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**MASSACHUSETTS CONTINGENCY PLAN  
IMMEDIATE RESPONSE ACTION STATUS REPORT  
and  
LANDFILL MONITORING REPORT**

**1<sup>ST</sup> QUARTER 2014**

**TOWN OF EASTHAM LANDFILL  
255 OLD ORCHARD ROAD  
EASTHAM, MASSACHUSETTS**

**DEP RTN 4-24301**

March 31, 2014

Prepared for:

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ES&M Project No. 2013-027

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## 1.0 INTRODUCTION

This Immediate Response Action (IRA) Status report has been prepared in accordance with the Massachusetts Contingency Plan (MCP) by Environmental Strategies & Management, Inc. (ES&M) on behalf of the Town of Eastham. This report describes activities conducted under Massachusetts Department of Environmental Protection (MassDEP) Release Tracking Number (RTN) 4-24301 during the first quarter of 2014 (2014Q1). This report also includes a summary of activities completed during the same period under the Town of Eastham's Landfill Monitoring Plan, approved by MassDEP on August 14, 2012.

### 1.1 Background

The Town's landfill accepted municipal wastes from the 1930's until approximately 1992, and was capped in 1997. The closure of the landfill consisted of the construction of a low permeability cap and the implementation of a groundwater monitoring program. This monitoring program included routine collection and laboratory analysis of groundwater samples from monitoring wells around the landfill and private drinking water wells in the neighborhood of the landfill. The landfill and surrounding properties are shown on the Site Map included as Figure 1.

In March 2004, vinyl chloride was detected in a water sample collected from a private drinking water well at a concentration of 2 micrograms per liter ( $\mu\text{g/L}$ ). Vinyl chloride is a volatile organic compound or "VOC" that is commonly found in groundwater where chlorinated solvents have been released. At this site, VOCs are likely related to debris buried at the landfill. Since the drinking water standard for vinyl chloride is 2  $\mu\text{g/L}$ , this discovery was reported to MassDEP as required by the MCP. Response actions related to this discovery included collection and analysis of water samples over a five year period. Laboratory results showed diminishing concentrations of vinyl chloride over time. The diminishing concentrations were attributed to the capping of the landfill, which limits the infiltration of rainwater, and hence, the leaching of contaminants to groundwater. A comprehensive report was submitted in 2009 (to supplement other previous reports) to document that a permanent solution had been achieved under the MCP. The term "permanent solution" as defined by the MCP means that a condition of no significant risk of harm to humans and the environment has been achieved.

On August 14, 2012, MassDEP's Division of Solid Waste issued a letter to the Town to outline revised monitoring and reporting requirements for the landfill and surrounding neighborhood. The revised Landfill Monitoring Plan (LMP) requires the collection of groundwater samples from monitoring wells and private wells, collection of soil gas samples from the perimeter of the landfill and quarterly reporting. The testing requirements for water samples include VOCs, certain metals, and "indicator" parameters such as pH, alkalinity, nitrates, and other compounds that are typically related to landfill leachate. The testing protocol was established to monitor groundwater quality in drinking water wells closest to the landfill, at a frequency determined by MassDEP. Included in MassDEP's August 14, 2012, letter was a

requirement to analyze groundwater samples for 1,4-dioxane. This compound is considered an “emerging” contaminant, meaning that its occurrence in the environment and its potential toxicity have only recently been considered by the regulatory and scientific community. It is for this reason that groundwater within and around the landfill had not previously been tested for 1,4-dioxane.

Following the detection of 1,4-dioxane in monitoring wells and private drinking water wells near and downgradient of the landfill, the Town initiated an extensive drinking water well testing program. Between February and August 2013, water samples were collected from 227 drinking water wells under this program.

The drinking water standard for 1,4-dioxane is currently 3 µg/L, and until recently, laboratories established reporting limits just below this standard (typically about 2.5 µg/L). This reporting limit (RL) sometimes referred to as the method reporting limit (MRL) is the level above which the laboratory can reliably and accurately report a result. The laboratory instruments can detect below that level, but those results are reported as estimated (such data is usually qualified with a “J” value on laboratory reports).

In the spring of 2013, MassDEP published draft regulations (which are still draft at this time) proposing to lower the MCP “GW-1” drinking water standard for 1,4-dioxane from 3 µg/L to 0.3 µg/L. The lowered drinking water standard is in response to several studies, primarily conducted on animals, that suggest that 1,4-dioxane is likely to be carcinogenic to humans. The proposed new standard corresponds to a target excess lifetime cancer risk of one in a million, using the most current toxicity information.

The lowered standard has necessitated the use of more sophisticated laboratory techniques to accurately detect 1,4-dioxane to a method reporting limit of about 0.2 µg/L. The Town has been utilizing laboratory methods that achieve this detection limit since the initiation of its drinking water well sampling program in February 2013. It should be noted that 1,4-dioxane is the only contaminant that has been detected above the GW-1 drinking water standards in samples collected during the Eastham private well sampling program.

During the initial phases of the private well sampling program, bottled water was offered to any resident where 1,4-dioxane was detected above one half of the current drinking water standard (1.5 µg/L). However, the action level for bottled water has been lowered to be consistent with the proposed drinking water standard of 0.3 µg/L. Therefore, bottled water is now being offered to residences in the study area where 1,4-dioxane has been detected at 0.3 µg/L or greater. A complete list of properties that meet this criterion is summarized on Table 1.

## **1.1 Purpose**

This IRA Status and Landfill Monitoring Report has been prepared to document activities undertaken from December 2013 through February 2014 for RTN 4-24301. This report also summarizes three public meetings that were held to inform the public of recent sampling activities and results.

