TOWN OF BOURNE
Department of
Integrated Solid Waste Management

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August 13, 2021

Ms. Erin Perry
Deputy Director
Cape Cod Commission
P. O. Box 226
Barnstable, MA 02630

RE: Town of Bourne Integrated Solid Waste Management Facility
Commission DRI File No. 20064 (EEA No. 11333)
Phases 7, 8 and 9 Landfill Expansion and Handling Facility Relocation

Dear Ms. Perry:

We would like to thank the Cape Cod Commission's (CCC) participants for the attention and interest that we were afforded during the virtual Development of Regional Impact (DRI) Subcommittee Hearing on July 26, 2021. As requested by the Subcommittee, we are herein responding to the public comment letter that was submitted on the afternoon of the hearing, and a subsequent letter, by the Conservation Law Foundation (CLF) and to other comments offered by the CCC Staff. We anticipate that this will be discussed at the continuation of the Hearing on Monday, August 16, 2021.

As you are aware the proponent for the Phases 7, 8 and 9 Landfill Expansion and Handling Facility Relocation is the Town of Bourne, a member community of the CCC. Its primary purpose is to serve its citizens and to support its neighboring communities, to the benefit of all. Without the solid waste management capacity that is provided by the Bourne Integrated Solid Waste Management (ISWM) Facility the Town and the region would suffer the detriment of having inadequate solid waste management capacity or be completely dependent on unreliable, distant and profit driven alternatives, which results in high costs and the likely increase in illegal disposal of waste to the environment. Of note is that if distant disposal alternatives are used, there are negative greenhouse gas impacts generated by the significantly increased transportation needs.

CAPE COD COMMISSION ACT

ISWM is literally the manifestation of the purpose of the Cape Cod Commission as described in the Cape Cod Commission Act, Section 1 (c) which states:

"The purpose of the Cape Cod Commission shall be to further: ...the provision of

adequate capital facilities, including transportation, water supply, and solid, sanitary and hazardous waste disposal facilities..."

The Town would also like to make note that goal seven of the Cape Cod Commission Act itself 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 developing a sound financial business model to properly pay for operations, closure and post-closure. The Bourne 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.

CONSISTENCY WITH THE CCC'S REGIONAL POLICY PLAN

As accurately described in the DRI, the ISWM Facility is fully supportive and is a necessary component for the Cape to achieve the RPP's **Waste Management (WM) Goal**. As one of the bases for forming ISWM, the Town of Bourne has established waste recycling, reuse and diversion programs and continues to implement and promote innovative and alternative actions. As the Commission is fully aware, it issued a *Development of Regional Impact Decision* in 2018 (CCC File No. 17024) for the Phase 6 Landfill Expansion. In that decision the Commission found the Phase 6 Landfill Expansion to be fully compliant with 2009 RPP (as amended) and the Town of Bourne's Local Comprehensive Plan. It found that the ISWM Facility met the regional need for the processing and disposal of wastes on Cape Cod. In addition, the DRI concluded that ***"the probable benefit of the Project is greater than its probable detriment"***. The Project that is now before the Commission was outlined in the 2018 DRI to make it a part of the planned capacity of the Facility and to make it the logical progression for maintaining the valuable asset and resource that the Bourne Landfill is for Cape Cod and the region.

The Phases 7, 8 and 9 landfill expansions are part of "the scarce, remaining solid waste disposal capacity that is ..... critical for the health of the Cape Cod community, environment and economy", as cited in the CCC Waste Management Technical Bulletin. As noted above the expansions were put before the Commission in its 2018 DRI, making it a resource that is to be preserved for the Cape Cod community.

The Town has worked closely with the CCC over the course of the development of the DRI application process to ensure that ISWM is in concert with the goals and regulations for solid waste management outlined in the RPP and its technical bulletins. As noted in the RPP, one of the key challenges facing the region is the provision of adequate infrastructure. ISWM has been a leader on Cape Cod in developing local recycling, composting and disposal infrastructure that serves other local municipalities. This includes the development of the modern, lined landfill

(when every other town closed their unlined dumps) and the construction of a C&D (construction and demolition) debris transfer station and a single stream recyclables transfer station. Currently eight communities on Cape Cod send their MSW to SEMASS which in turn brings the residual ash from that waste to ISWM. Bourne and Falmouth send their MSW directly to the landfill. This means that ISWM serves 10 of the 15 communities on the Cape either directly or indirectly. Even with the most aggressive of diversion efforts, society still generates wastes of all types and well-run, engineered and permitted sites like ISWM will always be needed. ISWM is part of the solution to managing our lifestyles on a daily basis, while also leading the way for the future.

The Town also played an active role in helping communities and the CCC determine how to manage their MSW after the original contracts with SEMASS expired. This resulted in the Town of Falmouth signing a ten-year contract with Bourne to accept its MSW. The County is currently working with two vendors on long-term solid waste management options for Cape Cod. One option is evaluating local alternatives for diversion activities and the ISWM facility is specifically listed as one of the alternatives to consider. The other option is focused on out-of-state disposal options by rail and long-haul trucking. This County lead evaluation clearly recognizes that the Cape needs to take charge on planning its long-term solid waste management and ISWM is clearly a major factor in helping the Cape communities with these challenges.

- ISWM is fully consistent with the Regional Policy Plan (RPP) that recognizes the need for infrastructure and planning for diversion activities. ISWM has a well-financed and carefully planned "built system" that fully supports Objective WM1 and WM2 and the methods for achieving those objectives as outlined in the RPP. Objective WM1 states "To reduce waste and waste disposal by promoting waste diversion and other Zero Waste initiatives." ISWM's recent activities to support the region include being the first to host to a regional mattress recycling initiative as part of a MassDEP grant program. This effort has led to permanent mattress diversion and recycling at the ISWM facility. Since 2016 ISWM has diverted over 19,500 mattresses for recycling with vendors in RI and MA. Some of the preliminary materials separation, called filleting, which breaks mattresses into its components such as metal springs, wood frames and foam support, was done at our transfer station. ISWM is committed to this program.

- ISWM also supports paint recycling and diversion. Bourne was the lead applicant for a DEP grant to conduct a paint recycling collection program representing all 15 towns on the Cape. ISWM organized and managed the grant for two years. It continues to lead the latex paint collection planning each summer. Since 2018, Bourne has help to divert over 19,300 gallons of reusable latex paint that was recycled into new paint by a paint recycler in Massachusetts.

- ISWM not only is a leader in managing programs, it is also a strong advocate for systemic policy changes on a state level that will create industry funded "care" programs for mattresses and paint. This is known as Extended Producer Responsibility (EPR) and ISWM has been a supporter of MassRecycle and its Product Stewardship Council, in both staff time and financial support, which is advocating for policy changes for these materials and for packaging as well. ISWM agrees with these efforts and fully supports

recycling and diversion targets consistent with the RPP. This is built upon Bourne's foundation of recycling and composting leadership since 1989.

