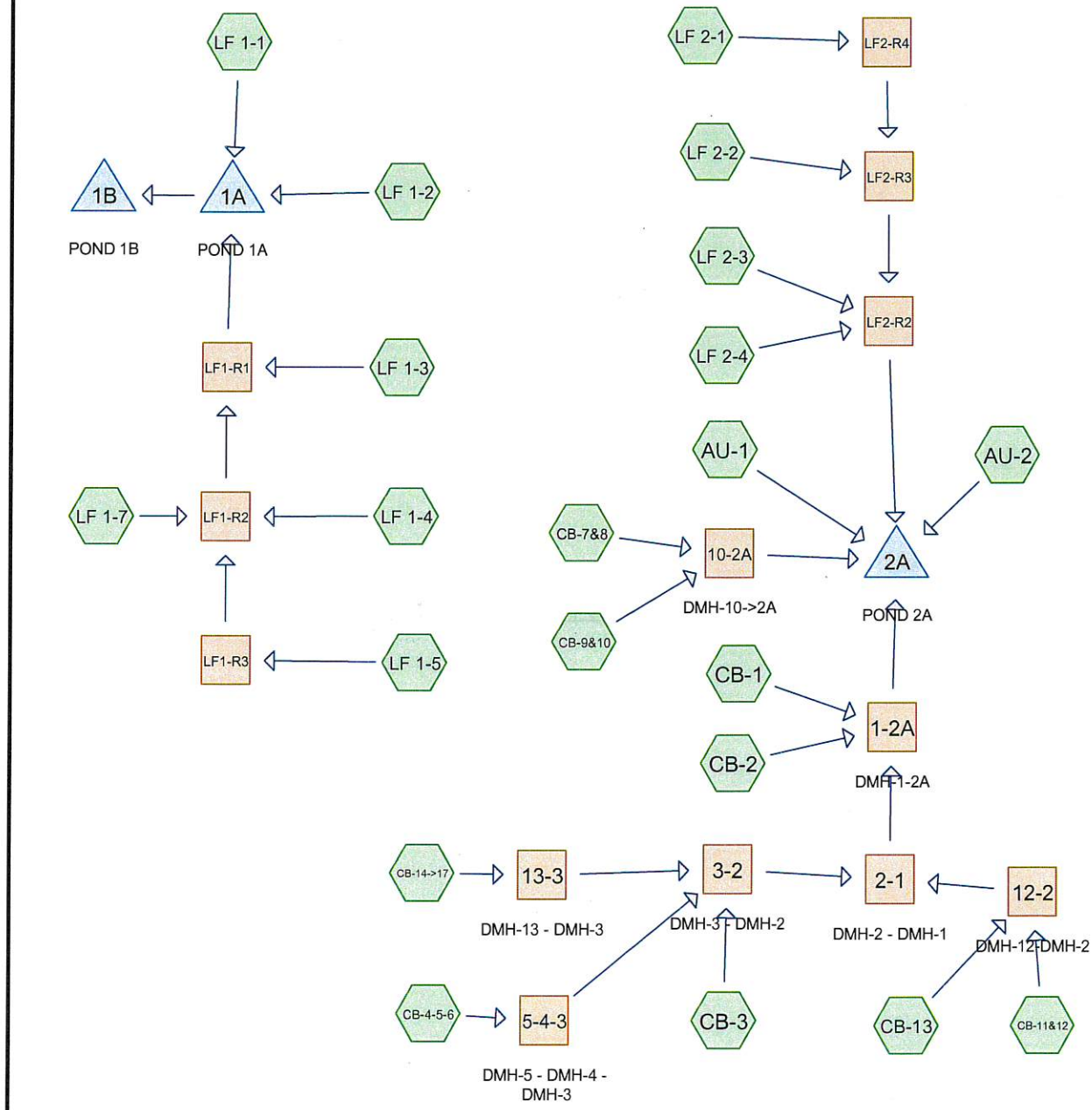
Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	777,400 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
80.00	9,800	0	0
82.00	14,400	24,200	24,200
84.00	19,400	33,800	58,000
86.00	24,600	44,000	102,000
88.00	30,200	54,800	156,800
90.00	36,000	66,200	223,000
92.00	42,100	78,100	301,100
94.00	48,500	90,600	391,700
96.00	61,100	109,600	501,300
98.00	67,800	128,900	630,200
100.00	79,400	147,200	777,400

Device	Routing	Invert	Outlet Devices
#1	Primary	80.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=9.15 cfs @ 15.29 hrs HW=93.79' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 9.15 cfs)

100-YEAR STORM EVENT



Routing Diagram for BOURNE-BUILD-OUT-2018- PH 6 ATC
Prepared by Windows User, Printed 2/21/2018

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

Subcatchment AU-1: Runoff Area=100,600 sf 54.08% Impervious Runoff Depth>5.35"
Flow Length=250' Slope=0.0400 '/' Tc=1.0 min CN=85 Runoff=15.67 cfs 1.029 af

Subcatchment AU-2: Runoff Area=369,000 sf 71.27% Impervious Runoff Depth>5.92"
Flow Length=540' Slope=0.0200 '/' Tc=3.1 min CN=90 Runoff=59.85 cfs 4.179 af

Subcatchment CB-1: Runoff Area=55,240 sf 100.00% Impervious Runoff Depth>6.86"
Flow Length=252' Tc=1.7 min CN=98 Runoff=9.57 cfs 0.725 af

Subcatchment CB-11&12: Runoff Area=30,900 sf 100.00% Impervious Runoff Depth>6.86"
Flow Length=207' Tc=1.4 min CN=98 Runoff=5.41 cfs 0.406 af

Subcatchment CB-13: Runoff Area=66,870 sf 50.10% Impervious Runoff Depth>4.13"
Flow Length=1,275' Tc=3.7 min CN=74 Runoff=7.90 cfs 0.528 af

Subcatchment CB-14->17: Runoff Area=60,440 sf 100.00% Impervious Runoff Depth>6.86"
Flow Length=303' Tc=1.6 min CN=98 Runoff=10.50 cfs 0.793 af

Subcatchment CB-2: Runoff Area=34,850 sf 100.00% Impervious Runoff Depth>6.86"
Flow Length=514' Tc=2.9 min CN=98 Runoff=6.03 cfs 0.457 af

Subcatchment CB-3: Runoff Area=42,823 sf 100.00% Impervious Runoff Depth>6.86"
Flow Length=195' Tc=1.2 min CN=98 Runoff=7.57 cfs 0.562 af

Subcatchment CB-4-5-6: Runoff Area=74,800 sf 100.00% Impervious Runoff Depth>6.86"
Flow Length=397' Tc=1.9 min CN=98 Runoff=12.98 cfs 0.982 af

Subcatchment CB-7&8: Runoff Area=116,200 sf 83.82% Impervious Runoff Depth>5.68"
Flow Length=439' Tc=14.7 min CN=88 Runoff=12.98 cfs 1.262 af

Subcatchment CB-9&10: Runoff Area=44,240 sf 100.00% Impervious Runoff Depth>6.86"
Flow Length=798' Tc=2.8 min CN=98 Runoff=7.67 cfs 0.581 af

Subcatchment LF 1-1: Runoff Area=456,500 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=1,620' Tc=10.4 min CN=69 Runoff=37.69 cfs 3.135 af

Subcatchment LF 1-2: Runoff Area=227,400 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=800' Tc=6.7 min CN=69 Runoff=21.16 cfs 1.563 af

Subcatchment LF 1-3: Runoff Area=349,500 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=880' Tc=8.4 min CN=69 Runoff=30.65 cfs 2.401 af

Subcatchment LF 1-4: Runoff Area=286,000 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=825' Tc=7.8 min CN=69 Runoff=25.64 cfs 1.965 af

Subcatchment LF 1-5: Runoff Area=271,200 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=635' Tc=7.2 min CN=69 Runoff=24.83 cfs 1.864 af

Subcatchment LF 1-7: Runoff Area=375,800 sf 59.21% Impervious Runoff Depth>4.34"
Flow Length=1,330' Slope=0.0330 '/' Tc=6.5 min CN=76 Runoff=42.43 cfs 3.122 af

Subcatchment LF 2-1: Runoff Area=492,800 sf 0.00% Impervious Runoff Depth>3.69"
Flow Length=1,725' Tc=14.0 min CN=70 Runoff=37.85 cfs 3.481 af

Subcatchment LF 2-2: Runoff Area=414,900 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=1,335' Tc=8.7 min CN=69 Runoff=35.74 cfs 2.850 af

Subcatchment LF 2-3: Runoff Area=357,300 sf 5.74% Impervious Runoff Depth>3.80"
Flow Length=1,340' Tc=8.3 min CN=71 Runoff=33.36 cfs 2.599 af

Subcatchment LF 2-4: Runoff Area=118,900 sf 0.00% Impervious Runoff Depth>3.59"
Flow Length=735' Tc=3.1 min CN=69 Runoff=12.47 cfs 0.818 af

Reach 1-2A: DMH-1-2A Avg. Flow Depth=2.50' Max Vel=9.98 fps Inflow=49.25 cfs 4.450 af
30.0" Round Pipe n=0.013 L=290.0' S=0.0110 '/' Capacity=43.02 cfs Outflow=46.22 cfs 4.449 af

Reach 2-1: DMH-2 - DMH-1 Avg. Flow Depth=1.70' Max Vel=9.75 fps Inflow=34.28 cfs 3.269 af
30.0" Round Pipe n=0.013 L=309.0' S=0.0110 '/' Capacity=43.03 cfs Outflow=34.53 cfs 3.268 af

Reach 3-2: DMH-3 - DMH-2 Avg. Flow Depth=2.00' Max Vel=8.73 fps Inflow=28.92 cfs 2.337 af
24.0" Round Pipe n=0.013 L=91.0' S=0.0120 '/' Capacity=24.76 cfs Outflow=24.81 cfs 2.336 af

Reach 5-4-3: DMH-5 - DMH-4 - DMH-3 Avg. Flow Depth=1.25' Max Vel=10.35 fps Inflow=12.98 cfs 0.982 af
15.0" Round Pipe n=0.013 L=171.0' S=0.0300 '/' Capacity=11.19 cfs Outflow=11.78 cfs 0.982 af