## 2.0 IMMEDIATE RESPONSE ACTION ACTIVITIES

The objective of the Immediate Response Action program is to identify private water wells in the vicinity of the landfill that have been impacted by 1,4-dioxane, and to provide alternative safe drinking water to affected residents. As discussed in recent public meetings, it is well documented that 1,4 dioxane is found in many common household items including paints, varnishes, detergents, shampoos and cosmetic products. Since all homes within the IRA study area discharge household waste water to the subsurface via a septic system, it appears likely that 1,4 dioxane has been introduced into the drinking water aquifer from multiple sources. Since the 1,4 dioxane that is found in common household goods is identical to 1,4 dioxane that was released within the boundaries of the landfill, it is difficult if not impossible to distinguish between these sources. Regardless, the Town is continuing with its efforts to define the extent of 1,4 dioxane in the study area and to offer bottled water to residents whose well water contains 1,4 dioxane above 0.3 µg/L.

The previous IRA status reports submitted to MassDEP document activities completed through November 2013. The following sections discuss IRA activities undertaken in December 2013, and in January and February 2014.

### 2.1 *Private Well Sampling*

#### 2.1.1 Phase 4

The primary IRA activity undertaken during this report period was Phase 4 of the private well sampling program, which was conducted during the first week of December 2013. The Eastham Board of Health compiled the list of properties to be included in the Phase 4 event based on the following criteria:

- Private wells in the study area that had not been tested during previous sampling phases.
- Private wells in areas beyond the study area to the south and east, since 1,4-dioxane had been detected at the furthest extent of the original study area and further definition of the extent of 1,4-dioxane was necessary.
- Properties within the study area where concentrations of 1,4-dioxane were detected above the reporting limit of 0.2 µg/L but below the proposed GW-1 Standard of 0.3 µg/L.

In November 2013, the Town of Eastham mailed letters to 141 property owners requesting access to their wells for sampling. Letter recipients were asked to contact ES&M to determine a convenient time for access during the first week of December. For seasonal homes that were closed for the season, property owners were given the option to provide access prior to next summer.

From December 2 through 6, 2013, water samples were collected from 39 residences. As with the previous sampling events, a field visit form was completed to document the date and time when the sample was collected, the sample location (e.g. kitchen tap,

outside spigot), and the configuration of the water system. Field crews also recorded pH, dissolved oxygen (DO), conductivity and temperature of the water as samples were collected. Field sampling forms summarizing this information are included in Appendix A. Samples were preserved and shipped to Test America Laboratories in Buffalo, New York, for analysis of volatile organic compounds by EPA Method 524.2 and 1,4-dioxane by Method 522 Mod. Both methods employ reporting limits that are below the drinking water standard for each compound (or below the proposed standard in the case of 1,4-dioxane).

Table 2 summarizes the compounds detected above the stated laboratory reporting limit in samples collected from these private wells in December 2013, and the complete laboratory reports are included in Appendix B. As required by 310 CMR 40.1403(10) of the MCP, property owners were notified of the laboratory results for samples collected from their properties. Copies of the notification packages sent following the sampling event in December are included in Appendix C<sup>1</sup>.

Table 3 summarizes drinking water sampling results from all phases of the private well sampling program<sup>2</sup>. The Site Map included as Figure 1 shows the properties within the study area; each parcel is color coded with one of four colors to represent the sampling results:

- Gray = 1,4-dioxane was not detected. Well water test results in this category were below the reporting limit for 1,4-dioxane of 0.2 µg/L. Since an estimated concentration (“J” value) was not reported, it is inferred that 1,4-dioxane is not present above the detection limit (approximately 0.04 µg/L).
- Yellow = 1,4-dioxane detected at a concentration below the proposed GW-1 standard of 0.3 µg/L. Laboratory results that are below 0.3 µg/L but above the reporting limit of 0.2 µg/L are quantified results, while results below 0.2 µg/L and above the method detection limit of 0.04 µg/L are qualified as estimated values (reported with a “J” qualifier).
- Red = 1,4-dioxane detected at or above 0.3 µg/L. All residents in the category have been offered bottled water and have been advised to not use their well water for consumptive purposes.
- White = well water not tested. Property is either part of Phase 4 study area and the property owners were not available to provide access; or the property is part of the Phase 5 study area which will be discussed in Section 4.1.
- White with NR = the owners of these properties were contacted by certified mail; however, no response was received or access was not granted.
- White/hatched = no well is on this property.

<sup>1</sup> Lab reports and copies of the notification packages sent to home owners for sampling events conducted prior to December were provided in previous status reports.

<sup>2</sup> The tables present the concentrations of compounds detected or if a compound was not detected above the laboratory reporting limit, the less than symbol and the reporting limit are shown (e.g. < 0.27). This indicates that the compound was not detected in the sample above the laboratory reporting limit of 0.27. Laboratory reporting limits may vary due to sample quantity provided and dilutions necessary for analysis.

### **2.1.2 Eastham Elementary School Well Sampling**

During this reporting period, water samples were collected from the Eastham Elementary School drinking water well located at 200 Schoolhouse Road on two occasions (February 11 and 14, 2014). Samples on both dates were collected before and after the pH adjustment and filtration system. Samples were preserved and shipped to Test America Laboratories in Buffalo, New York, for analysis of volatile organic compounds by EPA Method 524.2 and 1,4-dioxane by Method 522 Mod. Acetone (possible laboratory contaminant) and methyl-tert butyl ether (MTBE, formerly used as an additive in gasoline) were detected at concentrations well below GW-1 drinking water standards, and 1,4 dioxane was detected below the laboratory reporting limit of 0.2 µg/L and these results were reported as “J” values. These results are summarized on Table 3 under the 200 Schoolhouse Road address. Field sampling forms summarizing this sampling event are included in Appendix A and complete laboratory reports are included in Appendix B.

### **2.1.3 Bottled Water Laboratory Testing**

On March 10, 2014, samples were collected from two of the Belmont Springs bottled water dispensers at the Eastham Elementary School. The first sample was collected from the dispenser located on the main floor near Staircase #5. The date on this bottle was February 12, 2014. The second sample was collected from the dispenser across from the library, and this bottle was dated February 13, 2014.

On March 14, 2014, a sample was collected from the Poland Springs water dispenser provided to the residents at 100 Meetinghouse Road.