- Future plans include working with a vendor to support food waste diversion at its residential recycling center. ISWM has offered compost bins for decades, but as local processors of food waste come on-line, there are more opportunities for diversion to consider. This diversion would be in addition to the organics diversion ISMW currently has in place that manages yard waste and brush. As noted in our SSEIR, and discussed in the excerpt in Attachment 1 to this letter, Bourne signed a site lease with Harvest Power, Inc. (HP) which was going to develop a state-of-the art anaerobic digester on-site to digest food waste and generate electricity from the biogas and the existing landfill gas. Bourne spent years of effort and hundreds of thousands of dollars, however, HP could not secure long-term contracts for its power and therefore terminated the lease. Despite this disappointment, ISWM continues to evaluate technologies that may be suitable for co-location at the ISWM facility and which could operate beyond the life of the landfill. As these facilities are built-out, including new office and maintenance facilities, ISWM will be working in close coordination with Cape Light Compact and other entities to incorporate renewable energy generation and energy efficiency into designs to reduce its carbon foot print. This includes the possibility of solar PV arrays and utilization of landfill gas for heating and hot water.

- Objective WM2 states- "Support an integrated solid waste management system." This is the core mission of ISWM, which is integrated solid waste management, and the substantial infrastructure that Bourne has invested at the site demonstrates its commitment to the principle of an integrated approach. This includes composting, recycling, C&D transfer for recycling, scrap metal recycling and numerous sheds for diverting other items such as its popular Swap Shop. The RPP states that one of the methods to achieve the objective is to "support existing municipal waste facilities and encourage regional coordination between municipal facilities." ISWM does this on a regular basis by working with fellow municipalities and the County to support regional events and to assist them in finding solutions, including disposal capacity if needed.

- Additionally, ISWM plays a significant role in supporting Objective CAP1 and Objective CAP2. Objective CAP1 states- "Ensure capital facilities and infrastructure promote long-term sustainability and resiliency." ISWM is located off of a major highway with convenient access and excellent separation from coastal resource areas. Additionally, it is removed from residential areas and is at one of the highest elevations of Cape Cod giving it outstanding protection from long-term sea level changes. More detail on climate changes is provided in subsequent sections of the letter and Attachment 1. With its on-site backup generators ISWM is resilient to weather events and has proven its worth in a crisis such as after the fire at SEMASS in 2007 when it accepted all the municipal MSW on Cape Cod for several months. Additionally, ISWM is part of Bourne's Local Emergency Planning Committee and will play an integral role in Bourne's response to storm events and other infrastructure emergencies.

- Objective CAP2 states- "Coordinate the siting of capital facilities and infrastructure to enhance the efficient provision of services and facilities that respond to the needs of the region." The efficient and well-planned use of the land at the ISWM facility supports this objective. The proposed site master plan has been developed to utilize every available square foot as efficiently as possible by co-locating multiple operations. It provides both disposal options for the next decade or more, but also has a plan for a permanent transfer operation beyond the life of the landfill that will serve the region for the foreseeable future, in a safe, reliable and environmentally sound manner. ISWM is committed to achieving these objectives and will continue to work with the CCC to receive feedback and guidance as plans develop.

WASTE DISPOSAL AND CAPACITY

ISWM has a permitted annual disposal capacity of 219,000 tons. As was outlined in the Conservation Law Foundation letter and the DRI application, 189,000 tons is utilized for municipal solid waste combustor ash from SEMASS and the remaining 30,000 tons are utilized mostly for MSW, primarily from within the Town of Bourne and the Town of Falmouth. The Town of Bourne and Town of Falmouth do not utilize all of the remaining 30,000 tons. Some of that remaining capacity is used to support local utilities such as drinking water and waste water treatment facilities. ISWM provides a critical role in providing disposal capacity for these often overlooked and unmentioned waste streams. Without the ISWM Facility these utilities would have limited, local access to needed disposal capacity to support their processes that are critical to infrastructure and human health.

Daily and Intermediate Cover

The Landfill Operations and Management Plan approved by MassDEP requires daily and intermediate cover be utilized to control vectors and nuisances such as blowing litter, birds, odors and fugitive emissions. Daily cover is applied to the operating face after the completion of each working day, while intermediate cover provides a longer term cover in areas that are not going to see operation or final cap materials for a longer period of time. As an operational rule of thumb, 20% of the total daily disposal tonnage is used for daily cover. ISWM receives approximately 70,000-80,000 tons of fly ash and 100,000-110,000 tons of bottom ash for disposal and an additional 43,800 tons of bottom ash for cover, annually. Bottom ash is utilized not only for daily cover for MSW, fly ash and other miscellaneous waste streams but also for maintaining internal landfill roads and bulking difficult to manage materials as it's aggregate-like properties make it useful for other needs. No ash of any kind can be used for intermediate cover and therefore additional material is required.

Areas that receive intermediate cover include completed outside slopes of the landfill or slopes that fall against adjoining future phases. Bottom ash which is always used for daily cover, cannot be used for intermediate cover on outside slopes. Areas requiring intermediate cover require thicker layers of material to prevent gas migration out of the landfill and to prevent unwanted water infiltration into the landfill. ISWM utilizes low level contaminated soils

approved under the MassDEP Policy COMM# 97-001 soil reuse policy for intermediate cover.

Below is the annual tonnage of COMM 97-001 cover soils ISWM has accepted for the last 5 years for use as intermediate cover:

- 2017 19,760 Tons
- 2018 28,054 Tons
- 2019 45,688 Tons
- 2020 28,527 Tons
- 2021 18,490 Tons (through August 6, 2021)

For the calendar year 2019 there is a noticeable increase in intermediate cover soils utilized by ISWM relative to the adjacent years. In 2019 ISWM was in the process of operating and covering Phase 5, a small overlay cell that was operated concurrently with Phase 4. Increased soils volumes were required to place intermediate cover on the entirety of Phase 5 and the operating outside slopes of Phase 4 as those areas reach final elevation of waste deposition. The operational needs for these soils vary from year to year based on the geometry of the landfill and other operational factors. The MassDEP solid waste regulations require a minimum 1-foot layer of intermediate cover in addition to six inches of daily cover in areas that will not see operation within 30 days, however ISWM's policy has been to install intermediate cover in thickness greater than 2-feet to prevent gas migration and water infiltration. Furthermore, it is the general operating practice at ISMW to not place MSW too close to an outside slope of the landfill to further mitigate the possibility of gas migration. Areas near outside slopes are filled with bottom ash which provides an increased buffer for fugitive emissions thus enhancing the efficiency of the landfill gas collection system. Most all of the outside slopes have intermediate cover composed of a layer of bottom ash and cover soils that are approximately ten feet in thickness.

ISWM generates revenue from nearly all of the waste streams that enter the landfill, as the efficient use of airspace is paramount. Cover materials such as bottom ash that are used for daily cover and soils used for intermediate cover generate less revenue than disposal materials. For ISWM to take additional cover material to simply generate revenue would be a mismanagement of valuable airspace and would actually result in a loss of revenue. Daily and intermediate cover material such as bottom ash and cover soils generate an average of less than 50% of the revenue generated for disposal materials like MSW or Fly Ash. Cover materials used for daily and intermediate cover are utilized for their purpose intended by the solid waste regulations.

Waste streams at ISWM have evolved over the past decades to serve regional disposal needs. Starting out as an MSW landfill originally, ISWM changed to accepting C&D, back to MSW and then finally to the blend of waste combustor ash and MSW that's currently accepted. The Town of Bourne's leaders have tasked ISWM with moving the model of the Bourne Landfill towards a residuals landfill and in response to that, ISWM is receiving mostly material that has been processed down to an irreducible minimum. By accepting the ash from SEMASS the Bourne Landfill indirectly supports 25% of the MSW disposal needs of Massachusetts and an even greater level of service to Cape Cod and Southeastern Massachusetts. In addition, the Bourne

Landfill provides support, by means of disposal, to local municipal utilities that would not otherwise be available in this region.