Reach 10-2A: DMH-10->2A Avg. Flow Depth=1.21' Max Vel=8.14 fps Inflow=16.18 cfs 1.843 af
24.0" Round Pipe n=0.013 L=410.0' S=0.0111 '/' Capacity=23.83 cfs Outflow=16.06 cfs 1.842 af

Reach 12-2: DMH-12-DMH-2 Avg. Flow Depth=1.50' Max Vel=5.97 fps Inflow=12.91 cfs 0.934 af
18.0" Round Pipe n=0.013 L=410.0' S=0.0078 '/' Capacity=9.27 cfs Outflow=9.38 cfs 0.933 af

Reach 13-3: DMH-13 - DMH-3 Avg. Flow Depth=1.22' Max Vel=6.77 fps Inflow=10.50 cfs 0.793 af
18.0" Round Pipe n=0.013 L=158.0' S=0.0100 '/' Capacity=10.50 cfs Outflow=10.30 cfs 0.793 af

Reach LF1-R1: Avg. Flow Depth=2.70' Max Vel=4.30 fps Inflow=112.09 cfs 9.335 af
n=0.033 L=450.0' S=0.0050 '/' Capacity=257.98 cfs Outflow=107.80 cfs 9.318 af

Reach LF1-R2: Avg. Flow Depth=2.37' Max Vel=4.12 fps Inflow=87.57 cfs 6.946 af
n=0.033 L=400.0' S=0.0052 '/' Capacity=264.35 cfs Outflow=83.40 cfs 6.934 af

Reach LF1-R3: Avg. Flow Depth=0.72' Max Vel=6.10 fps Inflow=24.83 cfs 1.864 af
n=0.033 L=700.0' S=0.0420 '/' Capacity=747.69 cfs Outflow=23.28 cfs 1.859 af

Reach LF2-R2: Avg. Flow Depth=3.22' Max Vel=9.28 fps Inflow=101.66 cfs 9.738 af
48.0" Round Pipe n=0.010 L=630.0' S=0.0030 '/' Capacity=102.28 cfs Outflow=99.84 cfs 9.728 af

Reach LF2-R3: Avg. Flow Depth=2.72' Max Vel=8.47 fps Inflow=68.75 cfs 6.329 af
42.0" Round Pipe n=0.010 L=570.0' S=0.0030 '/' Capacity=71.64 cfs Outflow=67.20 cfs 6.322 af

Reach LF2-R4: Avg. Flow Depth=2.02' Max Vel=7.46 fps Inflow=37.85 cfs 3.481 af
36.0" Round Pipe n=0.010 L=270.0' S=0.0030 '/' Capacity=47.49 cfs Outflow=37.44 cfs 3.478 af

Pond 1A: POND 1A Peak Elev=93.70' Storage=103,029 cf Inflow=156.14 cfs 14.016 af
Outflow=125.35 cfs 13.450 af

Pond 1B: POND 1B Peak Elev=89.35' Storage=379,802 cf Inflow=125.35 cfs 13.450 af
Outflow=6.74 cfs 7.141 af

Pond 2A: POND 2A Peak Elev=96.78' Storage=551,660 cf Inflow=194.51 cfs 21.227 af
Outflow=12.20 cfs 13.061 af

Summary for Subcatchment AU-1:

Runoff = 15.67 cfs @ 12.01 hrs, Volume= 1.029 af, Depth> 5.35"

Runoff by SCS TR-20 method, UH=SCS, 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
46,200	69	50-75% Grass cover, Fair, HSG B
54,400	98	Paved parking & roofs
100,600	85	Weighted Average
46,200		45.92% Pervious Area
54,400		54.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	250	0.0400	4.06		**Shallow Concentrated Flow, PAVEMENT & ACROSS LAND** Paved Kv= 20.3 fps

Summary for Subcatchment AU-2:

Runoff = 59.85 cfs @ 12.05 hrs, Volume= 4.179 af, Depth> 5.92"

Runoff by SCS TR-20 method, UH=SCS, 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
106,000	69	50-75% Grass cover, Fair, HSG B
263,000	98	Paved parking & roofs
369,000	90	Weighted Average
106,000		28.73% Pervious Area
263,000		71.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	540	0.0200	2.87		**Shallow Concentrated Flow, PAVEMENT** Paved Kv= 20.3 fps

Summary for Subcatchment CB-1:

Runoff = 9.57 cfs @ 12.03 hrs, Volume= 0.725 af, Depth> 6.86"

Runoff by SCS TR-20 method, UH=SCS, 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
55,240	98	Paved parking & roofs
55,240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	232	0.0140	2.40		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.1	20	0.0150	5.56	4.36	**Pipe Channel, CB-1 TO DMH-8** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
1.7	252	Total			

Summary for Subcatchment CB-11&12:

Runoff = 5.41 cfs @ 12.02 hrs, Volume= 0.406 af, Depth> 6.86"

Runoff by SCS TR-20 method, UH=SCS, 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
30,900	98	Paved parking & roofs
30,900		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	193	0.0125	2.27		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.0	14	0.0150	5.56	4.36	**Pipe Channel, CB-11 TO DMH-11** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
1.4	207	Total			

Summary for Subcatchment CB-13:

Runoff = 7.90 cfs @ 12.06 hrs, Volume= 0.528 af, Depth> 4.13"

Runoff by SCS TR-20 method, UH=SCS, 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
33,500	98	Paved parking & roofs
33,370	49	50-75% Grass cover, Fair, HSG A
66,870	74	Weighted Average
33,370		49.90% Pervious Area
33,500		50.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	1,250	0.0210	5.72	38.62	**Trap/Vee/Rect Channel Flow, GRASSED SWALE** Bot.W=0.00' D=1.50' Z= 3.0 '/' Top.W=9.00' n= 0.030
0.1	25	0.0100	5.26	6.46	**Pipe Channel, CB-13 TO DMH-12** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'

n= 0.013

3.7	1,275	Total

Summary for Subcatchment CB-14->17:

Runoff = 10.50 cfs @ 12.02 hrs, Volume= 0.793 af, Depth> 6.86"

Runoff by SCS TR-20 method, UH=SCS, 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
60,440	98	Paved parking & roofs
60,440		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	235	0.0200	2.87		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.2	68	0.0120	5.77	7.08	**Pipe Channel, CB-16 TO DMH-13** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
1.6	303	Total			

Summary for Subcatchment CB-2:

Runoff = 6.03 cfs @ 12.05 hrs, Volume= 0.457 af, Depth> 6.86"

Runoff by SCS TR-20 method, UH=SCS, 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
34,850	98	Paved parking & roofs
34,850		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	500	0.0200	2.87		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.0	14	0.0150	7.28	12.87	**Pipe Channel, CB-2 TO DMH-1** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
2.9	514	Total			

Summary for Subcatchment CB-3:

Runoff = 7.57 cfs @ 12.02 hrs, Volume= 0.562 af, Depth> 6.86"

Runoff by SCS TR-20 method, UH=SCS, 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
42,823	98	Paved parking & roofs
42,823		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	178	0.0170	2.65		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.1	17	0.0100	5.26	6.46	**Pipe Channel, CB-3 TO DMH-3** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
1.2	195	Total			

Summary for Subcatchment CB-4-5-6:

Runoff = 12.98 cfs @ 12.03 hrs, Volume= 0.982 af, Depth> 6.86"

Runoff by SCS TR-20 method, UH=SCS, 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
74,800	98	Paved parking & roofs
74,800		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	350	0.0260	3.27		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.1	47	0.0100	5.26	6.46	**Pipe Channel, CB-5 TO DMH-6** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
1.9	397	Total			

Summary for Subcatchment CB-7&8:

Runoff = 12.98 cfs @ 12.20 hrs, Volume= 1.262 af, Depth> 5.68"

Runoff by SCS TR-20 method, UH=SCS, 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
97,400	98	Paved parking & roofs
18,800	39	>75% Grass cover, Good, HSG A
116,200	88	Weighted Average
18,800		16.18% Pervious Area
97,400		83.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	170	0.0500	0.22		**Sheet Flow, GRASS AREA** Grass: Short n= 0.150 P2= 2.00"
1.5	247	0.0190	2.80		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.1	22	0.0100	5.26	6.46	**Pipe Channel, CB-8 TO DMH-10** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
14.7	439	Total			

Summary for Subcatchment CB-9&10:

Runoff = 7.67 cfs @ 12.04 hrs, Volume= 0.581 af, Depth> 6.86"

Runoff by SCS TR-20 method, UH=SCS, 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
44,240	98	Paved parking & roofs
44,240		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	590	0.0460	4.35		**Shallow Concentrated Flow, PAVED AREA** Paved Kv= 20.3 fps
0.5	208	0.0200	7.44	9.14	**Pipe Channel, CB-9 TO DMH-10** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
2.8	798	Total			

Summary for Subcatchment LF 1-1:

Runoff = 37.69 cfs @ 12.15 hrs, Volume= 3.135 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, 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
410,600	69	50-75% Grass cover, Fair, HSG B
45,900	72	Dirt roads, HSG A
456,500	69	Weighted Average
456,500		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"
3.1	290	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	130	0.0800	14.08	302.69	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.033
0.2	200	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
2.0	950	0.0160	7.86	94.34	**Channel Flow, DRAINAGE SWALE** Area= 12.0 sf Perim= 10.0' r= 1.20' n= 0.027
10.4	1,620	Total			

Summary for Subcatchment LF 1-2:

Runoff = 21.16 cfs @ 12.10 hrs, Volume= 1.563 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, 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
227,400	69	50-75% Grass cover, Fair, HSG B
227,400		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"
0.5	50	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.5	120	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.7	420	0.0250	9.62	206.81	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.1	160	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
6.7	800	Total			

Summary for Subcatchment LF 1-3:

Runoff = 30.65 cfs @ 12.12 hrs, Volume= 2.401 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, 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
349,500	69	50-75% Grass cover, Fair, HSG B
349,500		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"
2.9	270	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.3	270	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	290	0.2200	16.12	338.49	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
8.4	880	Total			