All samples were properly preserved and transported to Alpha Analytical Laboratories in Mansfield, MA (with a trip blank) for analysis of 1,4-dioxane by EPA Method 8270 SIM. This method is compliant with MassDEP’s Compendium of Analytical Methods (CAM) and employs reporting limits that are below the proposed drinking water standard for 1,4-dioxane. 1,4-dioxane was not detected in any of the bottled water samples. The laboratory reports were approved in accordance with ES&M’s data quality review process, and are included in Appendix B.

### **2.1.4 Landfill Gatehouse and DPW Wells**

Water samples were also collected from two drinking water wells within the landfill area for analysis of VOCs and 1,4-dioxane. On February 7, 2014, a water sample was collected from the “DPW Garage” sink located in the southern end of the DPW garage. The well that serves this building is located to the south of the DPW building. On February 11, 2014, a sample was collected from the “Gatehouse” well which serves the gatehouse located near the entrance to the transfer station. Both wells are shown on Figure 2. No site-related VOCs or 1,4 dioxane were detected in either sample. Field sampling forms summarizing this sampling event are included in Appendix A, the laboratory test results are summarized on Table 3, and the complete laboratory reports are included in Appendix B.

## 2.2 Pilot Test for 1,4-Dioxane Removal/Destruction

ES&M has reviewed published information regarding the removal of 1,4-dioxane from water. Advanced oxidation has been demonstrated to destroy 1,4-dioxane in water; however, no point-of-use systems are currently available for use in a residential home. High-grade activated carbon may remove 1,4-dioxane from water, but its efficacy has not yet been adequately demonstrated.

ES&M has completed two field pilot tests; one involving activated carbon and one using a small advanced oxidation unit. Laboratory tests were also conducted to determine the potential for treatment by a commercially-available advanced oxidation unit. The results of these tests are described below.

### 2.2.1 Activated Carbon Adsorption Test

As described in the previous IRA status report, an activated carbon system consisting of the following components was installed in a private residence within the study area on November 14, 2013:

- Two polyglass adsorbers, each 13 inches diameter by 54 inches tall with integral plumbing;
- 110 pounds of acid-washed, coconut based, 12 x 40 virgin activated carbon;
- Three ball valves that can be used to bypass the carbon treatment system;
- Three sample valves that can be used to collect influent, midpoint and effluent water samples; and
- One Carlon model 6251MNL flow meter.

The pilot test includes collecting water samples before treatment (labeled influent), after treatment by the primary adsorber and before the secondary adsorber (labeled mid), and after treatment by the secondary adsorber (labeled effluent). Nine sets of samples were collected over a 76 day period. During each sample collection event, the volume of water that had been treated by the carbon adsorbers was recorded. Water samples were shipped under chain-of-custody to Test America in Buffalo, NY, for laboratory analysis of VOCs<sup>3</sup> by EPA Method 524.2 and for 1,4-dioxane by EPA Method 522 Mod.

The test results are summarized below:

Date	Sample ID	Totalizer (gallons)	1,4-Dioxane Concentration (ug/L)			Cumulative Gallons Treated	Days
			Influent	Mid	Effluent		
11/14/2013	PTC-1	25.85	1.6	0.046J	<0.20	0	0
11/20/2013	PTC-2	962.14	2.0	<0.040	<0.20	936	6
11/26/2013	PTC-3	2015.19	1.7	0.053J	<0.20	1989	12
12/5/2013	PTC-4	3478	1.3	0.066J	<0.20	3452	21
12/11/2013	PTC-5	4238.47	1.3	0.068J	<0.20	4213	27
12/18/2013	PTC-6	5009.34	1.9	0.098J	<0.20	4983	34

<sup>3</sup> VOCs analysis was discontinued after the eighth set of sample results which did not show VOCs in the water.

Date	Sample ID	Totalizer (gallons)	1,4-Dioxane Concentration (ug/L)			Cumulative Gallons Treated	Days
			Influent	Mid	Effluent		
12/27/2013	PTC-7	6328.73	2.2	0.17J	<0.20	6303	43
1/2/2014	PTC-8	7583	2.0	0.16J	<0.20	7557	49
1/29/2014	PTC-9	10776.79	2.0	0.30	<0.20	10751	76

Evaluation of the test data reveals the following:

- The influent 1,4-dioxane concentration ranged from 1.3 µg/L to 2.2 µg/L.
- The average 1,4-dioxane concentration in the influent water was 1.8 µg/L.
- The concentration of 1,4-dioxane in the mid samples ranged from <0.040 µg/L (after 6 days of treatment) to 0.30 µg/L after 76 days of treatment.
- 1,4-dioxane was not detected in any of the effluent samples collected over this 76-day period.
- On January 29, 2014, the secondary adsorber was moved into the primary position, and the carbon in the original primary adsorber (now the secondary adsorber) was replaced with virgin carbon.
- Information relative to the performance of the carbon treatment system during this test period includes:
  - The water usage rate in this home averaged 141 gallons per day.
  - The total volume of water treated before 1,4-dioxane was detected above 0.3 µg/L in the mid samples was 10,751 gallons.
  - The carbon treatment system adsorbed approximately 73 mg of 1,4-dioxane, mostly in the primary adsorber.
  - The mass of 1,4-dioxane adsorbed per unit mass of carbon was approximately 0.003 mg/g.

These test results indicate that coconut-based activated carbon may offer a reliable means to remove 1,4-dioxane from water; however, the actual mass of 1,4-dioxane adsorbed per unit mass of carbon is very small. There was no indication that 1,4-dioxane desorbed from the primary adsorber during the test. Finally, it is important to remember that this is only one data set and more test data is needed to confirm that coconut-based carbon can be applied confidently to remove 1,4-dioxane from drinking water.

ES&M and the Town of Eastham will continue to evaluate the performance of carbon at this residence and the results will be reported in subsequent IRA status reports. We are also exploring the possibility of conducting carbon pilot tests at other residences.