It is true that tonnage entering the facility has increased with the change to mostly ash in 2015, however volume consumption of the permitted finite airspace has remained relatively consistent. Where ash has higher density than MSW it consumes less annual airspace than MSW per ton. The additional tons entering the landfill do not equate to increased use of airspace and does not indicate an intent to fill the landfill "as quickly as possible." The intent of the Town of Bourne and ISWM is to provide a longer term solution for solid waste residuals, while other alternative waste disposal options and technologies can be developed and implemented.

WATER RESOURCES GOALS AND PFAS

PFAS are regulated by MassDEP as drinking water contaminants. It is well documented that the Bourne Landfill and the downgradient areas are not existing or potential drinking water source areas. Proactively, the Town of Bourne's Board of Health and the Bourne Water District have instituted and enforce the prohibition of any public or private drinking water wells in the vicinity of and downgradient from the Landfill. In addition, the Town provided public water connections to all private well users in the downgradient area. In terms of groundwater characterization, as defined by the Massachusetts Contingency Plan (MCP), the GW-1 criteria is not applicable to that area, nor does GW-2 criteria apply, because groundwater is greater than fifteen feet below the ground surface. As a result of being neither GW-1 nor GW-2, groundwater is defaulted to being categorized as GW-3. Consequently, there is no risk of exposure to PFAS through drinking water at or downgradient from the Bourne Landfill.

As identified on Table 1 of the MCP the GW-3 standards for PFAS are 25,000 to 2,000,000 times higher than the GW-1 drinking water standards.

ISWM has been monitoring groundwater quality in its vicinity and downgradient of the Landfill, in accordance with the MassDEP approved quarterly groundwater monitoring program, since 1997. In those 24 intervening years, monitored groundwater quality has improved, presumably because of the abandonment and removal of the former septage pits that were located in the northeast corner of the site, the closing and capping of the unlined Phase 1-A,B,C Landfills and the mining and removal of the former unlined Phase 1-D Landfill. Over the past several years SITEC Environmental has reviewed the results of the monitoring events and has provided a summary report to ISWM identifying any exceedances of the GW-1 standards, as required by the solid waste regulations, and noting any identified trends in groundwater quality. Typically, there may be exceedances of secondary standards, such as pH, iron, manganese, sodium and TDS, with a few exceedances of the low threshold, drinking water standard for 1,4-dioxane, at the immediate perimeter of the Landfill. However, there has been no reported exceedances of the applicable GW-3 standards for any parameter. In general, there is no contaminant plume emanating from the Bourne Landfill, consequently, there is no credible reason to presume that PFAS are migrating from the Landfill, further supporting the conclusion that there is no risk presented from PFAS.

ISWM has been operating the Bourne Landfill, including its environmental monitoring program, in full compliance with its MassDEP approvals. MassDEP reviewed and approved ISWM's Final Comprehensive Site Assessment, which was also reviewed by CCC. ISWM is unquestionably committed to maintaining its exemplary compliance record by assenting to comply with all directives of MassDEP, including sampling and analyzing its leachate and groundwater for PFAS, should it be directed to do so. As stated above, because of the absence of any drinking water sources, PFAS does not pose a risk to human health, safety or the environment, downgradient from the Landfill. Consequently, ISWM has not and does not intend to sample for PFAS, in groundwater since it poses no risk, until it is directed to do so by MassDEP.

CLF fails to realize that the Bourne Landfill does not produce or profit from PFAS. Rather it is a receiver of PFAS that is generated by society and the use of PFAS in countless consumer products, and delivered to the Landfill from curbside collection, residential drop-off sources, and potentially ash from the SEMASS facility. Receiving and landfilling waste, as well as containing any leachate that it may produce, is a very effective treatment for the removal of PFAS from exposure to human and environmental receptors. The most effective means of eliminating exposure to PFAS is to eliminate them from being produced in the first place. Until that happens, the disposal of PFAS containing wastes in a fully compliant and environmentally protective landfill is the best alternative.

Current research indicates that landfills may actually sequester PFAS. A recent study conducted at a Vermont landfill, as cited in the CLF letter, determined that less than ten percent of the PFAS that enters a landfill in various waste streams ends up in the leachate. The PFAS group is often referred to as a contaminant of emerging concern, indicating the need for more long-term research to draw definitive conclusions. However, current research indicates that like the newspapers that don't decay after years of sitting in landfills, most of the long-chain PFAS (e.g., the six PFAS regulated by DEP) will likely stay in the landfill. Further supporting long term sequestration of PFAS in landfills, a recent study showed the PFAS concentrations in the leachate from closed landfills were significantly lower than for the active landfills. When considered in combination with reduced leachate generation after closure, the mass flow of PFAS from the landfill will be further reduced.

PFAS Removal Pilot Project

In addition to containment, ISWM has proactively initiated a pilot plant project for the treatment of leachate, including the treatment of PFAS components, to meet GW-1 (drinking water) standards. This project is the state of the art in addressing this environmental concern. CLF misconstrued this meaningful effort to address the potential presence of PFAS and the need to be able to produce a leachate that can be readily accepted at virtually any treatment plant, without restriction.

ISWM is in the process of conducting a pilot scale test for the treatment of landfill leachate using "Flouro-Sorb," a proprietary product of CETCO (Specialty Minerals, Inc.), in order to remove per- and polyfluoroalkyl substances (PFAS) in leachate. Even though no regulations have been

promulgated relative to PFAS in wastewater, ISWM realizes the importance of removal of these compounds from a human health and safety, environmental and regulatory standpoint. Civil and Environmental Consultants (CEC), a national civil and environmental engineering firm has been retained to provide support in designing, studying and evaluating removal of PFAS from the Town of Bourne's leachate. The CEC team is led by Ivan Cooper, P.E., BCEE, who is nationally recognized as a leader in the field of PFAS mitigation. ISWM seeks to find a simplistic alternative to other common solutions to PFAS removal such as Ion Exchange Resins or Reverse Osmosis.

Fluoro-Sorb was identified as a possible PFAS removal adsorptive media based on reports of successfully treating drinking water and groundwater. CETCO reports that Fluoro-Sorb adsorbent is a proprietary, National Science Foundation (NSF) certified adsorption media that removes PFAS from drinking water, groundwater, and soil. Fluoro-Sorb is a modified bentonite clay with specific adsorbent capabilities that binds PFAS (including PFOS and PFOA) and is not affected by co-contaminants in the waste stream. Fluoro-Sorb adsorbent can be deployed as a flow-through filtration media, either as the primary means of treatment or as a pre- or post-treatment method.

CEC proposed to Bourne that a bench test should be implemented to identify if a Fluoro-Sorb system with minimal pretreatment will remove PFAS constituents from leachate. During bench scale testing, Fluoro-Sorb media was shown to have greater than 99% removal efficiency of the six PFAS compounds regulated under the Massachusetts drinking water standards. ISWM has since moved to develop a pilot scale study at the Bourne Landfill site to further prove viability of the technology at higher flows and longer time durations. ISWM's goal for the pilot treatment study is to provide a process that can consistently remove the six Massachusetts regulated PFAS compounds from landfill leachate to less than the GW-1 drinking water standards of 20 parts per trillion. Additionally, part of ISWM's goal is to develop a treatment methodology that will encapsulate PFAS in the depleted media, not allowing it to be available for future movement into the environment.

