BROWNFIELD
SCIENCE & TECHNOLOGY

# Soil Sampling and Ecological Risk Assessment Work Plan
# Axil Belko – 1991-0916-BA4

**July 2014**

*Prepared For:*

**Ms. Jenny Herman**
**Maryland Department of the Environment**
**Oil Control Program**
**1800 Washington Blvd, Suite 620**
**Baltimore, MD 21230-1719**

*Prepared By:*

**Brownfield Science & Technology, Inc.**
**3157 Limestone Road**
**Cochranville, PA 19330**

Nicholas Santella, PhD, P.G.
Chemist/Hydrogeologist

William "Tripp" Fischer, P.G.
Principal Hydrogeologist

## TABLE OF CONTENTS

## LIST OF TABLES



## LIST OF FIGURES

# 1.0 INTRODUCTION

This Soil Sampling and Ecological Risk Assessment Work Plan (Work Plan), prepared by Brownfield Science & Technology, Inc. (BSTI) describes proposed activities for the Axil Belko project in Kingsville, MD (**Figure 1**). This Work Plan and the activities described herein are intended to satisfy the requests made by the MDE contained in the May 28, 2014 approval of BSTIs January 21, 2014 *Conceptual Site Model Report*. MDE requested additional soil sampling to investigate and delineate any petroleum impacts in the area between Areas A and C and to the east under the footprint of former building 7. To address ecological risk, MDE requested two additional rounds of surface water sampling adjacent to Outfall 1, Outfall 2 and the Seep. Samples were to be collected considering river stage and only when sheen is observed at the Seep.

In addition, acute ecological toxicity testing originally proposed by BSTI was not approved and a plan for testing to include a sediment dwelling species was requested. It was also requested that field observations collected at the locations of the Outfalls and Seep be submitted in a tabular format. A detailed description and rational for activities proposed to address these requests, and the requested field data, are presented below.

# 2.0 ADDITIONAL ASSESSMENT ACTIVITIES

## 2.1 Soil Sampling

As noted by MDE, prior investigative and remedial activities indicate that TPH-DRO is present in soils between Area A and Area C ranging in concentrations from 4,590 to 12,200 mg/kg. The concrete pipe which formerly connected to Outfall 2 runs through this area (**Figure 2**).

Discharge of water from Outfall 2 has continued since its abandonment in April 2013. It is believed that the discharge from Outfall 2 consists of groundwater that infiltrates into the open reach of piping still present from the point of abandonment to the Little Gunpowder Falls River (LGF) (River). In March 2014 the concentration of TPH-DRO in this discharge water was 410 ug/l.

MDE has requested an investigation to delineate the extent of petroleum impacts in between Area A and Area C and to the west within the former building footprint as illustrated in **Figure 2**. MDE has also requested that BSTI determine the origin and path of Outfall 2. BSTI proposes that the horizontal and vertical extent of petroleum impacts in this area be established via a direct push soil boring assessment, proposed boring locations are illustrated in **Figure 2**. If obvious petroleum impacts (sheen or staining) are observed, additional borings will be added as necessary to delineate these impacts.

For borings within the former building footprint, the concrete slabs will first be penetrated using a hammer point or concrete core drill. Direct push cores will then be advanced until refusal at bedrock which is expected between 15 and 25 feet below grade. Soil cores will be continuously logged including screening with a PID and/or use of Oil-In-Soil™ test kits as appropriate. Soil samples will be collected to characterize and delineate observed petroleum impacts vertically and horizontally. Samples will be collected from these soil borings at the depth interval indicating highest levels of petroleum impacts. In the case of obvious petroleum impacts a second sample will be collected for vertical delineation. Samples will be analyzed for TPH-DRO only.

On completion, boreholes will be backfilled with soil and capped with a concrete plug at grade with the slab. Results of this investigation will be included in a quarterly update report.

BSTI maintains that it is neither practical nor necessary to further establish the origin and location of the storm water piping formerly connected to Outfall 2. The location of this pipe has been previously confirmed by excavation in three locations. In October 2009 a test pit (TP-1) uncovered a concrete pipe believed to be a part of Outfall 2 at a depth of less than 2 feet below grade. In April 2013, during remedial excavations a portion of this pipe adjacent to MW-5 was removed. Subsequently a portion of the pipe near the river bank was abandoned in order to eliminate Outfall 2 as a potential conduit for petroleum impacts in the excavation area to reach the LGF River.