### 2.2.2 Ozone/UV Light Test

Advanced oxidation, which most commonly involves the use of ozone or hydrogen peroxide and ultraviolet light has been demonstrated to destroy 1,4-dioxane in water. However, effective point-of-use systems that operate with little or no operator attention are not yet available. During this report period, ES&M collaborated with HF Purewater

(Compton, California) to perform a bench-scale test to determine whether drinking water from the study area would be amenable to advanced oxidation. In addition, ES&M completed a limited field pilot test using a small ozone/UV system that is readily available at many home improvement retailers. The test results are summarized below.

#### Bench Scale Laboratory Tests

ES&M contacted Dr. Reid Bowman of H.F. Purewater, a manufacturer of large-scale advanced oxidation systems. Dr. Bowman expressed interest in developing a point of use system and agreed to conduct preliminary tests on a sample of water collected from Eastham. Dr. Bowman was provided with a water sample and after testing, he concluded the following:

*“... regarding our bench testing of the water we received from you which had a 1,4-dioxane concentration of 1.7 ug/L when tested as compared to 1.8 ug/L reported on 8/27/13. We have demonstrated under several conditions the ability to reduce the 1,4-dioxane concentration to <0.2 ug/L. There is still room for additional optimization but need to know the status of the project before putting significantly more resources into developing a product for the project<sup>4</sup>.”*

The quoted email was a follow up to a verbal conversation in which Dr. Bowman stated that the subject water readily transmitted UV light and did not contain other constituents that consumed hydrogen peroxide. Dr. Bowman concluded that the water was a good candidate for treatment by advanced oxidation.

#### Field Pilot Test

ES&M purchased a small, under sink treatment device which the manufacturer claims employs a five-step process (ozone, UV light, photo oxidation, filtration, and post filtration UV) to disinfect water and remove lead. This device (Zuvo water filtration system series 300) was selected for testing because it is an inexpensive treatment unit that reportedly uses ozone and UV light, which have successfully been used at other sites to destroy 1,4-dioxane in water. A test was conducted on November 20, 2013, (described in the previous IRA Status Report) using untreated water obtained from a private residence.

The test results are summarized below:

- The average flow rate processed through the Zuvo unit during the test was 0.34 gallons per minute.
- A set of influent and effluent samples were collected after 92 minutes of operation and 32.2 gallons of water had been processed. The influent/effluent 1,4-dioxane concentrations were 2.0 and 1.8 µg/L, respectively, indicating a removal efficiency of approximately 10%.
- A second set of influent and effluent samples were collected after 66 additional minutes of operation and an additional 21.2 gallons of water had been processed. The influent/effluent 1,4-dioxane concentrations were 2.0 and 1.6 µg/L, respectively, indicating approximately 20% removal efficiency.

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<sup>4</sup> Email correspondence from Dr. Reid Bowman to Thomas Sylvia on February 4, 2014.

The laboratory results did not indicate that the Zuvo unit was effective at removing 1,4-dioxane. No additional testing of this unit is planned.

All laboratory reports associated with the pilot test are included in Appendix D. As required by 310 CMR 40.1403(10) of the MCP, the property owner was notified of the laboratory results for samples collected from their property. A copy of the notification package is included with the other homeowner notification letters in Appendix C.

### **2.3 MCP Notifications for IRA Status Report Submittal**

As required by the MCP, notice of the electronic submittal of this IRA status report to MassDEP is provided to the Town of Eastham Board of Health and Chief Municipal Officer. A copy of the notification letter pertaining to this report is included in Appendix E.

## **3.0 LANDFILL MONITORING PROGRAM ACTIVITIES**

The Landfill Monitoring Plan outlines sampling and analytical requirements for groundwater within and near the landfill, and private drinking water wells in the neighborhoods around the landfill. The LMP also includes requirements for sampling of landfill gas. The Plan was most recently revised and approved by MassDEP's Solid Waste Management Section in August 2012. This revised LMP required that the Town analyze water samples for 1,4-dioxane (utilizing EPA Method 8260B or 8270 SIM, with a reporting limit of no greater than 3 µg/L) at six of the monitoring locations (five monitoring wells and one residential drinking water well). A summary of the Landfill Monitoring Plan sampling requirements and schedule are shown on Table 4. The following sections describe sampling and monitoring activities completed during this report period.

### **3.1 Landfill Monitoring Plan Annual Sampling**

#### **3.1.1 Landfill Monitoring Wells**

As prescribed by the LMP, annual groundwater samples were collected from landfill monitoring wells MW 2S, MW 4S, MW 5S and MW 8 on December 18, 2013. Samples were collected by Barnstable County Department of Health and Environment personnel and submitted to the Barnstable County Health Laboratory for analysis of VOCs, 1,4-dioxane, metals and indicator parameters. The laboratory test results are summarized on Table 5, which includes applicable regulatory standards and/or guidelines. The field sampling logs are included in Appendix A and the complete laboratory reports are included in Appendix B.

### **3.1.2 Private Wells**

The LMP includes annual sampling of private well water from several homes near the landfill. Drinking water samples had already been collected from most of the properties included in the annual sampling program during the first three quarters of 2013. Samples were collected from the five remaining residences - 280 Alston Avenue, 265 Alston Avenue, 130 A Old Orchard Road, 130B Old Orchard Road and 210 Old Orchard Road - on December 18, 2013.

The samples collected from these residences were preserved and submitted to Test America for analysis of VOCs, 1,4-dioxane, and metals. Field sampling forms for this sampling event are included in Appendix A. The laboratory results are included on Table 5 and the laboratory report is included in Appendix B. As required by 310 CMR 40.1403(10) of the MCP, property owners were notified of the laboratory results for samples collected from their properties during this report period. Copies of the notification packages are included in Appendix C.

## **3.2 Landfill Monitoring Plan Semi-Annual Sampling**

### **3.2.1 Landfill Monitoring Well MW 21S**

Groundwater samples have been collected from monitoring well MW 21S semi-annually under the LMP in the past and were due to be collected in November 2013. However, Barnstable County field personnel were unable to locate this well at that time. Another attempt to locate this monitoring well will be made in May 2014.