PFAS compounds exist in all of our daily lives and are the result of manufacturing goods that are spread across society. Waste receiving facilities such as landfills and wastewater treatment plants do not produce these compounds but simply receive them from the consumers and end users of the products that utilize and contain them. It should be emphasized that ISWM is developing a cutting-edge process for removal and sequestration of PFAS from landfill leachate under its own volition. ISWM has made substantial progress in its process and will continue to invest substantial financial capital and resources in moving toward a solution that can capture these chemicals.

WASTE COMBUSTER ASH

Figure 3-1 in the August 6, 2021 CLF letter was misrepresented as the composition of waste that is combusted by the SEMASS Facility. The methodology approved by the MassDEP for the

Waste Characterization Study referenced sampling only acceptable loads. Unacceptable loads include:

- Frontload and Rearload compacting trucks that mix Residential and Industrial/Commercial/Institutional (ICI) accounts on the same route
- Transfer Trailers originating at commercial transfer stations that accept a mix of Residential and ICI wastes; and
- Transfer Trailers originating at transfer stations that may accept waste from out-of-state.

For the SEMASS facility, roughly 77 percent of the incoming loads arrive on transfer trailers or rail cars and are defined as unacceptable loads. In addition, the report notes that the facility recovers approximately 35,000 tons of recyclable metals pre- and post-combustion annually. The study reflects the pre-processed inbound waste which contains these recovered materials.

Using the acceptable load samples that were analyzed for the Waste Characterization Study (which include metals that are subsequently recovered) that represent a small percentage of the incoming waste at the facility and presenting it as the composition of all of the incoming waste is not appropriate.

MassDEP promulgated regulations in accordance with state laws that are protective of human health and the environment. Testing of ash from all of the municipal waste combustion facilities in Massachusetts was required by MassDEP beginning in 1987 pursuant to the Department's policy entitled "Ash Sampling and Analysis Guidance-SWM-9-7/88" and in later guidance provided by United States Environmental Protection Agency (USEPA) and MassDEP. The detectable concentrations of metals from the municipal waste combustion ash have been reported below the USEPA hazardous characteristics levels and the ash is therefore defined as a non-hazardous solid waste and is acceptable for disposal at the Bourne Landfill for co-disposal with MSW, as approved by the Bourne Board of Health and the CCC.

The USEPA defines a waste that exhibits toxicity characteristics as one where the extract from a waste contains contaminants above defined concentrations. The extraction methodology is meant to simulate leaching through a landfill. The SEMASS ash has been subjected to real world leaching at the Carver Marion Wareham (CMW) and Bourne Landfills for more than thirty years. Leachate from the landfills has been routinely analyzed (on a quarterly basis for CMW and for Bourne) and all of the results show concentrations of contaminants that characterize the leachate as non-hazardous. Furthermore, the leachate is not acidic as claimed, as the result of years of testing show that the leachate is close to a neutral pH.

LANDFILL LINER SYSTEM

CLF continues to chant its mantra "all landfills leak", based on a 1982 EPA report. To give it

some context, the subject of that report and its subsequent evaluation as cited in the CLF letter (footnote 64), was not a landfill but a leachate lagoon that held liquid not solid waste. The construction of the lagoon was of about ten feet of unspecified "silty clay" material from a local borrow source and a smooth 60 mil HDPE geomembrane liner, with no protective layer, such as sand, over the liner. Those areas of the liner that were not submerged by leachate were directly exposed to sunlight and the atmosphere. There was no discussion of any construction quality assurance testing being conducted. During the fourteen year operating life of the lagoon, it was reported that it "had been drained several times to remove sludge and to patch geomembrane liner defects." That cleaning would expose the liner to either hand or mechanical equipment operations that are a clear threat to the integrity of the geomembrane. There is little or no similarities of this lagoon's liner system construction or operations, compared to the liner systems that have been constructed at the Bourne Landfill.

At the time that the referenced lagoon was constructed, unlined landfills were the norm, including the Bourne Landfill and all of the other landfills on Cape Cod. Single composite lined landfills were the state of the art in the 1980s, with only a few in existence or being developed at the time in Massachusetts. The Phase 2 Landfill was the first single composite lined landfill constructed in 1999. Beginning with the construction of the Phase 3, Stage 1 Landfill in 2000, and all other cells since then, liners have been constructed with double composite liners with interstitial leak detection. The Phase 3, Stage 1 liner was the first double composite liner constructed in Massachusetts, before the regulations were revised to require their construction. Double composite liners are constructed with five impermeable liner layers, of which three are self-healing (clay that will swell when hydrated and seal migration pathways for liquids). Supporting the improbability that any leakage occurs is that during construction of those liner systems a very intensive construction quality assurance program was conducted, documented and reviewed by MassDEP, before the landfill was permitted to operate. Further, the liner system's integrity is protected from damage by operations. There is an 18 inch screened sand drainage and protection layer that covers the entire liner. The initial waste placement operations is a protective layer of five feet of an automobile shredder fluff, which has no objects larger than three inches.

GREEN HOUSE GAS AND CLIMATE CHANGE

Green House Gas (GHG) Generation

The ash residue from SEMASS that is sent to the Bourne landfill has no potential for emitting GHGs. The landfill continues to release GHGs from two sources other than the ash residue accepted from the SEMASS municipal combustion facility:

- Methane and carbon dioxide generated through decomposition of the putrescible organic portion of MSW accepted at the landfill during or prior to 2014, when the landfill first began accepting ash residue in large quantities and reduced its acceptance of unprocessed

MSW accordingly. As MSW in landfills decomposes, it generates methane and carbon dioxide over a period of 30 years or more. Consequently, ISWM continues to operate the landfill gas collection and flare systems to collect and destroy methane that continues to be generated, notwithstanding that the inert ash residue does not contribute to methane production.

- Methane and carbon dioxide generated through decomposition of the putrescible organic portion of the modest quantities of solid wastes other than inert ash residue that has been accepted at the landfill since 2014.

Quantities of landfill gas collected and destroyed from the landfill, which contain the GHG emissions, have declined by 50 percent since 2014, and those further reductions are anticipated as the amount of organic and putrescible materials in the landfill available for decomposition continues to decline. During 2020, the Bourne Landfill emitted 7,979 metric tons of GHG emissions. At the current rate of decline, by 2026 the Bourne Landfill is estimated to emit less than 4,000 metric tons of GHG emissions.

We note that ash residue disposed at the Bourne landfill provides a benefit for increasing the collection efficiency of landfill gas to the highest levels possible. Specifically, the ash residue provides substantially thick layers of inert, low permeable material over MSW previously and currently disposed, which decreases the ability of gas to escape from the landfill and increases the ability of the system to collect gas generated from the contained MSW.

Climate Change Mitigation Goals and Objectives

The Cape Cod Commission has asked the Town of Bourne ISWM (ISWM) to address the impacts of the proposed expansion of the Bourne Landfill more fully on greenhouse gas (GHG) emissions considering the Cape Cod Climate Action Plan as well as comments provided by CLF. The Project supports and is entirely consistent with the Cape Cod Climate Action Plan and the planning principles described. The performance of the Project is contrary to the claims and misrepresentations of the facts provided by CLF regarding GHG emissions. If the concern were to be singularly minimizing the impacts of GHG emissions to our environment, for reasons described herein, responsible parties should be unquestionably avid proponents of the Project.

The Project supports and is entirely consistent with the Cape Cod Climate Action Plan and the planning principles described.