The direction and orientation of the Outfall 2 pipe within the former building footprint is not precisely known. The origin of Outfall is presumed to be storm water grates located at grade on the uphill (southwest) side of the former building. Based on the observed depth of the Outfall 2 piping at TP-1 it is expected that this piping is located at a depth of over 15 feet below grade as it enterers the building and rises to near grade as it passes through or around the former Building 7. Based on the location and depth of this piping a large excavation requiring extensive removal of concrete would be required to confirm its origin and orientation. This degree of effort is not warranted given that the concern regarding this Outfall is solely related to its potential as a conduit to the LGF River. As described above, the Outfall 2 piping has been removed and backfilled at two locations down gradient of former Building 7 and so up gradient piping no longer serves as a direct conduit to the LGF River.

### 2.2 Environmental Ecological Exposure

TPH-DRO is present in Outfalls and the Seep. However, surface water samples collected downstream of these discharge points have contained no detectable levels of TPH-DRO. This is presumed to result from the small quantity of petroleum impacted groundwater discharged to the LGF. Discharge rates for Outfall 1, Outfall 2, and the Seep averaged 0.5 gpm, 0.9 gpm, and 1 gpm, respectively, from May 2013 through May 2014. Comparatively, the mean flow of approximately 21,000 gpm reported for the LGF at the USGS gauging station at Laurel Brook.

Given that TPH-DRO has not been detected in surface water, it is expected that the toxicological effect on ecological receptors in the LGF River is negligible. However, as the discharge of groundwater containing TPH-DRO may continue for an indeterminate length of time, additional evaluation of the potential ecological impacts of this discharge may be warranted. Proposed evaluation is described below.

Two additional rounds of surface water sampling will be conducted for the analytical parameters TPH-DRO and PAHs. Samples will be collected from the LGF River immediately down gradient of the Outfall and Seep locations at a time where sheen or product is observed at the Seep. Samples will not be collected during periods of high discharge as evidenced by river stage at the Site and or flow at the Laurel Brook gauging station. Analytical results will be compared to MDE criteria for toxic substances in surface water for PAHs.

Potential for ecological impacts due to the continued discharge of TPH-DRO from the Seep, and Outfall 2 will be evaluated though the use of in-vivo ecological toxicity testing. Outfall 1 will not be evaluated due to its lower flow (half of Outfall 2) and order of magnitude lower TPH-DRO concentrations compared to Outfall 2. Samples will be collected for toxicity analysis at the same time as quarterly sampling for TPH-DRO and PAHs allowing for comparison with historic concentrations. Testing will be performed using pooled water collected from directly under the Seep and water discharging from Outfall 2.

48-hr acute testing will be performed with a common and sensitive test organism, Cerodaphnia dubia, and 96 hour acute testing will be performed with the sediment dwelling species Hyalella azteca. Tests will be conducted with undiluted sample water without renewal as concentrations of TPH-DRO are expected to remain consistent over the test period. Should results of this testing indicate toxicity, a multi-concentration test will be conducted using the sample location/subject organism combination with highest toxicity. The multi-concentration test will be performed using multiple dilutions of the most toxic original sample. These tests will be evaluated in concert with analytical data for TPH-DRO and PAHs from surface water, Outfalls and the Seep to determine if additional monitoring or evaluation is required.

## 2.3 Outfall and Seep Monitoring

As requested by MDE a table was developed summarizing field observations at the Seep and Outfalls from 2011 through the present (**Table 1**). As described in prior quarterly reports, sheen and or small quantities of product were observed with greater frequency during and immediately after the excavation of the MW-2 and the nearby former brick structure in August 2013. Observations of sheen and small quantities of product have decreased in frequency but remain more common than was the case in 2011 and 2012 prior to the remedial excavation in Area C. Maximum quantities of free product have consisted of isolated dime sized drops in the Seep area, typically trapped behind water saturated sorbent pads. Observations of product are expected to continue to decrease in frequency as the groundwater system equilibrates.