### **3.2.2 Landfill Soil Gas Monitoring**

Personnel from the Barnstable County Department of Health and Environment conducted semi-annual soil gas monitoring at the Eastham Landfill on December 11, 2013. Six soil gas monitoring points were screened for percent methane (reported as % of the lower explosion limit or LEL), hydrogen sulfide (H<sub>2</sub>S) in parts per million (ppm), oxygen (percent), and VOCs (in ppm). The Eastham Landfill Soil Gas report prepared by BCDHE is included in Appendix F.

## **3.3 Landfill Monitoring Plan Quarterly Sampling**

### **3.3.1 Landfill Monitoring Wells**

As prescribed by the LMP, quarterly groundwater samples were collected from landfill monitoring wells MW 3I and MW 3D on February 27, 2014. The locations of these wells in the landfill are shown on Figure 1. Samples were collected by Barnstable County Department of Health and Environment personnel and submitted to the Barnstable County Health Laboratory for analysis of VOCs, metals and indicator parameters. The laboratory test results are summarized on Table 5, which includes applicable regulatory standards and/or guidelines. Field logs are included in Appendix A. The complete laboratory report from Barnstable County with chain of custody is included in Appendix B.

### **3.3.2 Private Wells**

The LMP includes quarterly sampling of private well water from three homes around the landfill - 100 Meetinghouse Road, 180 Old Orchard Road, and 285 Alston Avenue. Preparations were made to collect samples from these properties on February 28, 2014; however, because of issues with the laboratory, the sample collection event had to be postponed until March 2014. The results will be reported in the next quarterly IRA Status and LMP sampling report, which will be submitted in June 2014.

## **4.0 FUTURE IRA AND LMP ACTIVITIES**

### **4.1 Immediate Response Action Plan Modifications**

On March 7, 2014 ES&M submitted an IRA Plan Modification report to MassDEP, which is available on line at <http://public.dep.state.ma.us/fileviewer/Rtn.aspx?rtn=4-0024301> or by hard copy at Town Hall or the library. The Plan Modification contains several important updates to the IRA program, as summarized below:

#### **Elimination of VOC Analysis from IRA Sampling Program**

The objective of the Immediate Response Action program is to identify private water wells in the vicinity of the landfill that have been impacted by 1,4 dioxane, and to provide alternative safe drinking water to affected residents. Since the IRA was initiated, samples collected from the study area have been analyzed for VOCs in addition to 1,4 dioxane. While many different VOCs have been detected in drinking water samples, concentrations of all VOCs have been well below drinking water standards. The Plan Modification provides full justification for the elimination of VOCs from the analytical program.

#### **Alternate Laboratory Analytical Method**

Drinking water samples have been analyzed for 1,4 dioxane using EPA Method 522 MOD, which is a drinking water analytical method that was modified by the laboratory to achieve a reporting limit of 0.2 µg/L and a detection limit of 0.04 µg/L. While this modified method has produced good quality data, the MCP requires Licensed Site Professionals to utilize the most up-to-date methods and standards. MassDEP developed the Compendium of Analytical Methods (“CAM”) several years ago to outline Quality Assurance/Quality Control requirements and performance standards for a variety of laboratory analytical methods. Because of recent advancements, EPA Method 8270 (a CAM-compliant method) is now available for the analysis of 1,4 dioxane with a reporting limit of approximately 0.15 µg/l and a method detection limit of 0.075 µg/l. Analytical reports will be similar to reports using EPA Method 522 MOD, with the use of “J” values for estimated concentrations of 1,4 dioxane above 0.075 µg/L but below 0.15 µg/L. All samples submitted for 1,4 dioxane analysis from this date forward will be analyzed using EPA Method 8270.

#### **Quarterly Sampling of Wells with 1,4 Dioxane between 0.2 and 0.29 µg/L**

Beginning in March 2014, drinking water samples will be collected on a quarterly basis from properties where the concentration of 1,4 dioxane has been reported to be between

0.2 and 0.29 µg/L. The purpose of re-sampling these properties is to confirm that the 1,4 dioxane levels do not exceed the proposed drinking water standard of 0.3 µg/L.

#### **Confirmation Sampling of Select Wells Exhibiting “J” Values**

One additional round of drinking water samples will be collected from private wells that exhibited an estimated concentration of 1,4 dioxane (i.e., a “J” value), and where that well is adjacent to a property where 1,4 dioxane concentrations are at or above 0.3 µg/L. The purpose of this program is to confirm that the 1,4 dioxane levels in the drinking water wells that are near affected wells do not exceed 0.3 µg/L. If these sample results are similar to previous testing results (i.e., continue to indicate concentrations of 1,4 dioxane well below 0.3 ug/l), no further testing will be conducted at this time. If test results are substantially higher than previously observed, additional testing may be proposed.

#### **Expansion of Private Well Sampling Program – Phase 5**

Phase 5 of the private well sampling program will include private drinking water wells on properties located to the south of Route 6, east of Schoolhouse Road and north of Glacier Hills Road (see Figure 1). Since 1,4-dioxane has been detected at the furthest extent of the original study area in those areas, this phase will extend the study area as necessary to further define the extent of 1,4-dioxane in groundwater. Phase 5 of the private well sampling program was completed in the second week of March 2014, and the results will be included in the next IRA Status Report.

#### **Annual Sampling of Wells with 1,4 Dioxane Concentrations above 0.3 µg/L**

Residents whose drinking water samples exhibited concentrations of 1,4 dioxane above the guideline of 0.3 µg/L have been offered bottled water to use for consumptive purposes. To establish longer-term trends of 1,4 dioxane levels, samples will be collected from these wells on an annual basis, likely between the months of April and June.

#### **Eastham Elementary School Well Testing**

The drinking water supply well at the Eastham Elementary School located at 200 Schoolhouse Road will be tested for 1,4 dioxane on a quarterly basis beginning in February 2014.

#### **Activated Carbon System Pilot Test**

A pilot test has been underway since November 2013 at the 255 Alston Street residence to evaluate the efficacy of activated carbon for removal of 1,4 dioxane from their drinking water. This carbon system will be maintained for the foreseeable future, including collection of influent/mid/effluent samples on a monthly basis and replacement of the carbon after approximately 10,750 gallons.