Summary for Subcatchment LF 1-4:

Runoff = 25.64 cfs @ 12.11 hrs, Volume= 1.965 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, 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
286,000	69	50-75% Grass cover, Fair, HSG B
286,000		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"
2.1	200	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
0.5	445	0.0670	15.75	338.57	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.0	50	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
7.8	825	Total			

Summary for Subcatchment LF 1-5:

Runoff = 24.83 cfs @ 12.11 hrs, Volume= 1.864 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, 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
271,200	69	50-75% Grass cover, Fair, HSG B
271,200		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"
1.8	170	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.1	25	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.4	390	0.1000	15.74	338.42	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.033
7.2	635	Total			

Summary for Subcatchment LF 1-7:

Runoff = 42.43 cfs @ 12.10 hrs, Volume= 3.122 af, Depth> 4.34"

Runoff by SCS TR-20 method, UH=SCS, 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
222,500	98	Paved parking & roofs
153,300	43	Woods/grass comb., Fair, HSG A
375,800	76	Weighted Average
153,300		40.79% Pervious Area
222,500		59.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0330	1.16		**Sheet Flow, PAVEMENT SHEET FLOW** Smooth surfaces n= 0.011 P2= 2.00"
5.8	1,280	0.0330	3.69		**Shallow Concentrated Flow, PAVEMENT** Paved Kv= 20.3 fps
6.5	1,330	Total			

Summary for Subcatchment LF 2-1:

Runoff = 37.85 cfs @ 12.20 hrs, Volume= 3.481 af, Depth> 3.69"

Runoff by SCS TR-20 method, UH=SCS, 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
347,100	69	50-75% Grass cover, Fair, HSG B
145,700	72	Dirt roads, HSG A
492,800	70	Weighted Average
492,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0200	0.12		**Sheet Flow, PLATEAU FLOW** Grass: Short n= 0.150 P2= 2.00"
4.0	240	0.0200	0.99		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
1.1	170	0.1400	2.62		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	260	0.0850	17.74	381.34	**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
14.0	1,725	Total			

Summary for Subcatchment LF 2-2:

Runoff = 35.74 cfs @ 12.13 hrs, Volume= 2.850 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, 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
359,100	69	50-75% Grass cover, Fair, HSG B
55,800	72	Dirt roads, HSG A
414,900	69	Weighted Average
414,900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0410	0.16		**Sheet Flow, plateau flow** Grass: Short n= 0.150 P2= 2.00"
2.6	220	0.0410	1.42		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.2	85	0.0470	7.45	156.45	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
0.6	920	0.0570	27.33	1,311.94	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
0.0	60	0.1750	32.33	57.13	**Pipe Channel, Lateral Culvert** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.010
8.7	1,335	Total			

Summary for Subcatchment LF 2-3:

Runoff = 33.36 cfs @ 12.12 hrs, Volume= 2.599 af, Depth> 3.80"

Runoff by SCS TR-20 method, UH=SCS, 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
299,400	69	50-75% Grass cover, Fair, HSG B
37,400	72	Dirt roads, HSG A
20,500	98	Paved parking & roofs
357,300	71	Weighted Average
336,800		94.26% Pervious Area
20,500		5.74% 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"
1.8	170	0.0500	1.57		**Shallow Concentrated Flow, PLATEAU FLOW** Short Grass Pasture Kv= 7.0 fps
0.9	700	0.0460	13.05	280.53	**Channel Flow, DIVERSION BERM** Area= 21.5 sf Perim= 18.5' r= 1.16' n= 0.027
0.1	120	0.3300	19.74	414.56	**Channel Flow, LET DOWN CHANNEL** Area= 21.0 sf Perim= 31.5' r= 0.67' n= 0.033
0.6	300	0.0050	8.10	388.56	**Channel Flow, DRAINAGE SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
8.3	1,340	Total			

Summary for Subcatchment LF 2-4:

Runoff = 12.47 cfs @ 12.05 hrs, Volume= 0.818 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, 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
118,900	69	50-75% Grass cover, Fair, HSG B
118,900		100.00% Pervious 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"
0.1	25	0.3300	4.02		**Shallow Concentrated Flow, SIDESLOPE FLOW** Short Grass Pasture Kv= 7.0 fps
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
0.1	60	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	200	0.0400	22.90	1,099.02	**Channel Flow, PERIMETER SWALE** Area= 48.0 sf Perim= 16.0' r= 3.00' n= 0.027
3.1	735	Total			

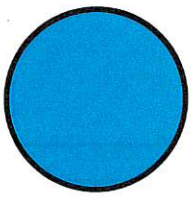
Summary for Reach 1-2A: DMH-1-2A

Inflow Area = 8.400 ac, 90.88% Impervious, Inflow Depth > 6.36" for 100 Year Storm event
Inflow = 49.25 cfs @ 12.05 hrs, Volume= 4.450 af
Outflow = 46.22 cfs @ 12.14 hrs, Volume= 4.449 af, Atten= 6%, Lag= 5.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.98 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.91 fps, Avg. Travel Time= 1.2 min

Peak Storage= 1,450 cf @ 12.08 hrs
Average Depth at Peak Storage= 2.50'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 43.02 cfs

30.0" Round Pipe
n= 0.013
Length= 290.0' Slope= 0.0110 '/'
Inlet Invert= 101.55', Outlet Invert= 98.36'



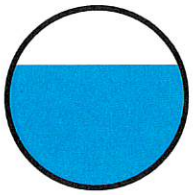
Summary for Reach 2-1: DMH-2 - DMH-1

Inflow Area = 6.332 ac, 87.90% Impervious, Inflow Depth > 6.20" for 100 Year Storm event
Inflow = 34.28 cfs @ 12.07 hrs, Volume= 3.269 af
Outflow = 34.53 cfs @ 12.07 hrs, Volume= 3.268 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.75 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.57 fps, Avg. Travel Time= 1.4 min

Peak Storage= 1,102 cf @ 12.07 hrs
Average Depth at Peak Storage= 1.70'
Bank-Full Depth= 2.50' Flow Area= 4.9 sf, Capacity= 43.03 cfs

30.0" Round Pipe
n= 0.013
Length= 309.0' Slope= 0.0110 '/'
Inlet Invert= 105.00', Outlet Invert= 101.60'



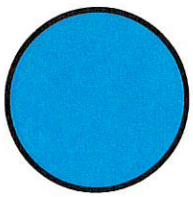
Summary for Reach 3-2: DMH-3 - DMH-2

Inflow Area = 4.088 ac,100.00% Impervious, Inflow Depth > 6.86" for 100 Year Storm event
Inflow = 28.92 cfs @ 12.03 hrs, Volume= 2.337 af
Outflow = 24.81 cfs @ 12.08 hrs, Volume= 2.336 af, Atten= 14%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.73 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.44 fps, Avg. Travel Time= 0.4 min

Peak Storage= 286 cf @ 12.00 hrs
Average Depth at Peak Storage= 2.00'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 24.76 cfs

24.0" Round Pipe
n= 0.013
Length= 91.0' Slope= 0.0120 '/'
Inlet Invert= 109.09', Outlet Invert= 108.00'



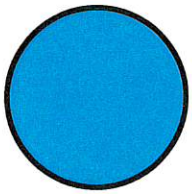
Summary for Reach 5-4-3: DMH-5 - DMH-4 - DMH-3

Inflow Area = 1.717 ac,100.00% Impervious, Inflow Depth > 6.86" for 100 Year Storm event
Inflow = 12.98 cfs @ 12.03 hrs, Volume= 0.982 af
Outflow = 11.78 cfs @ 12.02 hrs, Volume= 0.982 af, Atten= 9%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.35 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.90 fps, Avg. Travel Time= 0.7 min

Peak Storage= 211 cf @ 12.04 hrs
Average Depth at Peak Storage= 1.25'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 11.19 cfs

15.0" Round Pipe
n= 0.013
Length= 171.0' Slope= 0.0300 '/'
Inlet Invert= 117.85', Outlet Invert= 112.72'



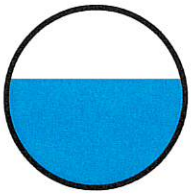
Summary for Reach 10-2A: DMH-10->2A

Inflow Area = 3.683 ac, 88.28% Impervious, Inflow Depth > 6.00" for 100 Year Storm event
Inflow = 16.18 cfs @ 12.18 hrs, Volume= 1.843 af
Outflow = 16.06 cfs @ 12.18 hrs, Volume= 1.842 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.14 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 3.01 fps, Avg. Travel Time= 2.3 min

Peak Storage= 811 cf @ 12.18 hrs
Average Depth at Peak Storage= 1.21'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 23.83 cfs

24.0" Round Pipe
n= 0.013
Length= 410.0' Slope= 0.0111 '/'
Inlet Invert= 102.40', Outlet Invert= 97.85'



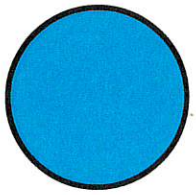
Summary for Reach 12-2: DMH-12-DMH-2

Inflow Area = 2.244 ac, 65.87% Impervious, Inflow Depth > 4.99" for 100 Year Storm event
Inflow = 12.91 cfs @ 12.04 hrs, Volume= 0.934 af
Outflow = 9.38 cfs @ 12.05 hrs, Volume= 0.933 af, Atten= 27%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.97 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.24 fps, Avg. Travel Time= 3.1 min

Peak Storage= 725 cf @ 12.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 9.27 cfs

18.0" Round Pipe
n= 0.013
Length= 410.0' Slope= 0.0078 '/'
Inlet Invert= 110.50', Outlet Invert= 107.31'



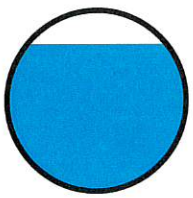
Summary for Reach 13-3: DMH-13 - DMH-3

Inflow Area = 1.388 ac,100.00% Impervious, Inflow Depth > 6.86" for 100 Year Storm event
Inflow = 10.50 cfs @ 12.02 hrs, Volume= 0.793 af
Outflow = 10.30 cfs @ 12.04 hrs, Volume= 0.793 af, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.77 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.43 fps, Avg. Travel Time= 1.1 min

Peak Storage= 244 cf @ 12.03 hrs
Average Depth at Peak Storage= 1.22'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 10.50 cfs

18.0" Round Pipe
n= 0.013
Length= 158.0' Slope= 0.0100 '/'
Inlet Invert= 111.13', Outlet Invert= 109.55'



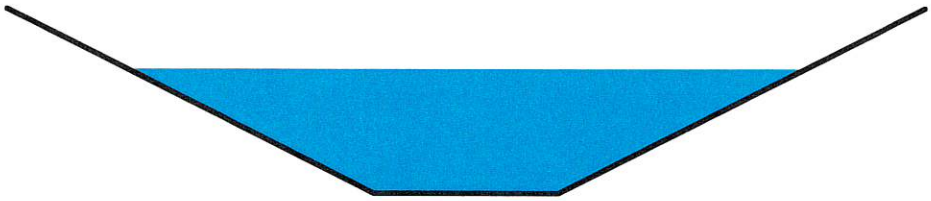
Summary for Reach LF1-R1:

Inflow Area = 29.442 ac, 17.35% Impervious, Inflow Depth > 3.80" for 100 Year Storm event
Inflow = 112.09 cfs @ 12.16 hrs, Volume= 9.335 af
Outflow = 107.80 cfs @ 12.21 hrs, Volume= 9.318 af, Atten= 4%, Lag= 3.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.30 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.60 fps, Avg. Travel Time= 4.7 min

Peak Storage= 11,408 cf @ 12.18 hrs
Average Depth at Peak Storage= 2.70'
Bank-Full Depth= 4.00' Flow Area= 48.0 sf, Capacity= 257.98 cfs

4.00' x 4.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 20.00'
Length= 450.0' Slope= 0.0050 '/'
Inlet Invert= 94.50', Outlet Invert= 92.25'



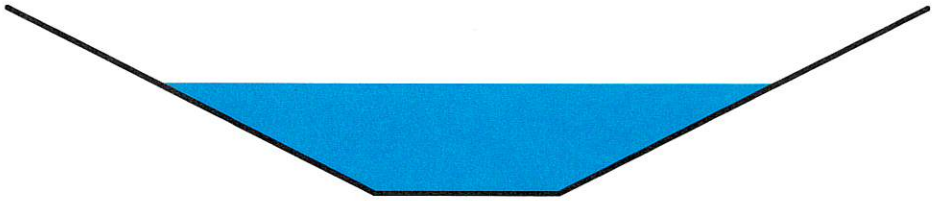
Summary for Reach LF1-R2:

Inflow Area = 21.419 ac, 23.85% Impervious, Inflow Depth > 3.89" for 100 Year Storm event
Inflow = 87.57 cfs @ 12.12 hrs, Volume= 6.946 af
Outflow = 83.40 cfs @ 12.17 hrs, Volume= 6.934 af, Atten= 5%, Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.12 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 4.5 min

Peak Storage= 8,289 cf @ 12.14 hrs
Average Depth at Peak Storage= 2.37'
Bank-Full Depth= 4.00' Flow Area= 48.0 sf, Capacity= 264.35 cfs

4.00' x 4.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 20.00'
Length= 400.0' Slope= 0.0052 '/'
Inlet Invert= 96.60', Outlet Invert= 94.50'



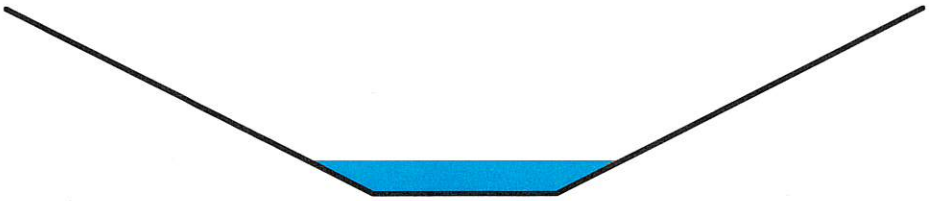
Summary for Reach LF1-R3:

Inflow Area = 6.226 ac, 0.00% Impervious, Inflow Depth > 3.59" for 100 Year Storm event
Inflow = 24.83 cfs @ 12.11 hrs, Volume= 1.864 af
Outflow = 23.28 cfs @ 12.17 hrs, Volume= 1.859 af, Atten= 6%, Lag= 3.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.10 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 2.01 fps, Avg. Travel Time= 5.8 min

Peak Storage= 2,724 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.72'
Bank-Full Depth= 4.00' Flow Area= 48.0 sf, Capacity= 747.69 cfs

4.00' x 4.00' deep channel, n= 0.033
Side Slope Z-value= 2.0 '/' Top Width= 20.00'
Length= 700.0' Slope= 0.0420 '/'
Inlet Invert= 126.00', Outlet Invert= 96.60'



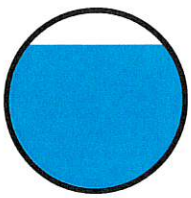
Summary for Reach LF2-R2:

Inflow Area = 31.770 ac, 1.48% Impervious, Inflow Depth > 3.68" for 100 Year Storm event
Inflow = 101.66 cfs @ 12.16 hrs, Volume= 9.738 af
Outflow = 99.84 cfs @ 12.20 hrs, Volume= 9.728 af, Atten= 2%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.28 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 3.96 fps, Avg. Travel Time= 2.7 min

Peak Storage= 6,835 cf @ 12.18 hrs
Average Depth at Peak Storage= 3.22'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 102.28 cfs

48.0" Round Pipe
n= 0.010
Length= 630.0' Slope= 0.0030 '/'
Inlet Invert= 95.01', Outlet Invert= 93.12'



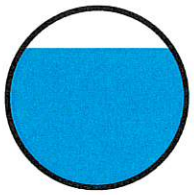
Summary for Reach LF2-R3:

Inflow Area = 20.838 ac, 0.00% Impervious, Inflow Depth > 3.64" for 100 Year Storm event
Inflow = 68.75 cfs @ 12.17 hrs, Volume= 6.329 af
Outflow = 67.20 cfs @ 12.21 hrs, Volume= 6.322 af, Atten= 2%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.47 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 3.58 fps, Avg. Travel Time= 2.7 min

Peak Storage= 4,566 cf @ 12.18 hrs
Average Depth at Peak Storage= 2.72'
Bank-Full Depth= 3.50' Flow Area= 9.6 sf, Capacity= 71.64 cfs

42.0" Round Pipe
n= 0.010
Length= 570.0' Slope= 0.0030 '/'
Inlet Invert= 97.22', Outlet Invert= 95.51'



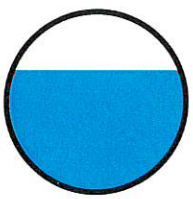
Summary for Reach LF2-R4:

Inflow Area = 11.313 ac, 0.00% Impervious, Inflow Depth > 3.69" for 100 Year Storm event
Inflow = 37.85 cfs @ 12.20 hrs, Volume= 3.481 af
Outflow = 37.44 cfs @ 12.22 hrs, Volume= 3.478 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.46 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 3.06 fps, Avg. Travel Time= 1.5 min

Peak Storage= 1,370 cf @ 12.21 hrs
Average Depth at Peak Storage= 2.02'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 47.49 cfs

36.0" Round Pipe
n= 0.010
Length= 270.0' Slope= 0.0030 '/'
Inlet Invert= 98.53', Outlet Invert= 97.72'



Summary for Pond 1A: POND 1A

Inflow Area = 45.142 ac, 11.32% Impervious, Inflow Depth > 3.73" for 100 Year Storm event
Inflow = 156.14 cfs @ 12.19 hrs, Volume= 14.016 af
Outflow = 125.35 cfs @ 12.31 hrs, Volume= 13.450 af, Atten= 20%, Lag= 7.5 min
Primary = 125.35 cfs @ 12.31 hrs, Volume= 13.450 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= 93.70' @ 12.31 hrs Surf.Area= 37,949 sf Storage= 103,029 cf (100,029 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= 42.0 min calculated for 13.354 af (95% of inflow)
Center-of-Mass det. time= 16.2 min (851.1 - 834.9)

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=120.81 cfs @ 12.31 hrs HW=93.69' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 82.95 cfs @ 11.74 fps)
└—**2=Broad-Crested Rectangular Weir** (Weir Controls 37.86 cfs @ 1.17 fps)

Summary for Pond 1B: POND 1B

Inflow Area = 45.142 ac, 11.32% Impervious, Inflow Depth > 3.58" for 100 Year Storm event
Inflow = 125.35 cfs @ 12.31 hrs, Volume= 13.450 af
Outflow = 6.74 cfs @ 16.39 hrs, Volume= 7.141 af, Atten= 95%, Lag= 244.5 min
Primary = 6.74 cfs @ 16.39 hrs, Volume= 7.141 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Starting Elev= 74.00' Surf.Area= 11,000 sf Storage= 32,400 cf
Peak Elev= 89.35' @ 16.39 hrs Surf.Area= 35,229 sf Storage= 379,802 cf (347,402 cf above start)
Flood Elev= 93.50' Surf.Area= 58,225 sf Storage= 559,525 cf (527,125 cf above start)

Plug-Flow detention time= 343.2 min calculated for 6.384 af (47% of inflow)
Center-of-Mass det. time= 132.3 min (983.4 - 851.1)

Volume	Invert	Avail.Storage	Storage Description
#1	70.00'	735,600 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.00	5,800	0	0
72.00	7,800	13,600	13,600
74.00	11,000	18,800	32,400
76.00	13,800	24,800	57,200
78.00	16,500	30,300	87,500
80.00	19,700	36,200	123,700
82.00	23,000	42,700	166,400
84.00	26,000	49,000	215,400
86.00	29,300	55,300	270,700
88.00	33,000	62,300	333,000
90.00	36,300	69,300	402,300
92.00	41,800	78,100	480,400
94.00	63,700	105,500	585,900
96.00	86,000	149,700	735,600

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=6.74 cfs @ 16.39 hrs HW=89.35' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 6.74 cfs)

Summary for Pond 2A: POND 2A

Inflow Area = 54.634 ac, 34.12% Impervious, Inflow Depth > 4.66" for 100 Year Storm event
Inflow = 194.51 cfs @ 12.11 hrs, Volume= 21.227 af
Outflow = 12.20 cfs @ 15.31 hrs, Volume= 13.061 af, Atten= 94%, Lag= 191.6 min
Primary = 12.20 cfs @ 15.31 hrs, Volume= 13.061 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Starting Elev= 82.00' Surf.Area= 14,400 sf Storage= 24,200 cf
Peak Elev= 96.78' @ 15.31 hrs Surf.Area= 63,718 sf Storage= 551,660 cf (527,460 cf above start)
Flood Elev= 100.00' Surf.Area= 79,400 sf Storage= 777,400 cf (753,200 cf above start)

Plug-Flow detention time= 316.5 min calculated for 12.505 af (59% of inflow)
Center-of-Mass det. time= 166.7 min (966.7 - 800.0)

Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	777,400 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
80.00	9,800	0	0
82.00	14,400	24,200	24,200
84.00	19,400	33,800	58,000
86.00	24,600	44,000	102,000
88.00	30,200	54,800	156,800
90.00	36,000	66,200	223,000
92.00	42,100	78,100	301,100
94.00	48,500	90,600	391,700
96.00	61,100	109,600	501,300
98.00	67,800	128,900	630,200
100.00	79,400	147,200	777,400

Device	Routing	Invert	Outlet Devices
#1	Primary	80.00'	**8.270 in/hr Exfiltration over Surface area**

Primary OutFlow Max=12.20 cfs @ 15.31 hrs HW=96.78' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 12.20 cfs)

APPENDIX 3

TOTAL SUSPENDED SOLID REMOVAL CALCULATION WORKSHEET

Total Suspended Solid Removal Calculation Worksheet

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)
Water Quality Swale	70%	1.00*	0.70	0.30
Fore Bay	25%	0.30	0.08	0.23
Infiltration Basin (Pre-Treatment)	80%	0.23	0.18	0.05
		Total TSS Removal=	96%	

Project: Phase 6 Landfill Expansion

Prepared By: ARQ

Date: 2/13/2018

* Equals remaining load from previous BMP (E) which enters the BMP

APPENDIX 4

STORM WATER 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

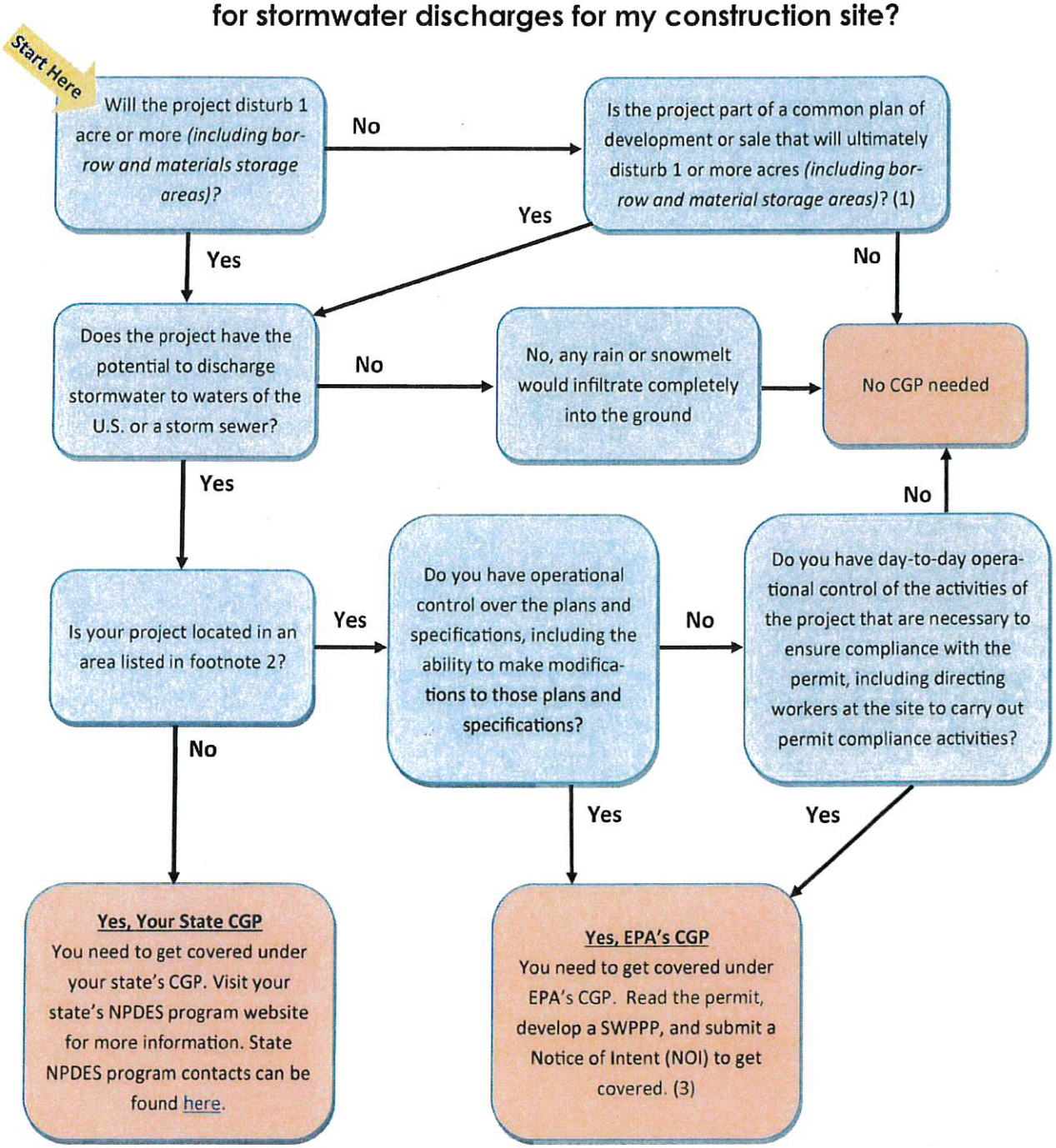
Once landfilled areas have reached final grades, the final cover system will be constructed to serve as an infiltration barrier to minimize further leachate production from the Landfill. The final cover

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 swales along the perimeter of the landfill.
- Perimeter stone-lined or grass lined drainage swales, will be constructed along the perimeter of the landfill and landfill access roads.

All final cover runoff will be diverted, via drainage swales, into storm water basins around the perimeter of the Landfill. The storm water control system has been constructed prior to the operation of the Landfill.

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

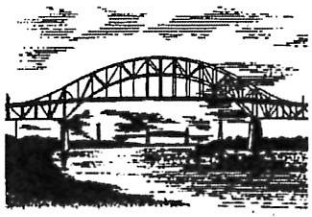
ATTACHMENT 4

CERTIFIED ABUTTERS LIST
TITLE INFORMATION

TOWN OF BOURNE

Board of Assessors
24 Perry Avenue
Buzzards Bay, MA 02532
(508) 759-0600 Ext. 1510 ♦ Fax (508) 759-8026

Anne Ekstrom, Chairman
Priscilla A. Koleshis, Clerk
Michael Leitzel, Member



Bruce Cabral, MAA,
Director of Assessing

September 4, 2018

Phil Goddard
Manager of Facility Compliance & Technology Development
Town of Bourne, ISWM Dept.
24 Perry Ave
Bourne, MA 02532

Reference: Abutters List for Map 28 Parcel 13, Map 32 Parcel 5 and 9
201 MacArthur Blvd, 325 MacArthur Blvd, 0 MacArthur Blvd

This is to certify that the enclosed list of names and addresses constitutes all of the abutters as defined in 310 CMR 16.02 of the subject property on the most recent tax list of the Town of Bourne. The purpose of the abutters list is for an application for a DRI submittal to the Cape Cod Commission for the Bourne Landfill on Map 28 Parcel 13 and Map 31 Parcels 5 and 9.

Abutting properties are: Map 27 Parcels 86, 87, 153, 184 and 186; Map 28 Parcel 12; Map 31 Parcels 8, 31, 33.01, 37 and 124; Map 31.4 Parcel 15; Map 32 Parcel 6.01; Map 44 Parcel 50.

See enclosed Data Base Inquiry Forms for abutters mailing addresses.

Board of Assessors

Anne Ekstrom
Priscilla Koleshis
Michael Leitzel

List Enclosed

Extract: 1 Abutters List
Database: LIVE
Filter: Key IN 5832,5836,5939,16423,16425,5967,6601,6682,6685,6686,16478,6963,7041,9709
Sort:

Report #24: Owner Listing Report

Fiscal Year 2019

Bourne MA

Key	Parcel ID	Owner	Location	LCI/CI	Bk-Pg(Cert) /Dt	Mailing Street	Mailing City	ST	Zip Cd/County
5832	27.0-86-0	SJC PROPERTIES LLC	170 MACARTHUR BLVD	N 3380	26838/263 11/8/2012	170 MACARTHUR BLVD	BOURNE	MA	02532
5836	27.0-87-0	RAPONI FRANCO TRS OF PAESANO REALTY TRUST	119-123 WATERHOUSE RD	N 3420	22975/95 6/12/2008	PO BOX 3139	POCASSET	MA	02559
5939	27.0-153-0	WATERHOUSE PROPERTIES LLC	124 WATERHOUSE RD	N 3300	28594/56 12/23/2014	124 WATERHOUSE RD	BOURNE	MA	02532
16423	27.0-184-0	FLETCHER JOHN P TRS BOURNE TECHNOLOGY PARK REALTY TRUST	3 TECHNOLOGY PARK DR	Y 3400	161440 10/6/2009	C/O MERCANTILE PROP MGMT PO BOX 790	BUZZARDS BAY	MA	02532
16425	27.0-186-0	FLETCHER JOHN P TRS BOURNE TECHNOLOGY PARK REALTY TRUST	2 TECHNOLOGY PARK DR	Y 3420	161440 10/6/2009	C/O MERCANTILE PROP MGMT PO BOX 790	BUZZARDS BAY	MA	02532
5967	28.0-12-0	MONUMENT BEACH SPORTSMAN CLUB	0 MACARTHUR BLVD	N 0380	1366/51 5/17/1967	P O BOX 331	MONUMENT BEACH	MA	02553-0331
6601	31.0-8-0	JMM REAL ESTATE LLC	280 MACARTHUR BLVD	N 3370	28703/269 2/26/2015	290 MACARTHUR BLVD	BOURNE	MA	02532
6682	31.0-31-0	MACARTHUR BOULEVARD LLC MISKINIS MOTORS	1 MOTOR WAY	N 3900	13719/192 4/11/2001	SHARKANSKY LLP- DAVID ORLOFF 1350 BELMONT ST	BROCKTON	MA	02301
6685	31.0-33-1	JMM REAL ESTATE LLC	290 MACARTHUR BLVD	N 3300	28703/269 2/26/2015	290 MACARTHUR BLVD	BOURNE	MA	02532
6686	31.0-37-0	BAY VIEW CAMPGROUNDS INC	260-270 MACARTHUR BLVD	N 3860	01817/0347	260 MACARTHUR BLVD	BOURNE	MA	02532-3836
16478	31.0-124-0	MACARTHUR BOULEVARD LLC MISKINIS MOTORS	2 MOTOR WAY	N 3900	13719/192 4/11/2001	SHARKANSKY LLP- DAVID ORLOFF 1350 BELMONT ST	BROCKTON	MA	02301
6963	31.4-15-0	CIRCLE O LLC & MACARTHUR PARK PLACE LLC	340 MACARTHUR BLVD	N 3880	22357/279 9/24/2007	C/O COASTAL MANAGEMENT 270 COMMUNICATION WAY UT 7B	HYANNIS	MA	02601
7041	32.0-6-1	NSTAR ELECTRIC CO	0 MACARTHUR BLVD	N 4400	NA/NA 1/3/2007	PO BOX 270	HARTFORD	CT	06141-0270
9709	44.0-50-0	COMMONWEALTH OF MASSACHUSETTS MASS. MILITARY RESERVATION	0 OTIS A F BASE	N 9160	N/A/N/A	C/O COMMANDER 158 REILLY ST, BOX 3	OTIS ANGB	MA	02542-1330

Total Records 14

To: Phil Goddard - ISWM

From: Bruce Cabral – Assessor's Office X1328

Date: 09/05/2018

Re: ISWM / Town Ownership - Map – Parcels 28.0-13, 32.0-5 & 32.0-9

Phil,

These pages (2 copies) relate to the ISWM parcels and their deed references.
Thanks for your patience on this.

Let me know if anything else is needed.

Thanks, Bruce

bcabral@townofbourne.com

Extract: ISWM- TOWN OWNERSHIP REFS
Database: LIVE
Filter: Key IN 5968,7039,15727
Sort: Key ASC

Report #24: Owner Listing Report

Fiscal Year 2019

Bourne MA

Key	Parcel ID	Owner	Location	LCt/Cl	Bk-Pg(Cert) /Dt	Mailing Street	Mailing City	ST	Zip Cd/County
5968	28.0-13-0	TOWN OF BOURNE DUMP & HIGHWAY DEPT	201 MACARTHUR BLVD	N 9970	1351/456 11/9/1966	24 PERRY AVE	BUZZARDS BAY	MA	02532
7039	32.0-5-0	TOWN OF BOURNE	325 MACARTHUR BLVD	N 9300	29639/278 5/10/2016	24 PERRY AVE	BUZZARDS BAY	MA	02532
15727	32.0-9-0	TOWN OF BOURNE	0 MACARTHUR BLVD	N 9970	13637/54 3/15/2001	24 PERRY AVENUE	BUZZARDS BAY	MA	02532

Total Records 3

ATTACHMENT 5

AERIAL PHOTOGRAPHS 1999 AND 2018
EXCERPTS FROM THE TOWN OF BOURNE LOCAL COMPREHENSIVE PLAN AND THE CAPE COD COMMISSION REGIONAL POLICY PLAN
CAPE COD COMMISSION ACT GOALS

ISWM Facility 1999


ISWM Facility January 2018

Section 19.0 - SOLID WASTE MANAGEMENT

The Department of public works provides Bourne residents with weekly curbside pickup of solid waste and certain recyclable materials. Other recyclables can be dropped off at the landfill site on MacArthur Blvd. Hazardous materials are collected at several regional collection days each year. Bourne generates less than one ton of solid waste per year-round resident, which is comparable to that generated by Brewster, Mashpee and Sandwich, but considerably lower than the amounts generated by other Cape Cod towns.

Bourne's recycling program began in 1989 when volunteers set up a drop-off area at the landfill. The following year biweekly curbside recycling began, one of the first such services in southeastern Massachusetts. By 2000 Bourne was recycling more than 40% of its solid waste, meeting the year 2005 goal of the Cape Cod Commission's Regional Policy Plan, and exceeding the percentage recycled by all but two other Cape Cod towns.

A composting program also began in 1989, collecting leaves, grass and Christmas trees. Over the years the program has expanded to include brush and stumps as well. Material for composting is ground up and placed in windrows, where it is converted to compost for use by Bourne residents. The composting operation has been moved to a 25-acre site abutting the old landfill, which was purchased by the town for that purpose.

Bourne landfill and recycling operations are managed by the Department of Integrated Solid Waste Management (ISWM), which operates under a separate ISWM Enterprise Fund that does not use general revenues for normal operations.

ISWM was created in 1997 in order to modernize operation of the landfill, generate revenues and meet new State regulations for management of solid waste. Bourne's 78-acre site was permitted by the State for a regional landfill operation accepting only non-MSW, primarily construction and demolition (C&D) debris, with the understanding that the town would invest in a major C&D processing facility by the end of 2003.

After analyzing market conditions and the changing regulatory situation, however, the Board of Selectmen chose not to construct this facility. Instead, they instructed ISWM to seek permits to allow disposal of MSW and incinerator ash. ISWM was granted a permit for MSW only, and is currently landfilling MSW. The Massachusetts Department of Environmental Protection recently changed its regulations to allow for co-disposal of incinerator ash in the landfill, but ISWM is not currently accepting ash for disposal. C&D materials, other than processing plant residuals and difficult to manage materials, are no longer landfilled, but are transferred to an off-site processor.

In May 2005, Town Meeting authorized ISWM to spend one million dollars of net assets from the enterprise fund to construct a permanent enclosed C&D transfer station on the abutting 25-acre parcel of town-owned land. The Board of Health subsequently voted to assign this parcel for all solid waste management activities other than landfilling or incineration.

Some town officials have become increasingly uncomfortable with being financially dependent on the roughly $2 Million in benefits Bourne receives from ISWM, given the unpredictable nature of a business heavily controlled by constantly changing state regulations and market conditions. As a consequence, town officials are currently examining options to limit investment, gradually wean the town from its financial dependency, and to extend the life of the facility as long as possible.

19.1 - Solid Waste Management Goal

The solid waste management goal of the Bourne Local Comprehensive Plan is to continue to maximize recycling and composting of solid waste; to recycle or compost more than 60 percent of all solid waste by 2010; and to dispose of the waste that cannot be recycled in an economical and environmentally sound manner.

19.2 - Solid Waste Management Policies

- Minimize the amount of solid waste that is generated.
- Maximize the amount of solid waste that is recycled.
- Reduce financial dependency on landfill operations and extend the life of the landfill facility, while assuring that long-term environmental safety remains an overriding concern.

19.3 - Highest Priority Actions for Solid Waste Management

- Monitor developing waste reduction programs and adopt successful models to reduce volumes of waste being generated by residents and businesses.
  Responsibility: DPW, ISWM and Recycling Committee
  Estimated cost: None
  Time schedule: Immediate and continuing
- Expand curbside recycling to include all materials now accepted at the drop-off facility.
  Responsibility: ISWM and DPW
  Estimated cost: To be determined
  Time schedule: 2006
- Improve enforcement of the mandatory recycling bylaw and target businesses and households that are not recycling with education and incentives to comply with the bylaw.
  Responsibility: DPW, ISWM and Recycling Committee
  Estimated cost: $2,000 for brochures and posters
  Time schedule: 2006 and continuing
- Continue the town's extensive household hazardous waste management programs in order to prevent hazardous waste from entering the landfill or otherwise being disposed of improperly.
  Responsibility: ISWM and DPW
  Estimated cost: None
  Time schedule: Immediate and continuing

19.4 - Second Priority Actions for Solid Waste Management

- Increase recycling from businesses and multi-family residential developments.
  Responsibility: DPW, ISWM and Recycling Committee
  Estimated cost: None
  Time schedule: Continuing
- Consider adding other biodegradable materials to the composting program.
  Responsibility: DPW, ISWM and Recycling Committee
  Estimated cost: To be determined
  Time schedule: 2008

19.5 - Other Priority Actions for Solid Waste Management

- Continue to explore more economical or efficient options for disposing of non-recyclable wastes in an environmentally sound manner.
  Responsibility: DPW and ISWM
  Estimated cost: Reduction in costs
  Time schedule: Continuing

- Explore adoption of a toxic and hazardous materials bylaw or regulation based on the Cape Cod Commission's model.
  Responsibility: Town Administrator and ISWM
  Estimated cost: None
  Time schedule: 2006

Waste Management

Municipal solid waste (MSW) includes garbage and refuse generated in homes, offices, and industries, leaf and yard wastes, and construction and demolition (C&D) debris. This Regional Policy Plan sets forth a vision of managing solid wastes in a cost-effective and environmentally responsible way.

This means first reducing, at the source of production or purchase, the total amount of solid waste created. For organic wastes such as food or yard waste, the plan promotes composting. Collection and marketing of recyclables are regarded as an essential element in reducing the waste stream. Incineration of wastes should be used only when all of the previously mentioned options have been exhausted. The highest priority should be for waste reduction and composting.