## 2.4 Assessment Outcome

BSTIs January 21, 2014 *Conceptual Site Model Report,* approved by MDE in correspondence dated May 28, 2014, reviewed the Seven Risk Factors described in the MDE's MEAT Guidance Document. Evaluation indicated that the Site presents no current or reasonably anticipated future threat to human health. Potential concerns were identified with regard to LNAPL, contaminant migration, and ecological exposure. To address these concerns, one year of additional monitoring of the seeps and outfalls with maintenance of boom and sorbent pads, one year of monitoring of groundwater and seep and outfall quality, and evaluation of ecological toxicity of groundwater discharging to the LGF River was proposed to address these concerns.

Additional soil sampling and ecological risk assessment activities were requested by MDE as part of the approval of BSTIs January 21, 2014 *Conceptual Site Model Report,* and the activities proposed to address this request are describe in sections 2.1 and 2.2 of this document. As such, should the findings of the additional assessment activities indicate no risk to human health or the environment, BSTI will submit a closure request report to solicit a final closure letter for the Site.

As reviewed most recently in the January 21, 2014 *Conceptual Site Model Report* TPH-DRO is the only substantial contaminant of concern in soil and groundwater at the Site. MDE standards

for TPH-DRO are based on the human health risk assumed to be present from an ingestion pathway in the case where all TPH-DRO is in the form of aromatic hydrocarbons, which are more toxic than aliphatic hydrocarbons. Based on the type of source material (hydraulic oil) and chemical analysis performed to date, the bulk of the TPH at this Site consists of aliphatic hydrocarbons. As such MDE TPH-DRO standards are highly conservative when applied to this Site and are not applicable for the purposes of protecting human health or the environment. In consideration of this, BSTI proposes the following criteria by which the proposed additional assessment activities will be evaluated. Assuming the following criteria are met, BSTI recommends that no further site assessment or corrective actions are necessary. Execution of these additional assessment activities will be contingent on MDE approval of these criteria.

Site conditions indicated by the additional soil investigation will be deemed acceptable by MDE should the following criteria be met:

- No substantial quantity of free phase petroleum is observed.
- No TPH-DRO concentrations are above residual saturation levels (approximately 10,000 mg/kg).

Site conditions indicated by ongoing monitoring of outfalls and seeps will be deemed acceptable by MDE should the following criteria be met:

- No substantial free phase product present at outfalls or the Seep (i.e. greater than the occasional small droplets currently observed).
- Stable or decreasing frequency of petroleum droplets or sheen.

Site conditions indicated by ongoing monitoring of groundwater and outfalls and Seep water quality will be deemed acceptable by MDE should the following criteria be met:

- Stable or decreasing trends in TPH-DRO and PAH concentrations during the next four quarters of monitoring.
- No VOCs present in POT-1 above MDE standards.

Site conditions indicated by ecological toxicity assessment will be deemed acceptable by MDE should the following criteria be met:

- Surface water analytical results will not exceed MDE criteria for toxic substances in surface water for PAHs.
- Surface water analytical results for TPH-DRO will not exceed concentrations which may be toxic based on the results of proposed ecological toxicity testing of water from Outfall 2 and the Seep.

## 2.5 Schedule

BSTI is prepared to coordinate sampling activities immediately upon approval of this Work Plan. Field activities associated with the direct push soil investigation will occur within thirty (30) days receipt of approval from the MDE. Water sampling activities associated with toxicological studies will be performed in conjunction with quarterly sampling activities in early September. BSTI will provide the MDE with five (5) days prior notice of all field activities.