## **4.2 Landfill Monitoring Plan**

Activities required by the Landfill Monitoring Plan will continue during the next reporting period, and will include the following:

- Review the objectives of the LMP and propose revisions to the sampling plan to be consistent with the current status of the IRA. For example, several residences that are sampled routinely are already being provided bottled water; therefore, continued sampling may provide limited beneficial information.
- Monitor soil gas monitoring wells at the landfill in May 2014 for methane, hydrogen sulfide, and oxygen; and field screen soil gas samples for volatile organic compounds.
- Collect quarterly groundwater samples from wells MW 3I and MW 3D in May 2014 for analysis of indicator parameters, metals and VOCs including 1,4-dioxane. Collect groundwater samples from well MW-21S, if possible, for analysis of VOCs and 1,4-dioxane.
- Collect quarterly private well samples from the 285 Alston Avenue, 100 Meetinghouse Road and 180 Old Orchard Road residences in March (in lieu of February samples) and May for analysis of VOCs, 1,4-dioxane and arsenic.
- Collect semi-annual groundwater samples from monitoring well MW -21S in May 2014, if well is accessible.

## 5.0 PUBLIC OUTREACH

Open communication with the residents of Eastham continues to be a priority, with the following components:

### Availability of Reports

All reports required by MassDEP are available on their website (<http://public.dep.state.ma.us/fileviewer/Rtn.aspx?rtn=4-0024301>). The Town of Eastham's also posts these reports on their website ([http://www.eastham-ma.gov/Public\\_Documents/EasthamMA\\_Health/LandfillFolder/](http://www.eastham-ma.gov/Public_Documents/EasthamMA_Health/LandfillFolder/www.eastham-ma.gov/Public_Documents/EasthamMA_Health/LandfillFolder/)). Hard copies of reports are available at Town Hall and at the Eastham Public Library.

### Direct Communications

Questions on the ongoing work related to this matter may be directed to:

- Jane Crowley, Health Agent, Eastham Board of Health  
508-240-5900, x229  
[jcrowley@eastham-ma.gov](mailto:jcrowley@eastham-ma.gov)
- Doug Heely, Licensed Site Professional, Environmental Strategies & Mgmt.  
508-226-1800  
[dheely@esm-inc.com](mailto:dheely@esm-inc.com)

### Public Meetings

Three public meetings were held during this report period to inform the public on the status of the 1,4-dioxane testing program, to educate and inform people on the potential health risks, and to report on the status of the proposed municipal water project. Each meeting is described below and videos are available on the Town of Eastham's Video on Demand webpage:

- go to [www.eastham-ma.gov/Public\\_Documents/Easthamma\\_VOD/video](http://www.eastham-ma.gov/Public_Documents/Easthamma_VOD/video)
- select the “Other Town Meetings” tab
- select the appropriate month on the calendar to the left to view the listing of meeting videos

#### **Community Update Meeting - February 11, 2014**

A meeting was hosted by the Eastham Health Department from 4 pm to 6 pm in the Earle Mountain Room at Town Hall. The meeting was well attended and included the following presenters:

**Jane Crowley, Eastham Health Agent.** Ms. Crowley hosted and moderated the meeting. She provided a brief history of the detection and investigation of 1,4-dioxane and the Town program to supply bottled water to residents whose well water has been affected by 1,4-dioxane. She introduced each of the speakers.

**Douglas Heely, Environmental Strategies & Management.** Mr. Heely, the Licensed Site Professional (LSP) for the site, gave an update of the sampling program and reviewed the laboratory results, including the number of affected wells. He provided information on possible other sources of 1,4-dioxane, which can include many common household items. He also discussed the QA/QC aspects of the laboratory data to help residents understand the laboratory reports they receive.

**Thomas E. Sylvia, Environmental Strategies & Management.** Mr. Sylvia reported on his research into potential treatment technologies to remove 1,4-dioxane from water. He reported that advanced oxidation is an effective technique to destroy 1,4-dioxane in water but that there are no small, point-of-use alternatives available. He also reported on the results of a test conducted to determine if high grade, coconut-based activated carbon can reliably remove 1,4-dioxane from water. Based on preliminary test results he indicated that carbon performance was encouraging but that it was too early to conclude that carbon could be widely applied. Mr. Sylvia opined that the potential cost of treating water from the 30 wells may be on the order of \$600,000 to \$750,000 per year.

**Madeline L. Scammell, DSc. - Boston University School of Health and Wendy Heiger-Bernays, DSc. - Boston University School of Health.** Drs. Scammell and Heiger-Bernays explained the animal studies that have been conducted to evaluate the potential health effects of 1,4-dioxane and how the results of these studies have been used to develop the drinking water guideline. They explained that the proposed drinking water standard of 0.3 µg/l was developed based on consuming 2 liters of water a day for 70 years to arrive at a cancer risk of 1 in one million ( $10^{-6}$ ). Ms. Heiger-Bernays stated that at the concentrations reported in the study area (less than 10 µg/L), there would be no significant risk resulting from showering.