Planning Principle #1: Reducing emissions and increasing resiliency to current and future hazards.

Reducing GHG emissions.
The putrescible organic portion of MSW that requires disposal will eventually convert to GHG

emissions either through combustion at a waste-to-energy facility in the form of carbon dioxide or through naturally occurring digestion at landfills in the form of methane and carbon dioxide. The impact of GHG emissions is global. The Bourne landfill reduces GHG emissions and provides the lowest impacts possible for GHG emissions given all alternatives as follows:

- Mostly ash disposal. The current system for MSW requiring disposal from Cape Cod communities results in the lowest impacts possible for GHG emissions given all alternatives. Approximately 66% of the Cape Cod communities deliver their MSW to SEMASS Resource Recovery Facility (SEMASS). The MSW that is combusted at SEMASS converts organics to power used locally and generates emissions of carbon dioxide that are largely displaced by avoided CO2 emissions from local fossil fueled power plants. The resulting ash residue from SEMASS that is sent to the Bourne landfill has no potential for emitting further GHGs.

- Local solution to minimize GHG emissions from transportation. The Bourne Landfill is the disposal facility closest to MSW generated from Cape Cod and from ash generated by SEMASS. All else being the same, disposal facilities closest to the source of generation of solid waste will result in the lowest GHG impacts because of the avoided GHGs from transportation to further distances. Much of the MSW generated by Cape Cod communities is aggregated at the Yarmouth transfer station in large rail cars and transferred to SEMASS directly by rail thereby reducing traffic and GHG emissions associated with MSW transportation. The Bourne Landfill receives ash from SEMASS and a small quantity of MSW from the Town of Bourne and adjacent Town of Falmouth. The Bourne Landfill is the disposal solution that is the shortest travel distance from these sources of generation.

  Any alternative landfill would likely be located at far distances (e.g., Western New York or Ohio), which would result in increased GHG emissions associated with transportation of MSW and/or ash. Accounting for the incremental trucking distance, the GHG emissions from incremental transportation exceed the total GHG emitted from the Bourne Landfill currently thereby more than doubling the GHG emissions in the alternative.

- Protective systems. The Bourne Landfill incorporates the most protective systems deployed at landfills to collect and destroy GHG emissions generated naturally. The protective system includes aggressive addition of horizontal and vertical landfill gas collection wells into new areas of waste to collect as close to 100% of the generated landfill gas possible, culminating in thermal destruction of all the landfill gas collected in a flare. The flare converts methane to carbon dioxide thereby reducing the global warming potential of the GHG emissions by 84 times on a 20 year basis and 28 times on a 100 year basis. Note that ash residue disposed at the Bourne Landfill provides a significant benefit for increasing the collection of landfill gas to the highest levels

possible. Specifically, the ash residue provides substantially thick layers of inert, low permeable material over MSW previously and currently disposed, which decreases the ability of gas to escape from the landfill and increases the ability of the system to collect gas generated from the contained MSW. ISWM provides these thick layers to entomb MSW exceeding all regulatory requirements including (1) all side slopes contain 10 feet of ash cover or 10 times the 1 foot of cover required by regulation, and (2) all daily cover contains 1 foot of ash cover or twice the 0.5-foot cover required by regulation. ISWM operating practices result in close to 100% collection of landfill gas. An important indication that landfill gas is being collected and destroyed at close to 100%, is that no odor complaints have been made over the last 8 years.

- Beneficial use of collected landfill gas. To the extent commercially viable, beneficial use of landfill gas can further reduce impacts of GHG emissions. ISWM has proactively explored and has tried to develop beneficial uses for the landfill gas over the years but given the low quantities of landfill gas generated, beneficial uses are not commercially viable without large subsidies. ISWM will continue to assess the feasibility and/or develop additional environmental projects that could have a potential reduction in GHG emissions at the site. The list of past and active initiatives in these areas are detailed in the "Climate Change and GHG Emissions Analysis" provided in the SSEIR dated November 13, 2020, which was subsequently certified by the Secretary of EOEEA on December 30, 2020 and is included as Attachment 1.

For the reasons shown above, extending the life of Bourne landfill through the proposed expansion would reduce GHG emissions that contribute to climate change, which is consistent with the Cape Cod Climate Action Plan and contrary to CLF claims.

Increasing Resiliency. ISWM detailed an Adaption and Resiliency analysis in the "Climate Change and GHG Emissions Analysis" certified by the Secretary of EOEEA. The Expansion will be an important part of a prudent climate change adaption and resiliency plan for Cape Cod. Floods and storms generate tremendous amounts of debris and materials that are only suitably managed by landfills because of their bulky and mixed nature. Recent flooding along the Gulf Coast of the U.S. highlights the integral role landfills play in responding to such crises and the recovery efforts. Without the landfill capacity in these areas, the economic, public health and transportation impacts would likely have been significantly greater. The Expansion will serve important infrastructure for Cape Cod to do the same in the event of such a natural disaster. Therefore, the Expansion will address the Cape Cod Climate Action Plan Priority Strategies including "reduce vehicle miles traveled" and "address vulnerabilities in public infrastructure".

Planning Principle #2: Taking actions that address GHG emissions from all sources, with emphasis placed on those targeting the region's highest emitting sectors.

As shown above, the current system for MSW requiring disposal from Cape Cod communities

results in the lowest impacts possible for GHG emissions given all alternatives. The Expansion will continue this benefit to addressing GHG emissions. As stated above, ISWM will continue to assess the feasibility and/or develop additional environmental projects that could have a potential reduction in GHG emissions at the site.

The waste sector is a low GHG emitting sector at 3% of the total GHG emissions according to the Cape Cod GHG Inventory. Contrary to CLF claims, the Project is a minor source of GHG emissions. Currently, the Bourne Landfill represents 0.28% of the total GHGs emissions in Cape Cod according to the Cape Cod Commission's own GHG Inventory. The Cape Cod Regional GHG Inventory estimates a total emissions rate of 3,564,875 metric tons of CO2e on Cape Cod mostly from stationary sources of energy and transportation on Cape Cod. The Bourne landfill represents 10,064 metric tons of CO2e or 0.28% of the total. The GHG emissions from the Bourne Landfill have declined each year since 2014 because the Bourne Landfill changed its solid waste mix from MSW to mostly ash residue from SEMASS and a small quantity of MSW. Specifically landfill gas quantities, which contain GHG emissions, have decreased by 50% since 2014 and are expected to further decline at this rate under the current operating conditions. This is expected to continue through the Project Expansion unless the Bourne Landfill changes its disposal of solid waste from mostly ash residue to mostly MSW.

The United States Environmental Protection Agency, (USEPA) also considers the Bourne Landfill a minor source not subject to its reporting requirements. Specifically, the Bourne Landfill is not required to report GHG emissions to the USEPA because the Bourne GHG emissions are below the USEPA Greenhouse Gases Reporting Program threshold of 25,000 metric ton.

Planning Principle #3: Recognizing the relationship between climate change and other regional challenges, and prioritizing actions that provide co-benefits.

As stated above, the Bourne Landfill helps to solve climate change and addresses the regional challenge of disposal capacity for Cape Cod. These are important priorities that the Expansion will continue to address.

Planning Principle #4: Considering economic impacts associated with implementation of actions, as well as the costs of inaction.

The cost on inaction by not moving forward with the Expansion can be measured by the effects of shortening the future life of the Bourne Landfill thereby increasing GHG emissions long-term by increasing transportation required to dispose of MSW to more distant disposal facilities, and prematurely stopping the important disposal capacity infrastructure that Cape Cod depends upon to manage debris from storm damage and potential interruptions of current disposal options. The cost of inaction on the Expansion would be damaging to the Cape Cod communities both environmentally and fiscally.

Planning Principle #5: Prioritizing communication and engagement to convey the urgency of the challenge and gain support for the range of solutions.

ISWM continues to be actively involved in the regional planning efforts and leading in professional associations that are all interested in the solid waste management goals and objectives for the region. ISWM provides important disposal capacity for MSW disposal for Cape Cod communities either through SEMASS or directly. In addition, ISWM is active in recycling and reuse of commodity recyclables and difficult to manage wastes, and management of household hazardous wastes all occurring adjacent to the Bourne Landfill.

Planning Principle #6: Incorporating equity considerations to ensure a successful implementation strategy.

The expansion is essential infrastructure that has major benefits to Cape Cod. The location is geographically isolated and does not burden any particular population.

In addition to the Proposed Expansion being entirely consistent with the Cape Cod Climate Action Plan, the Secretary of Energy and Environmental Affairs determined and certified that the Proposed Expansion adequately and properly complies with MEPA and its implementing regulations. ISWM detailed the GHG emissions under the possible limits of operating scenarios for the future, and the past and current initiatives for mitigating GHG emissions further in "Climate Change and GHG Emissions Analysis" in the SSEIR dated November 13, 2020, which is included as Attachment 1. On December 30, 2020, the Secretary of Energy and Environmental Affairs determined that the Proposed Expansion complied with MEPA and its implementing regulations including the May 5, 2010, MEPA GHG Policy. The Secretary confirmed that ISWM complied with the MEPA GHG Policy by providing full and complete disclosure of the potential future quantities of GHG emissions and the identification of measures to avoid, minimize or mitigate such emissions.

NATURAL HABITAT AND MITIGATION

The proposed project is designed and will be implemented in accordance with the Massachusetts *Endangered Species Act* (M.G.L. Ch. 131A; MESA) regulations at 321 CMR 10.00. The Massachusetts Division of Fisheries & Wildlife, Natural Heritage and Endangered Species Program (NHESP) is the State agency responsible for the regulation of State Endangered, Threatened, and Special Concern species in Massachusetts. ISWM has been in correspondence with NHESP regarding the proposed project since approximately 2017 during the project development process. Thus far, ISWM has followed the required regulatory steps, including conducting project site assessments and filing a MESA Project Review with NHESP. Following this review, NHESP has determined that the project will require a Conservation and Management Permit (CMP) in order to adequately address any impacts to the Eastern Box Turtle and its

habitat. Since that filing, ISWM and its consultants have had numerous pre-permitting conversations with NHESP staff toward addressing the regulatory performance standards for work within habitat that is mapped for a Massachusetts Species of Special Concern. The filing of an application for a CMP with NHESP is pending.

CLF's July 26, 2021, comment letter presumptuously asserts that, "*ISWM has not sufficiently demonstrated that the Project meets these performance standards.*" However, correspondence from NHESP directly contradicts this statement. In its letter dated April 9, 2020, NHESP states,

> "*The Proponent has continued to proactively consult with the Division on a pre-filing basis to avoid, minimize and mitigate impacts to the state-listed species and their habitats* (...) *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.*"

Further, in its response letter dated December 17, 2020, NHESP states,

> "*The Proponent has identified a candidate parcel in the vicinity of the property which should provide an acceptable option to address the required long-term net benefit for Eastern Box Turtle associated with the Project.*"

In addition to the other requirements under MESA, the pending CMP will require the implementation of a Rare Species Protection Plan (RSPP) prior to any land clearing. This will include extensive turtle sweeps conducted by qualified biologists under specific weather and time of year conditions to ensure that no state-listed rare species is directly harmed during site clearing activities. Following discussions with NHESP, and as part of that RSPP, the Town intends to erect fencing along any open space buffer areas to prevent wildlife, and in particular, box turtles, from migrating into active areas within the ISWM facility post construction. The proposed fencing is consistent with other perimeter containment wire grid fencing at the landfill.

During the July 26, 2021, CCC Subcommittee meeting, some of the Subcommittee members had expressed concern regarding the relocation of found box turtles to just a small sliver of land adjacent to the existing ISWM facility. For clarification, any box turtle found within the 12-acre parcel would be relocated beyond the proposed perimeter containment fencing to an area outside of the fencing with similar forested habitat.

In addition, the proposed project will not significantly impact wildlife corridors or opportunities for wildlife movement outside of this fencing, as the project site is located along the western edge of a vast, 15,000-acre contiguous natural landscape located at Camp Edwards on Joint Base Cape Cod. The fencing is merely intended to minimize wildlife interactions within ISWM active areas.

OPEN SPACE WAIVER REQUEST

Some of the Subcommittee members have expressed concern regarding ISWM's open space waiver request.

Expansion of the ISWM facilities into the adjacent 12-acre parcel has been part of the master plan for the facility for several years. With the knowledge that the use of the 12-acre parcel would necessitate mitigation through both the CMP under MESA, as well as address the open space requirements under the RPP, ISWM and the Town have been actively pursuing mitigation options.

The 12-acre parcel, as well as a narrow segment of the easternmost portion of the 25-acre parcel, which is otherwise largely developed and actively used by ISWM operations, is identified as a Natural Placetype in the Regional Policy Plan (RPP) in part because it is mapped as *Priority Habitat of Rare Species* (PH 490) and *Estimated Habitat of Rare Wildlife* (EH 423) as regulated through NHESP. [We note that these numerical designations have recently changed with the release of the 15th Edition of the Natural Heritage Atlas, effective August 1, 2021.]

As noted, ISWM has been coordinating these efforts with NHESP since approximately 2017 regarding the use of this parcel by ISWM. Since the land is mapped by NHESP as habitat for the Eastern Box Turtle, a Massachusetts Species of Special Concern, off-set land mitigation through a CMP, is required at a 1.5:1 ratio. This will be achieved through a combination of on-site and off-site land preservation.

Under the DRI, ISWM has requested that this mitigation proposal also meet the Open Space mitigation requirements under the RPP, which requires a 3:1 mitigation ratio, in light of the other regional benefits afforded by ISWM.

The CCC Open Space Technical Bulletin provides guidance on how the CCC interprets and implements the Open Space goals and objectives in the RPP, and identifies the specific methods by which a project can meet these goals and objectives. ISWM believes that in the context of its regional benefits that the proposal to provide off-site mitigation is appropriate and has respectfully requested consideration under a waiver.

The Open Space Goal cited in the RPP is as follows: "*To conserve, preserve, or enhance a network of open space that contributes to the region's natural and community resources and systems.*" The Open Space Goal is achieved by meeting three main objectives:

- Objective OS1 – *Protect and preserve natural, cultural, and recreational resources*

- Objective OS2 – *Maintain or increase the connectivity of open space*
- Objective OS3 – *Protect or provide open space appropriate to context*

The Technical Bulletin cites that "*The permanent protection of land and resources within the Natural Areas Placetype is a regional priority.*" Thus, the preservation of land off-site is entirely appropriate. The Technical Bulletin identifies that high value lands mapped as "*BioMap2 Core Habitat, Critical Natural Landscapes, habitat for rare or endangered species,* (…) *Wellhead Protection Areas, potential future drinking water supply sites,* (…) *and large unfragmented blocks of undeveloped land and wildlife corridors*" are considered priorities for protection.

Again, in consultation with NHESP, the Town underwent an extensive search to find available parcels in the municipality that met these same or similar criteria, and after an exhaustive effort, identified the approximately 18-acre mitigation parcel as presented in the DRI and the Natural Resources Inventory (NRI).

The proposed mitigation parcel, at 0 MacArthur Boulevard, is a 17.8-acre rectangular property located along the east side of MacArthur Boulevard (Route 28), just south of the Otis rotary and southwest of the Massachusetts National Cemetery. The parcel is an undeveloped wooded lot with a plant community indicative of a typical Cape Cod pine/oak forest habitat. The mitigation parcel directly abuts undeveloped forested parcels to the north, east, and south, with the Joint Base Cape Cod (JBCC) defining its eastern property boundary. In addition, an approximately 200-foot wide strip of forested land buffers this parcel from the northbound lane of Route 28 (MacArthur Blvd) to the west.

Similar to the 12-acre parcel, the 18-acre mitigation parcel is identified as a Natural Placetype under the RPP, as well as *Priority Habitat of Rare Species* and *Estimated Habitat of Rare Wildlife*, as well as BioMap2 Core Habitat and BioMap2 Core Habitat for Species of Conservation Concern, which are designated as key areas that are critical for the long-term persistence of rare species and other Species of Conservation Concern. In addition to being suitable, high-quality Box Turtle habitat, the mitigation parcel is also located within an approved DEP Zone II Wellhead Protection Area, which is critical for protecting the recharge area around public water supply groundwater sources.

While mapped as Critical Natural Landscape, which is defined in BioMap 2 as lands that support wide-ranging native species, the 12-acre parcel is not mapped as BioMap2 Core Habitat, nor as Core Habitat for Species of Conservation Concern, and is not mapped within a DEP Zone II. Rather than surrounded by forested lands, this parcel is contiguous with and directly abuts the active portions of ISWM to its north. It also supports a partially overgrown, paved roadway that traverses its southern boundary.

The 18-acre mitigation parcel is abutted by parcels immediately north and south, which are already afforded conservation protection as follows:

- Map 52/Parcel 40 to its north is under the custody of the Bourne Select Board, was purchased by the Town for the purposes of preservation of open space, conservation, and passive recreation, and is protected under Article 97.
- Map 52/Parcel 42 to its south is under the care and custody of the Bourne Conservation Commission.

The mitigation parcel, however, currently has no level of open space protection. Instead, the mitigation parcel is locally zoned within the Residential 40 (R40) zoning district under the Bourne Zoning Bylaw. By contrast, the 12-acre project parcel is zoned within a business district (Business District-3), as are the several parcels to its south, which limits its ability to contribute toward an unfragmented wildlife corridor, as the remaining parcels are not under control of the Town.

The mitigation parcel will be placed under permanent protection through the Article 97 process and will be conveyed to the Bourne Conservation Commission as a means of habitat and open space protection with the proposed project. By preserving this land, the project is furthering the objectives identified in the Open Space Technical Bulletin, by permanently protecting a parcel that is otherwise vulnerable to development and which will lend to the permanent protection of a larger unfragmented block of undeveloped land and wildlife corridor, which are considered priorities for protection. By virtue of these additional important characteristics, preservation of the mitigation parcel, will further address the open space objectives of the RPP.

Placing permanent protection on the off-site, residentially zoned 18-acre parcel may also, in effect, be viewed as a "*transfer of development rights to less vulnerable areas*," (such as immediately adjacent to a solid waste operation).

Open Space Context and Additional Open Space Considerations

As stated in the Technical Bulletin, the application of the goals and objectives toward open space is also meant to be implemented on a case-by-case basis by considering several factors including the project context.

In its July 26, 2021 and August 6, 2021, letters stating that the "*Request for a Waiver of the 3:1 Mitigation Ratio Requirement for Natural Areas Should be Denied*," CLF suggests that the request for a waiver for the 3:1 ratio requirement is not meeting these objectives . However, we believe that CLF has presented its comments in a manner that does not account for the larger context of the project. As discussed at length in this letter, the ISWM facility serves a greater regional purpose by providing important solid waste infrastructure not only to the Town of Bourne, but to the Cape Cod region and southeastern Massachusetts, and it is entirely within the Open Space guidance to consider this context and allow for flexibility in meeting the Open

Space requirement. Without this flexibility, the project cannot fully realize the potential for providing the community and regional benefits afforded by the ISWM facility into the future.

The existing cap at the Bourne landfill is vegetated with shallow rooted grasses that stabilize the cap and minimize erosion. The vegetated landfill cap effectively provides an area of open space within the ISWM facility. The Open Space Technical Bulletin specifically grants discretion to the Commission to consider this as providing open space:

> "*Where projects located on severely degraded areas such as gravel pits and landfill sites are revegetated, at the Commission's discretion, the revegetated areas may be counted toward meeting the open space requirement; these areas should be regraded consistent with the surrounding topography in a manner that reduces or eliminates potential erosion.*" (Emphasis added.)

The capped area is mowed regularly to protect the liner by discouraging the establishment of more deeply rooted vegetation (e.g., shrubs and trees), while also maintaining a grassland community that allows for continued monitoring of wellheads. In accordance with Federal rules and guidelines, the vegetative cover should be capable of maintaining growth without extensive maintenance, as "*the major function of the vegetative cover is to minimize wind and water erosion. Perennial grasses are often used because they can be rapidly established into a thorough cover.*" The landfill cap cannot be allowed to revert to a forested community over time for those reasons.

However, a shift toward a more diverse plant community on the capped portions of the landfill that includes both native grasses and forbs or wildflowers would provide not only long-term soil stabilization over the landfill cap but would increase the ability of the ISWM facility to provide additional wildlife benefits and an alternative Natural Area Placetype at the ISWM facility.

In order to achieve this benefit, and at the suggestion of CCC Staff, ISWM reviewed the guidelines provided in two documents, *Revegetating Landfills and Waste Contamination Areas Fact Sheet* and *Reuse Opportunities at Capped Sites*,

The Fact Sheet indicates that "Species diversity helps reduce disease dispersal or blights and encourages wider biological diversity in the restored habitat, making it more like a natural ecosystem, in turn reducing long-term operation and maintenance (O&M) and promoting a self-sustaining ecosystem," which would further the goals and objectives of the RPP.

As such, ISWM is considering a transition to a more diverse, low maintenance plant community on the landfill cap area, and with CCC input would select a regionally appropriate native plant seed mix to establish a plant community with regional benefits, as this type of open pollinator community is in decline, not only regionally, but world-wide.

This plant community would be established and maintained to be fully compatible with the integrity of the ISWM Facilities containment system(s) and will provide additional long-term ecological benefits that would include providing habitat for local wildlife, food and resources for

pollinator species, as well as reduced air pollution, carbon sequestration, and increased diversity of the local natural areas.

The existing capped landfill occupies 37 acres in the northern part of the facility. Upon full build-out, this habitat could be increased by an additional 40 acres. Overall, the establishment of native grassland/wildflower meadow habitat over the ISWM Facility caps would result in an additional 77 acres of on-site open space.