# TABLES

**Table 1**
**Site Inspection Summary**
**Axil Belko**
**Kingsville MD**

| Date | Seep | Outfall 1 | Outfall 2 | MW-2 Excavation | Notes |
|---|---|---|---|---|---|
| 3/22/11 | sheen | no sheen | no sheen | NA | |
| 4/1/11 | no sheen | no sheen | no sheen | NA | Excavation Areas A, D, I |
| 4/27/11 | no sheen | no sheen | no sheen | NA | Building 8 Slab Demolished |
| 5/2/11 | no sheen | no sheen | no sheen | NA | |
| 5/11/11 | no sheen | no sheen | no sheen | NA | |
| 5/24/11 | no sheen | no sheen | no sheen | NA | |
| 6/2/11 | no sheen | no sheen | no sheen | NA | |
| 7/6/11 | no sheen | no sheen | no sheen | NA | |
| 7/20/11 | no sheen | no sheen | no sheen | NA | |
| 10/14/11 | sheen | no sheen | no sheen | NA | |
| 10/31/11 | no sheen | no sheen | no sheen | NA | |
| 11/29/11 | sheen & tiny amount of oil | no sheen | sheen | NA | |
| 12/8/11 | no sheen | no sheen | no sheen | NA | |
| 1/13/12 | no sheen | no sheen | no sheen | NA | |
| 1/19/12 | sheen | no sheen | no sheen | NA | |
| 1/25/12 | no sheen | no sheen | no sheen | NA | |
| 2/6/12 | no sheen | no sheen | no sheen | NA | |
| 3/29/12 | no sheen | no sheen | no sheen | NA | |
| 6/11/12 | no sheen | no sheen | no sheen | NA | Pilot Excavation |
| 7/12/12 | no sheen | no sheen | no sheen | NA | |
| 7/27/12 | no sheen | no sheen | sheen | NA | 2nd excavation completed |
| 9/12/12 | no sheen | no sheen | no sheen | NA | water above seep |
| 10/31/12 | sheen | no sheen | no sheen | NA | 3rd excavation completed |
| 11/8/12 | small amount of product | no sheen | sheen | NA | |
| 11/21/12 | small amount of product | no sheen | no sheen | NA | Start of Demolition |
| 1/9/13 | no sheen | no sheen | no sheen | NA | |
| 1/24/13 | no sheen | | | NA | |
| 2/11/13 | no sheen | no sheen | no sheen | NA | |
| 4/12/13 | sheen | no sheen | no sheen | NA | |
| 4/30/13 | no sheen | no sheen | no sheen | NA | 4th excavation completed |
| 5/7/13 | no sheen | no sheen | no sheen | NA | |
| 6/21/13 | sheen | no sheen | no sheen | NA | |
| 7/9/13 | drops of oil | no sheen | no sheen | NA | |
| 7/26/13 | drops of oil | no sheen | no sheen | NA | |
| 7/30/13 | drops of oil | no sheen | no sheen | NA | |
| 8/19/13 | drops of oil | no sheen | no sheen | NA | 5th excavation completed |
| 8/20/13 | drops of oil | no sheen | no sheen | residual oil | |
| 8/22/13 | drops of oil | no sheen | no sheen | residual oil | MW-2 excavation backfilled |
| 9/12/13 | drops of oil | no sheen | no sheen | no product | |
| 10/3/13 | little oil | no sheen | no sheen | no product | |
| 10/7/13 | little oil | no sheen | no sheen | no product | |
| 10/21/13 | drops of oil | no sheen | no sheen | no product | |
| 10/28/13 | small amount of oil | no sheen | no sheen | no product | |

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**Table 1**
**Site Inspection Summary**
**Axil Belko**
**Kingsville MD**