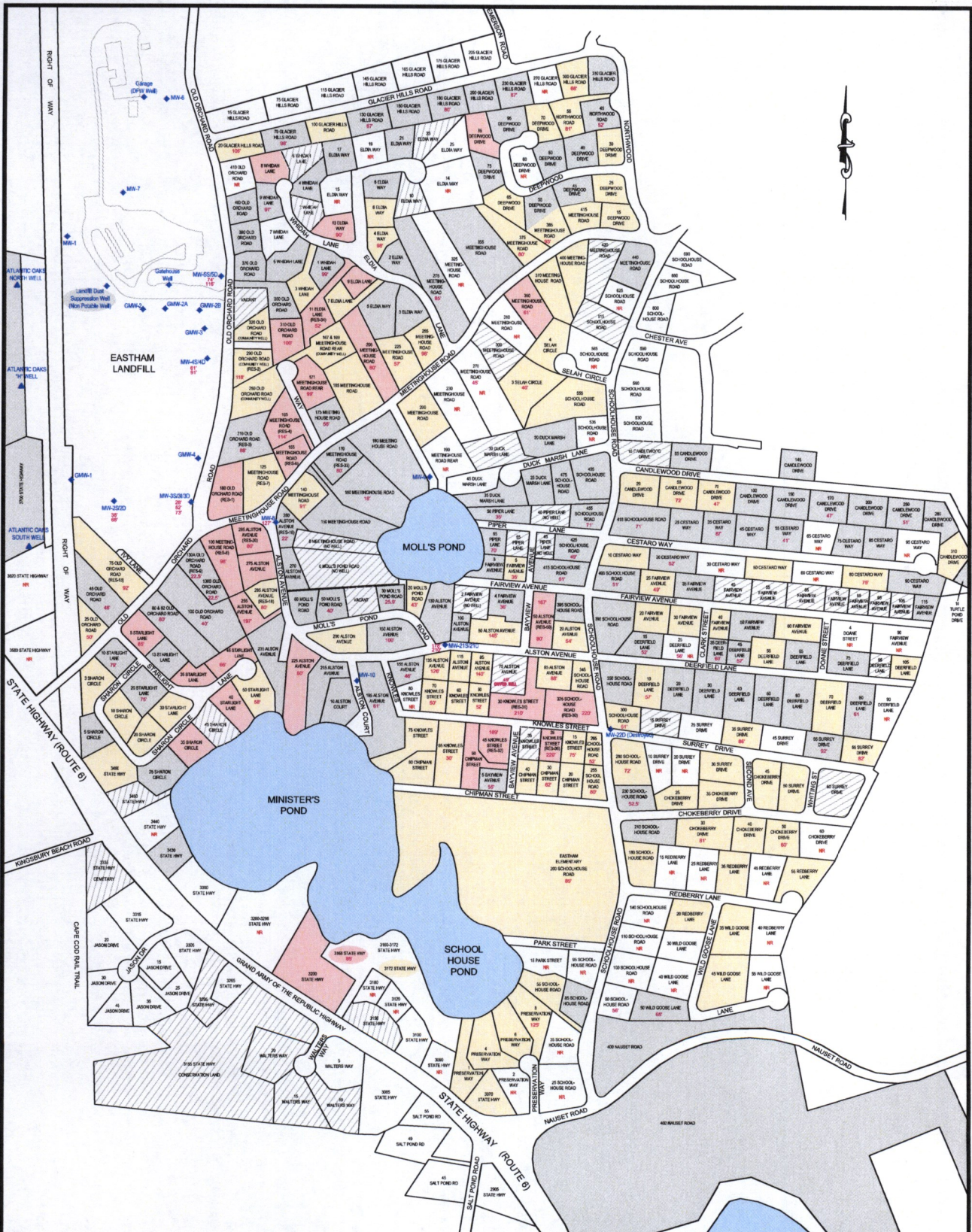
**Mark White - Environmental Partners Group.** Mr. White provided an overview of the proposed municipal water system plans for the Town of Eastham. He discussed several potential options including the “backbone” system that would provide municipal water to all the residences in the landfill study area, provide fire protection for most of the Town residents, and allows for future expansion. Mr. White described the locations of the three municipal supply wells that have been permitted and installed, and he discussed recent groundwater test results from the District H wells.

**Mark Dakers - Massachusetts Department of Environmental Protection, Bureau of Solid Waste.** Mr. Dakers reviewed the history of the landfill and how it was capped in 1997. He also described the initiation of the 1,4-dioxane testing program.

Following the presentations, all speakers participated in an approximate one-hour question and answer session.

**Elementary School Meetings - February 19 and 24, 2014**

Following the detection of 1,4-dioxane below the reporting limit of 0.2 µg/L in drinking water at the school, a meeting was held to inform parents, teachers and other interested persons of the status of the 1,4-dioxane testing program. Both meetings were attended by the school principal (Joanne Finnegan), Town Manager Sheila Vanderhoef, Health Agent Jane Crowley, Mark White of Environmental Partners and Thomas Sylvia of Environmental Strategies & Management.