The RPP and the Waiver conditions allow for case-by-case considerations, including "meeting the intent of the goal or objective through an "*alternate approach, including appropriate mitigation.*" With this alternate proposal, including both on-site and off-site land preservation at a 1.5:1 ratio, and the establishment of a native open pollinator community over time on up to 77 acres, as part of the waiver, ISWM requests consideration of this alternative opportunity to provide additional on-site open space to better meet the intent of open space requirements under the RPP.

CONSTRUCTION OF STORMWATER FACILITIES

The grading and construction of the proposed Stormwater Basin No. 3 and the Bioretention Area Stormwater Basin No. 4 will be conducted as soon as the 12-acre parcel has been cleared. During construction of the 12-acre parcel facilities, runoff will be directed to Stormwater Basin No. 3. The influent stormwater interceptor pipe will be extended from Stormwater Basin No. 3, northward but will not initially be connected to the existing drainage interceptor, where it discharges into Stormwater Basin No. 2. The interceptor pipe will not be connected to discharge into Stormwater Basin No. 3 until at least the 12-acre area is stabilized. That connection can be delayed until the excavation for Phases 7 and 8 will require the abandonment of Stormwater Basin No. 2, which could be several years after the facilities on the 12-acre parcel have been operational. Runoff from the western portion of the 12-acre parcel will be temporarily diverted to Stormwater Basin No. 3 from Bioretention Area Stormwater Basin No. 4, while the bioretention area is backfilled with specified organic soils and vegetated. Once the bioretention area is stabilized the diversion to Stormwater Basin No. 3 will be eliminated and the Bioretention Area Stormwater Basin No. 4 will become active.

Thank you for you and your staff's consideration and assistance in preparation of the response. If you have any questions, please don't hesitate to contact me.

Sincerely,

Daniel T. Barrett

General Manager

Attachment

ATTACHMENT 1

CLIMATE CHANGE AND GREEN HOUSE GAS EMISSIONS ANALYSIS (FINAL SSEIR)

2.2.5 Climate Change and Greenhouse Gas (GHG) Emissions Analysis

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

2.2.5.1 Adaption and Resiliency

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

The Town has reviewed the prediction for sea level change noted in the report on page 16 that describes changes for Woods Hole, MA which is close to Buzzards Bay and the Landfill. The "Extreme", or maximum physically plausible case, sea level rise scenario for as far into the future as the year 2100, predicts a maximum rise of 10.3 feet above

current sea level. While this level is unlikely, nevertheless, the designs for the expansion of the Bourne Landfill and associated waste management and handling facilities would not be directly affected by this change as the facility is located on one of the highest points on Cape Cod and has elevations ranging from approximately 144 feet MSL to 90 feet MSL along the perimeter of the facility. The maximum predicted sea level rise is well below this level.

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

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

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

- ISWM has a backup generator for on-site power in the event of storms.
- The ISWM facility has data backup storage off-site at Town Hall and furthermore, the technology staff has ensured that storage at Town Hall is also backed-up at an off-site location.
- ISMW reviews its operations, supply chains and staffing to assess areas for improvement to be ready to respond to increased storm events in coordination with the Town Administrator, Town first responders, the LEP Committee and other Town staff. Coordination will also include working with the County that maintains a regional emergency response staff and state staff at appropriate agencies.

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

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

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

2.2.5.2 GHG Background

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

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

2.2.5.3 Existing GHG Mitigation

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

   In the final Air Quality Plan Approval issued by MA DEP, the MA DEP determined the utility flare to be the "top-case" for Best Available Control Technology (BACT)

for control of landfill gas and its subsequent emissions of NOx, CO and VOCs (Air Quality Plan Approval, Application SE-12-011, March 18, 2013). ISWM compared the utility flare to an enclosed flare, and determined that given the context in which it is used, the utility flare has several key operational advantages over an enclosed flare:

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

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

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

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

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

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

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

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

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

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

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

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

2.2.5.4 Landfill Expansion Scenarios

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

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

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

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

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

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

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

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

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

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

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

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

2.2.5.5 Attempted GHG Mitigation Measures

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

LFG conversion to pipeline natural gas

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

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

Microturbines fueled by LFG

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

LFG-to-energy facility

Following the recommendation of the preceding feasibility study, the Town applied for and obtained MDEP Air Permits for a LFG-to-energy facility using internal combustion engine-generator sets to generate up to 4.5 megawatts and recover heat to evaporate up to 18 Million gallons of Landfill leachate. LFG-to-energy facility would require up to 1,785 scfm of LFG at 50-percent methane content to operate at capacity. The production of electricity by the LFG-to-energy facility would result in 19,400 tons of CO2 indirect reductions annually using a CO2 marginal emission rate factor of 1,036 pounds of CO2 per MWhr, which emission rate factor is established in "ISO New England 2015 Air Emissions Report". The indirect reduction of CO2 emissions is the quantity of CO2

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

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

Anaerobic digestion of organic materials and biogas-to-energy

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

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

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

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

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

2.2.5.6 Other GHG Mitigation

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

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

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

- LFG Blower Power. With a new flare system, ISWM purchased and installed in 2015 two new LFG blowers, each driven with a 40 HP motor. The motors are belt-driven with rotary sheaves selected to minimize energy consumption at desired flow rates. The Town performs on-going maintenance, replacing

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

- Photovoltaic (PV) Solar. The Town has the potential to install and operate up to 6.9 MW of PV solar over the final closed plateau of the landfill, on the roof of an existing maintenance garage and on the roofs of potential new offices, transfer stations and maintenance facilities that are proposed to be developed at the southern end of the facility, as shown on Figure 11 – Solar Array Plan in Attachment 3. With a capacity factor of 13%, a PV solar array of 6.9 MW would result in approximately 4,100 tons of CO2e indirect reductions annually using the CO2 marginal emission rate factor of 1,036. The total contribution from the capped landfill area is less than discussed in previous submittals because the current application envisions a final elevation of 225' for the capped landfill versus an elevation of 185' which reduces the plateau area upon which panels can be installed on level grade. However, additional PV solar arrays may be installed along finished side-slopes as has been done at the closed landfill along Route 24 in Randolph. Installation of PV solar arrays on sloped surfaces is a relatively new development and the Town will investigate the feasibility of applying it to the Bourne Landfill at the appropriate time. While solar projects at landfills have become very common in Massachusetts in recent years, these projects are usually developed on closed landfills that have been inactive for decades. The landfill operated by ISWM is still active and even though sections have been closed for a number of years, a careful evaluation of traffic patterns and topography must be conducted prior to any installation. This was stressed in

the MA Department of Energy Resources document entitled *The Guide to Developing Solar Photovoltaics at Massachusetts Landfills*, which noted on page 8, *"As part of any feasibility assessment, the host municipality will need to inspect the landfill to evaluate a number of potential issues that may impact site development, including storm water, landfill gas, and settlement."* ISWM will work with its consulting engineering team to determine when and where a potential area will become available for development. However, given the relatively recent deposition of waste and its composition, it may take at least five years or even longer for an area to become suitably stable. ISWM will look at this carefully along with various procurement options and business models to determine the earliest time that at least a portion of the facility could be utilized for a solar array which will be expanded over time. Nevertheless, the long-term ISWM facility is a good candidate for solar once it is fully capped and closed. In the shorter term ISWM will evaluate options for the installation of solar arrays on rooftops, especially as it begins design of an anticipated new office/garage complex at the southern end of the property

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

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

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

improve considerably versus considering just the existing maintenance facility in isolation.

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

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

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

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

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

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

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

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

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

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

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

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

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

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