Like other regions of New England, Cape Cod faces the challenge of managing its solid and hazardous wastes in an environmentally sound manner. Thousands of households and businesses dispose of small quantities of hazardous materials and/or wastes at the SEMASS waste-incineration facility in Rochester, Massachusetts, or pour hazardous materials or wastes down the drain to septic systems and sewage treatment plants. Environmental regulations require increasingly sophisticated waste management strategies and administrative arrangements to ensure compliance. Cape Cod citizens support efforts to protect the environment from the adverse impacts of solid waste collection, transport, and disposal. Nine out of 10 respondents to the 2005 Cape Cod Residents Survey called "protecting the Cape's drinking water supply" a high priority, while the regulation most supported by respondents was one that "prohibits storage or use or hazardous materials or waste near public water supplies."

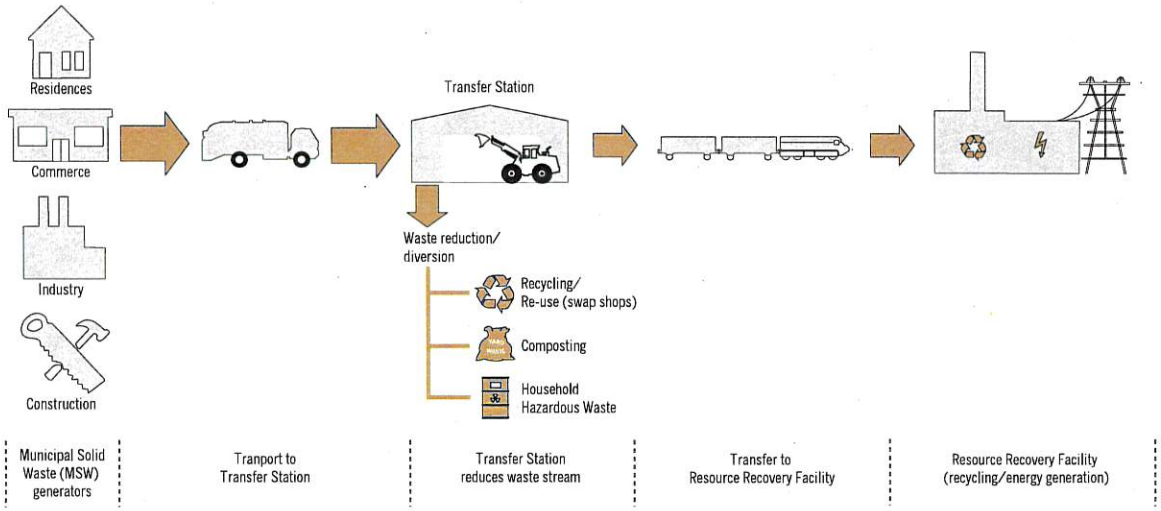
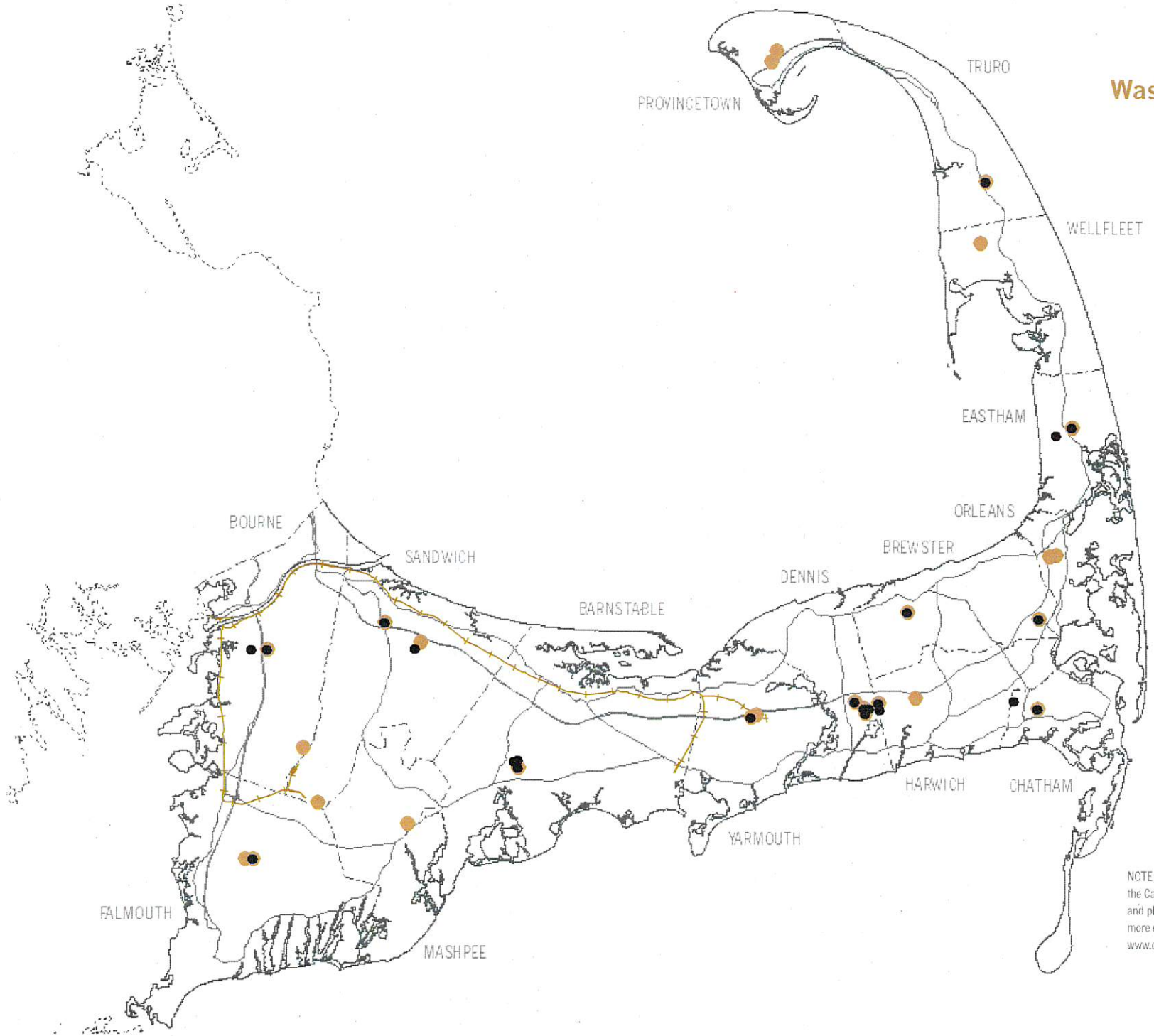


Diagram WM1: Elements of the Disposal Process for Municipal Solid Waste Generated on Cape Cod



Waste Management Facilities

Cape Cod's solid waste is transported mainly by train and truck. This map shows the waste management facilities and landfills located on primary transportation routes. At these facilities and landfills, it is critical to minimize or prevent pollution from the waste stream from seeping into the groundwater.

- Resource Recycling Facilites
- Capped Landfills and Transfer Stations
- Railways Used for Shipping Waste

NOTE: All maps in the Regional Planning section of the Cape Cod Regional Policy Plan are for illustration and planning purposes only. They may be viewed in more detail online: www.capecodcommission.org/regionalplans/RPP/

Waste Management

Goal WM1

Hazardous Materials and Waste Management

To protect Cape Cod's water resources by prohibiting activities that contaminate the water supply, and to support actions by households and businesses that promote the handling, storage, and disposal of hazardous materials and wastes in an environmentally sound manner.

The Cape Cod Commission promotes the protection of the Cape's drinking water supply. In cooperation with the Cape Cod Cooperative Extension and local household hazardous waste management programs, the Commission works to educate consumers and businesses about buying, using, and disposing of hazardous materials and wastes.

90 % *

Nine out of ten of respondents called "protecting the Cape's drinking water supply" a high priority, while the regulation most supported by respondents was one that "prohibits storage or use or hazardous materials or waste near public water supplies."

* Survey of Cape residents conducted in 2005 by the Center for Survey Research of the University of Massachusetts-Boston

Cape Cod Commission Actions

WM1-C1 **Hazardous Waste Education:** The Cape Cod Commission will work to educate and assist residents, businesses, institutions, and governments to reduce hazardous materials and wastes.

WM1-C2 **Hazardous Waste Policy:** The Cape Cod Commission will assist the state with its development of hazardous waste policies and regulations by participating on advisory committees to the Massachusetts Department of Environmental Protection.

WM1-C3 **Hazardous Waste Collection and Reporting:** The Cape Cod Commission will assist towns with bid processes, coordination, data collection, and development of educational materials for household hazardous waste collection programs.

Recommended Town Actions

WM1-T1 **Hazardous Waste Bylaw:** The towns should adopt a toxic and hazardous materials bylaw or regulation, using the Cape Cod Commission's model bylaw or similar regulations.

WM1-T2 **Hazardous Waste Collection:** The towns should hold periodic household hazardous waste collection events and establish other programs at transfer stations to manage other hazardous wastes such as mercury-containing wastes, fluorescent bulbs, antifreeze, and waste oil.

WM1-T3 **Hazardous Waste Emergency Response Plan:** The towns should develop and maintain an emergency response plan for spills of hazardous materials during transit.

Solid Waste Management

To manage solid waste using an integrated solid waste management system that includes waste reduction, recycling, and composting, and to divert 60 percent of municipal solid waste from incinerator and landfill facilities through recycling and composting programs by 2012.

Communities are seeking economical and innovative ways to manage municipal solid waste properly. On Cape Cod, these trends are clearly demonstrated by:

- an emphasis on increasing the percentage of household waste that is recycled and on expanding markets for recyclables;
- waste-to-energy facilities with advanced air-pollution control technologies; and
- a trend towards regionalization of waste management.

Cape residents strongly support recycling efforts. Every town on Cape Cod has a recycling program, and six towns have mandatory recycling bylaws. In 2006, residential recycling rates here varied by town from 15 to 50 percent, with the Cape-wide average being approximately 30 percent. To increase recycling rates, the Regional Policy Plan recommends regional efforts in cooperation with realtors, tourism businesses, and chambers of commerce to encourage recycling by tourists and seasonal residents, with a goal of achieving a Cape-wide recycling rate of 60 percent by 2012.

In 1985, 14 Cape Cod towns signed 30-year contracts with SEMASS. With the current contracts due to expire by 2015, renegotiation of disposal contracts should be a priority for Cape communities. If Cape towns work cooperatively to manage solid waste as a region, they will gain economies of scale and greater bargaining power. Partnerships between all Cape towns and Barnstable County will help the region to manage solid wastes in a safe, cost-effective manner.

Cape Cod Commission Actions

WM2-C1	**Solid Waste Financing:** The Cape Cod Commission will assist towns, at their request, in adopting full-cost accounting methods in solid waste management to demonstrate the financial benefits of adopting a pay-as-you-throw solid waste disposal program.
WM2-C2	**Solid Waste Disposal:** The Cape Cod Commission will monitor SEMASS contractual issues through participation in the Council of SEMASS Communities. The Commission will also research long-term alternatives to SEMASS waste-incineration services for solid waste disposal.
WM2-C3	**Recycling:** The Cape Cod Commission will, at a town's request, prepare a model agreement between a town and private waste and recycling haulers for the mandatory collection and transport of recyclables.

Recommended Town Actions

WM2-T1	**Solid Waste Financing:** The towns should adopt accounting methods that reflect all capital costs and operational expenses of municipal recycling and waste disposal services.
WM2-T2	**Integrated Waste Management:** The towns should develop an integrated system of waste management that involves recycling, composting, incineration, and landfilling for dealing with municipal solid waste, bio-solids, and construction and demolition materials.

Goal WM1: Hazardous Materials and Waste

To protect Cape Cod's drinking water by prohibiting land use activities involving the handling, storage, and disposal of hazardous materials and wastes that pose a significant threat to groundwater supplies.

	Minimum Performance Standards	Reference
WM1.1	**Hazardous Materials/Waste Restrictions:** Development and redevelopment that involves the use, treatment, generation, handling, storage, or disposal of Hazardous Materials and/or Hazardous Wastes, with the exception of Household Quantities or less, shall not be allowed within Wellhead Protection Areas and Potential Public Water Supply Areas, except as provided in WM1.2 and WM1.3.	Water Resources Classification Map I
WM1.2	**Credit for Redevelopment:** Redevelopment within Wellhead Protection Areas that involves use, treatment, generation, handling, storage, or disposal of Hazardous Materials and/or Hazardous Wastes may be allowed to exceed the limits in WM1.1 provided that the quantity of hazardous materials is less than the quantity from the prior use and provided adequate documentation of the previous volume is approved by the Commission.	Water Resources Classification Map I
WM1.3	**Credit for Removal of Development:** Development and redevelopment within Wellhead Protection Areas that involves the use, treatment, handling, storage, or disposal of Hazardous Materials and/or Hazardous Wastes may be allowed to exceed the quantity limits of hazardous materials in WM1.1 up to, but not exceeding the amount, that the development or redevelopment permanently eliminates at another facility, project, or site within the same Wellhead Protection Area and provided adequate documentation of the volume eliminated is approved by the Commission.	Water Resources Classification Map I
WM1.4	**Pollution Prevention and Emergency Response Plan:** Development and redevelopment in Wellhead Protection Areas and Potential Public Water Supply Areas shall prepare a Pollution Prevention and Emergency Response plan for both the construction phase and normal operations that identifies potential contamination sources, threats of Hazardous Material and Hazardous Waste releases to the environment, describes material storage and handling details, containment and contingency plans for spill response, and documents regular inspection and employee education opportunities.	Water Resources Classification Map I
WM1.5	**Compliance with Massachusetts Hazardous Waste Regulations:** Any development or redevelopment that uses, handles, generates, treats, or stores Hazardous Waste shall be in compliance with Massachusetts Hazardous Waste Regulations, 310 CMR 30.0 for the purposes of Cape Cod Commission review by providing the Commission with evidence of the following: (a) registration with or notification to the Massachusetts Department of Environmental Protection as a generator of Hazardous Waste; (continued on next page)	

Goal WM1 (continued)

WM1.5 (cont.)	(b) a written plan or protocol to manage the Hazardous Waste prior to disposal; (c) a signed contract with a registered, licensed company to dispose of the Hazardous Waste.	
	Best Development Practices	
WM1.6	**Elimination of Hazardous Materials/Waste:** Development and redevelopment is encouraged to eliminate Hazardous Materials or Hazardous Waste handled, treated, generated, used, or stored at a pre-existing facility, site, or project.	

Goal WM2: Solid Waste

To manage solid waste using an integrated solid waste management system that includes waste reduction, recycling, and composting and to divert 60 percent of municipal solid waste from incinerator and landfill facilities through recycling and composting programs by 2012.

	Minimum Performance Standards	Reference
WM2.1	**Construction Waste:** Development and redevelopment projects shall address the disposal of construction waste at both the construction and post-construction phases of development or redevelopment. To do so, a plan shall be provided to demonstrate how the applicant proposes to handle solid wastes, construction and demolition (C&D) wastes, and recyclable materials currently categorized by the Massachusetts Department of Environmental Protection (DEP) as a waste ban material.	
WM2.2	**C&D Waste Plan:** If C&D waste is to be generated as a part of the proposed development or redevelopment, a plan shall be provided that specifies: • a listing of C&D wastes that will be generated during the development or redevelopment; • the method for separating, storing, transporting, and disposing of gypsum (wall board and sheetrock) from the remainder of the waste stream; and • the methods that will be used to recycle or dispose of those remaining materials in the C&D waste stream.	

Goal WM2 (continued)

WM2.3 **Post-construction Waste:** A solid waste and recycling management plan shall be provided that identifies how both solid wastes and recyclable materials will be handled in the post-construction phase of the development. In particular, the applicant shall provide a plan detailing how waste ban materials (particularly plastic, glass containers, and cardboard) will be collected, stored on site, and recycled.

WM2.4 **Food-waste Recycling:** A post-construction management plan shall be provided by those developments (primarily supermarkets) generating significant amounts of food wastes to demonstrate how an applicant will recycle organic materials. A plan shall specify, at a minimum:

- the anticipated amounts of organic wastes to be generated;
- the manner by which the organic wastes will be stored on site prior to being sent off site; and
- the destination of the organic waste materials that will be composted.

The organics recycling program shall be consistent with the standards outlined in the DEP voluntary Supermarket Recycling Program Certification guidelines.

CAPE COD COMMISSION ACT GOALS

1. **Protect public health, safety, and general welfare**

2. **Protect, enhance and preserve the following unique values and resources of Cape Cod: natural, coastal, scientific, historical, cultural, architectural, archaeological, and recreational.** The RPP must include Identification of critical resources and management needs including the values and resource listed above as well as aesthetic and economic resources, groundwater and surface water supplies, available open space, and available regions for agriculture, aquaculture and development activity. The RPP must include a growth policy including guidelines for the protection of resources. The RPP must include regional goals for the provision of open space, recreation, coastal resources and historic preservation.

3. **Maintain and enhance sound local and regional economies by promoting the expansion of employment opportunities; ensuring balanced and sustainable economic growth and development capable of absorbing the effects of seasonal fluctuations in economic activity; and implement a balanced and sustainable economic development strategy for Cape Cod.** The RPP must include regional goals for the provision of job creation and economic development.

4. **Identify and protect areas whose characteristics make them particularly vulnerable to adverse effects of development.**

5. **Coordinate appropriate uses of the region's land and other resources.** The RPP must include a growth policy including guidelines for the protection of resources.

6. **Anticipate, guide and coordinate the rate and location of development with the capital facilities necessary to support such development.** The RPP must include a growth policy including guidelines and regional goals for the provision of capital facilities necessary to meet current and anticipated needs

7. **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. The Cape Cod Commission Act defines capital facilities as public facilities and services necessary to support development, including but not limited to roads, water, sewers, waste disposal, affordable housing, schools, police and fire protection facilities.

8. **Promote and further the development of an adequate supply of fair affordable housing for low-income and moderate-income persons, preserving the social diversity of Cape Cod.** The RPP must include regional goals for the provision of fair affordable housing.

ATTACMENT 6

BOURNE BOARD OF SELECTMEN
LETTER OF SUPPORT

TOWN OF BOURNE
Town Administrator
24 Perry Avenue
Buzzards Bay, MA 02532
Phone 508-759-0600 x1503 – Fax 508-759-0620

THOMAS M. GUERINO
email: tguerino@townofbourne.com

August 14, 2018

Mr. Harold Mitchell, Chairman
Cape Cod Commission
P.O. Box 226
Barnstable, MA 02630

Re: Town of Bourne, Phase 6 landfill expansion

Dear Chairman Mitchell:

The Bourne Board of Selectmen would like to express our strong support for the approval of the Phase 6 landfill expansion at the Department of Integrated Solid Waste Management (ISWM) located on MacArthur Boulevard. This expansion is an integral part of ensuring the continued operations of ISWM which currently serves as a vital part of the Cape Cod infrastructure not only for landfilling, but also for transfer operations for construction and demolition debris and single stream recyclables.

The capacity provided in Phase 6 is particularly important as the Town currently receives MSW from the Town of Falmouth under contract, as well as municipal combustor ash from Covanta SEMASS in Rochester, MA where several towns on the Cape send their MSW.

The creation of ISWM in 1998 and the subsequent development of ISWM facility has been and continues to be an important policy decision for the Town of Bourne as supported by the Board and at numerous Town Meetings. The Town is pleased to be a part of efforts to provide our fellow Cape Cod communities with local options to help manage their waste, recyclables and organics.

We urge the Commissioners to approve this expansion. Please feel free to contact Town Administrator, Thomas Guerino at 508-759-0600, extension 1308, if you have any questions for the Board.

Thank you for your consideration.

Respectfully submitted,

Bourne Board of Selectmen

Peter J. Meier

Judith Froman

James L. Potter

George G. Slade Jr.

Jared P. MacDonald

CC: Town Administrator
ISWM Department
Bourne Board of Health