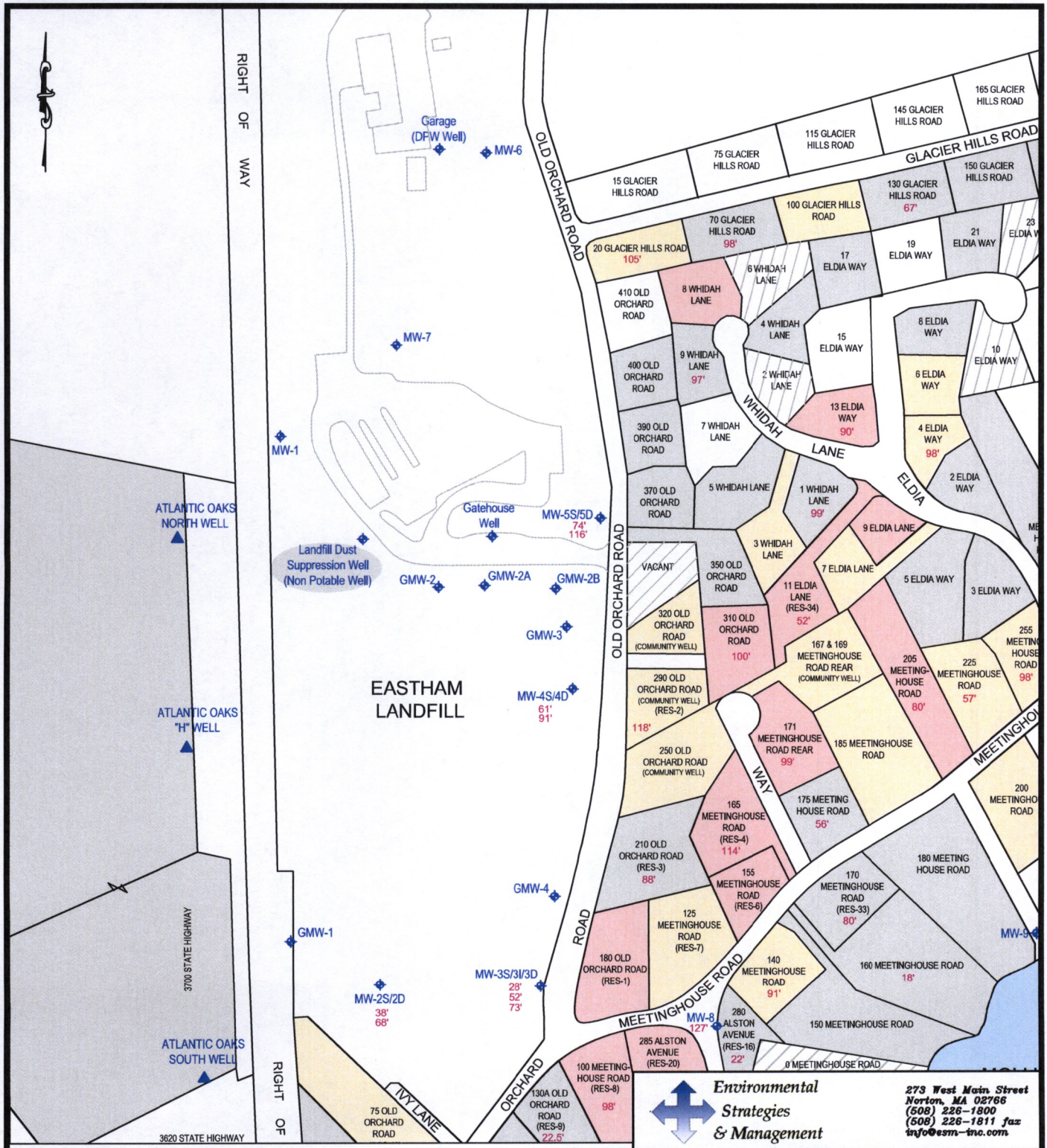


**LEGEND**

- ◆ MONITORING WELL
- ▲ WATER SUPPLY WELL
- 52' WELL DEPTH BELOW GROUND SURFACE
- ▨ VACANT PROPERTY / NO WELL
- 1,4 DIOXANE DETECTED AT OR ABOVE 0.3 ug/L [PROPOSED MCP METHOD 1 GW-1 STANDARD]
- 1,4 DIOXANE DETECTED BELOW 0.3 ug/L
- 1,4 DIOXANE NOT DETECTED
- PROPERTY NOT TESTED

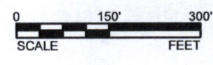
SOURCE: "ENVIRONMENTAL MONITORING LANDFILL MONITORING PLAN" PREPARED FOR EASTHAM LANDFILL, OLD ORCHARD RD, EASTHAM, MA, BY BENEKT ENVIRONMENTAL ASSOCIATES, INC., BREWSTER, MA, DATED 8/17/13.

277 West Street Brewster, MA 02798 (508) 238-1900 (508) 238-1911 Fax http://www.benekt.com		
GAUGING DATE:	DRAWING DATE:	ACAD FILE:
	03/25/14	EASTHAM LANDFILL
<b>SITE MAP</b>		
CLIENT:	TOWN OF EASTHAM	PM:
LOCATION:	OLD ORCHARD ROAD EASTHAM, MASSACHUSETTS	LSP:
RTN:	DMR	PROJECT NO.:
4-24301		2013-027
		FIGURE:
		1



**LEGEND**

- ◆ MONITORING WELL
- ▲ WATER SUPPLY WELL
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- 1,4 DIOXANE NOT DETECTED
- PROPERTY NOT TESTED



SOURCE: 1) "ENVIRONMENTAL MONITORING LANDFILL MONITORING PLAN" PREPARED FOR EASTHAM LANDFILL, OLD ORCHARD RD, EASTHAM, MA, BY BENNETT ENVIRONMENTAL ASSOCIATES, INC., BREWSTER, MA, DATED 6/17/13; 2) GOOGLE EARTH AERIAL, IMAGERY DATE: 3/11/2012.

**Environmental Strategies & Management**

273 West Main Street  
Norton, MA 02766  
(508) 228-1800  
(508) 228-1811 fax  
info@esm-inc.com

GAUGING DATE:	DRAWING DATE: 03/31/14	ACAD FILE: EASTHAM LANDFILL
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## EASTHAM LANDFILL SITE MAP

PROPERTY OWNER: <b>TOWN OF EASTHAM</b>		PM: TS
LOCATION: OLD ORCHARD ROAD EASTHAM, MASSACHUSETTS		LSP: DH
RTN: 4-24301	DWG: DMR	PROJECT NO.: 2013-027
		FIGURE: 2

TABLE 1  
AFFECTED PROPERTIES ELIGIBLE FOR BOTTLED WATER  
FOLLOWING PHASE 4 SAMPLING EVENT  
EASTHAM LANDFILL PRIVATE WELL SAMPLING PROGRAM

50 Alston Avenue  
225 Alston Avenue  
255 Alston Avenue  
275 Alston Avenue  
285 Alston Avenue  
60 Chipman Street  
9 Eldia Way  
11 Eldia Way  
13 Eldia Way  
85 Deepwood Drive  
25 Knowles Street  
30 Knowles Street A  
30 Knowles Street B  
45 Knowles Street  
100 Meetinghouse Road A  
100 Meetinghouse Road B  
155 Meetinghouse Road  
165 Meetinghouse Road  
171 Meetinghouse Road Rear (A, B & C)  
205 Meetinghouse Road  
350 Meetinghouse Road  
180 Old Orchard Road  
310 Old Orchard Road  
325 Schoolhouse Road  
35 Sharon Circle  
5 Starlight Lane  
35 Starlight Lane  
40 Starlight Lane  
45 Starlight Lane  
3168 State Hwy (private well amongst group of properties with shared well)  
3200 State Hwy  
8 Whidah Lane