| Date | Seep | Outfall 1 | Outfall 2 | MW-2 Excavation | Notes |
|---|---|---|---|---|---|
| 11/4/13 | small amount of oil | no sheen | no sheen | no product | |
| 11/11/13 | drops of oil | no sheen | no sheen | no product | |
| 11/18/13 | no product | no sheen | no sheen | no product | |
| 11/22/13 | no sheen | no sheen | no sheen | no product | |
| 11/25/13 | no sheen | no sheen | no sheen | no product | |
| 12/2/13 | little oil | no sheen | no sheen | no product | |
| 12/9/13 | no sheen | no sheen | no sheen | no product | |
| 12/16/13 | sheen | no sheen | no sheen | no product | |
| 12/23/13 | no sheen | no sheen | no sheen | no product | |
| 12/30/13 | sheen | no sheen | no sheen | no sheen | |
| 1/6/14 | no sheen | no sheen | no sheen | no sheen | |
| 1/13/14 | no sheen | no sheen | no sheen | no sheen | |
| 1/20/14 | product size of dime | no sheen | no sheen | no sheen | |
| 1/29/14 | no sheen | no sheen | no sheen | no sheen | |
| 2/5/14 | no sheen | no sheen | no sheen | no sheen | |
| 2/10/14 | product size of dime | no sheen | no sheen | no sheen | |
| 2/17/14 | sheen | no sheen | no sheen | no sheen | |
| 2/24/14 | no sheen | no sheen | no sheen | no sheen | |
| 3/4/14 | sheen | no sheen | no sheen | no sheen | |
| 3/18/14 | no sheen | no sheen | no sheen | no sheen, algae growth | |
| 3/24/14 | no sheen | no sheen | no sheen | no sheen, algae growth | |
| 4/2/14 | sheen | no sheen | no sheen | minimal sheen | |
| 4/9/14 | no sheen | no sheen | no sheen | no sheen | |
| 4/14/14 | sheen | no sheen | no sheen | no sheen | |
| 4/22/14 | sheen | no sheen | no sheen | no sheen | |
| 5/19/14 | sheen | no sheen | no sheen | no sheen | |
| 6/2/14 | small droplets of product | no sheen | no sheen | no sheen | |
| 6/9/14 | small droplets of product | no sheen | no sheen | no sheen | |
| 6/16/14 | no sheen | no sheen | no sheen | no sheen | |
| 6/23/14 | 1" circle of product | no sheen | no sheen | no sheen | |
| 6/30/14 | no sheen | no sheen | no sheen | no sheen | |
| 7/7/14 | no sheen | no sheen | no sheen | minimal sheen | |

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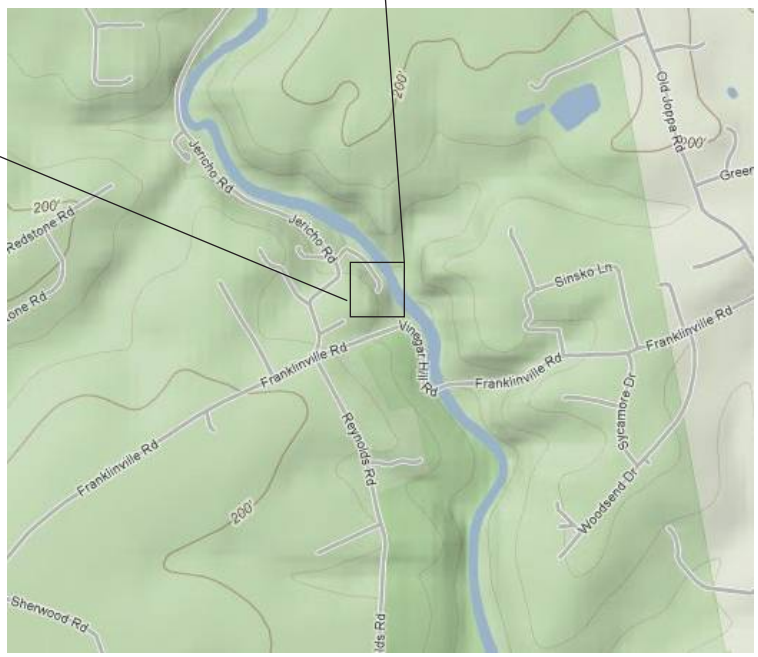
# FIGURES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3157 Limestone Rd., Cochranville PA, 19330

# SITE LOCATION

AXIL-BELKO

11931 JERICHO RD KINGSVILLE, MD

**Notes:**

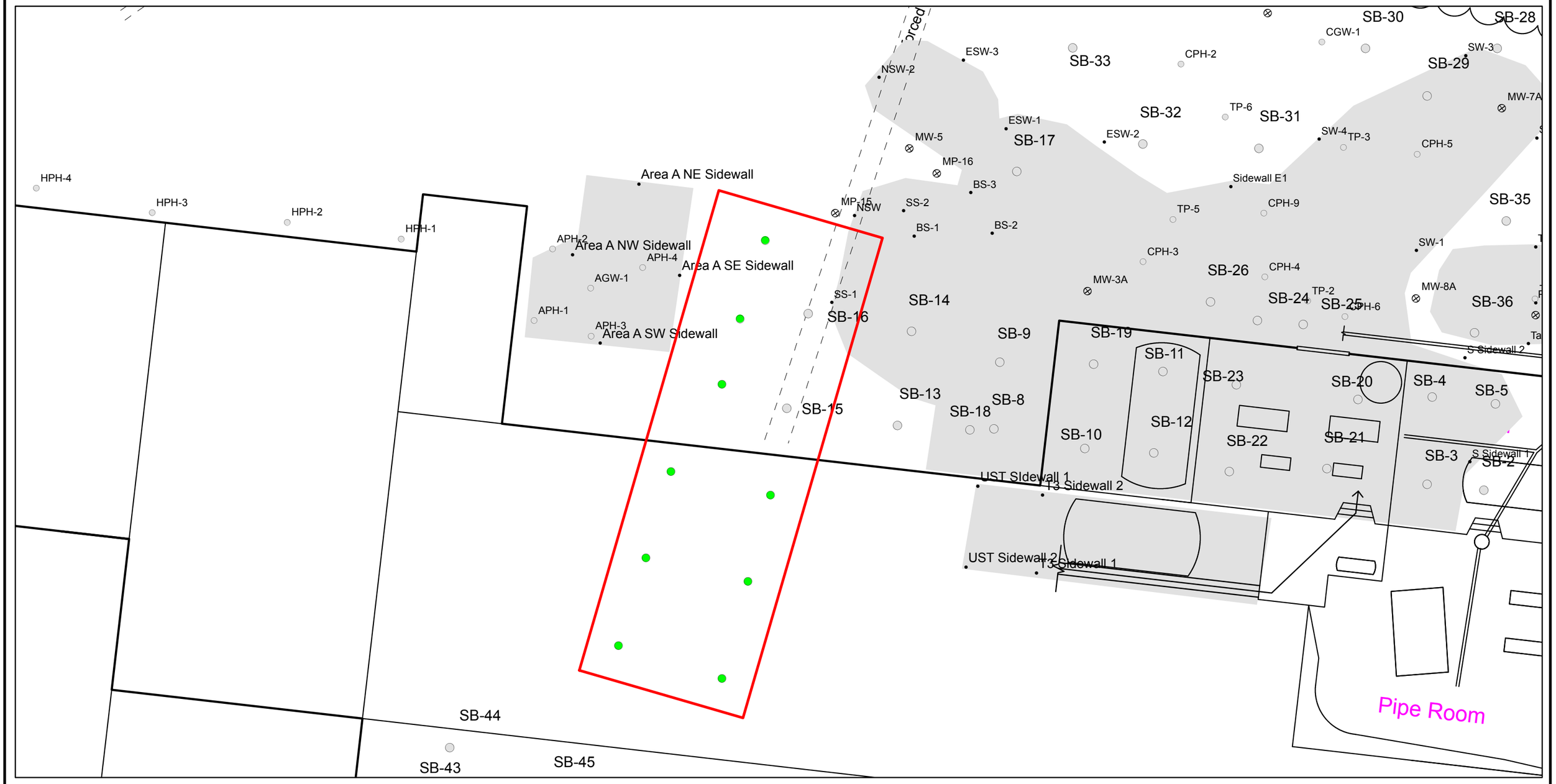
1. Image source Bing Maps October 2013

| Date: | Dr. By: | Chk. By: | BSTI Job No. | Figure Number: |
|---|---|---|---|---|
| 4/30/14 | NS | WTF | 367 | 1 |

Scale Bar:

0 65 170 195 Feet

Scale Reference

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**Notes:**

Analytical data in units of mg/kg

## Legend

- 2014 Proposed Borings
- Monitoring Well
- Confirmation Sample
- 2012 Sample Locations
- Phase II Sample Locations
- Water Discharge Piping
- Excevation Extents
- Investigation Area

# PROPOSED SOIL BORING LOCATIONS

AXIL-BELKO

11931 JERICHO RD KINGSVILLE, MD

| Date: | Drawn By: | Checked By: | BSTI Job Number: | Figure Number: |
|---|---|---|---|---|
| **10/15/13** | **NS** | **WTF** | **367** | **2** |

Scale Bar: 0 5 10 20 30 40 Feet

Scale Reference: