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REMEDIAL ACTION PLAN
ADDENDUM No. 2

VALLEY VILLAGE
10243 State Route 85
Kittanning, PA 16201
Facility I.D. No. 03-06500
USTIF No. 2014-0036(S)

Prepared for

Pennsylvania Department of Environmental Protection
Southwest Regional Office
400 Waterfront Drive
Pittsburgh, PA 15222-4745

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LIST OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
COCs	contaminants of concern
CSM	Conceptual Site Model
DPVE	dual phase vacuum extraction
EC	environmental covenant
gpm	gallons per minute
MSC	Medium Specific Concentration
MSC_{IAQ}	Medium Specific Concentration for Indoor Air Quality
MSC_{SG}	Medium Specific Concentration for Soil Gas
MTBE	methyl tert-butyl ether
NQD	New Quick Domenico
ORC	oxygen releasing compound
OSHA	Occupational Safety and Health Administration
PADEP	Pennsylvania Department of Environmental Protection
PennDOT	Pennsylvania Department of Transportation
PID	photoionization detector
PNDI	Pennsylvania Natural Diversity Index
POC	Point of Compliance
QA/QC	Quality Assurance / Quality Control
RACR	Remedial Action Completion Report
RAPR	Remedial Action Progress Report
RAP	Remedial Action Plan
SCR	Site Characterization Report
SHS-RUA	Statewide Health Standard, Residential, Used Aquifer
SPL	separate phase liquid
SSS	Site Specific Standard
SVE	soil vapor extraction
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank

1.0 INTRODUCTION

Insite Group, Inc. (IGI), on behalf of Mr. Joseph Buffone of JBRL Development Corp., provides this Remedial Action Plan Addendum No. 2 for the Valley Village facility located at 10243 State Route 85, Kittanning, PA in Cowanshannock Township, Armstrong County. A release of unleaded gasoline was reported during an upgrade of tank tops in March 2014. The source of the release was believed to be the sump on Tank 003.

A SCR/RAP was approved by the PADEP in June 2015 and a SCR/RAP Addendum was approved in August 2016. The SHS was selected as the cleanup standard for both soil and groundwater. A site map is provided as **Figure 1.**

1.1 Summary of Remediation

Remediation commenced in August 2016 and included the following:

- A total of 160 pounds of RegenOx Part A was mixed in slurry form and injected into the UST cavity. The mixture was extracted approximately 3 weeks later.
- A total of 1,919.71 tons of impacted soil was excavated and disposed.
- A total of 10,781 gallons of groundwater was extracted during excavation and recycled/disposed.
- A PlumeStop barrier was installed along the downgradient property boundary. A total of 4,000 pounds of PlumeStop and 495 pounds of ORC was applied to a trench approximately 70 feet long, 6 feet wide, and 17 feet deep.
- The sanitary sewer line was encountered during excavation at a location about 20 feet north of its marked location. A PVC pipe originating in the UST cavity, terminated in the sewer line backfill. A series of PVC risers, SL-1 through SL-6, were installed along the sewer line to serve as potential injection/extraction points.
- An additional 160 pounds of RegenOx Part A was mixed in slurry form and injected into the UST cavity and extracted one month later.

1.2 Status Post-Remediation

1.2.1 Soil

Following excavation of impacted soil, twelve confirmatory soil samples (plus one duplicate) were collected and submitted for laboratory analysis of the post-2008 short list of unleaded gasoline parameters. The analytical results showed that attainment of the SHS was demonstrated for soil.

1.2.2 Groundwater

The analytical results from the most recent groundwater sampling event are summarized in the table below:

Sample ID	Date	Depth to Water (feet)	GW Elevation (feet)	Unleaded Gasoline Parameters (ug/L)								
				Benzene	Ethyl-benzene	Cumene	MTBE	Naph-thalene	Toluene	1,2,4-Trimethyl-benzene	1,3,5-Trimethyl-benzene	Total Xylenes
SHS-RUA				*5*	*700*	*840*	*20*	*100*	*1,000*	*15*	*420*	*10,000*
Monitoring Wells												
MW-1R	06/26/17	3.43	1,116.53	**35.5**	1.5	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<3.0
MW-3R	06/26/17	5.23	1,113.88	**632**	544	16.4	<1.0	23.2	22.3	**215**	107	539
MW-4R	06/26/17	5.10	1,113.92	<1.0	<1.0	<1.0	1.5	<2.0	<1.0	<1.0	<1.0	<3.0
MW-8	06/26/17	5.75	1,109.92	**2,800**	76.4	32.3	**60.6**	10.7	13.6	1.0	7.8	7.5
MW-9	06/26/17	4.97	1,108.85	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<3.0
MW-10	06/26/17	5.82	1,108.25	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<3.0
MW-11	06/26/17	3.99	1,110.04	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<3.0
MW-13	06/26/17	6.46	1,110.34	**14.4**	<1.0	<1.0	**118**	<2.0	<1.0	<1.0	<1.0	<3.0
MW-14	06/26/17	5.78	1,110.78	<1.0	<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<1.0	<3.0
MW-15	06/26/17	5.71	1,115.84	**30.7**	2.3	1.3	4.3	<2.0	<1.0	<1.0	<1.0	<3.0
Extraction Wells												
EW-1R	06/26/17	4.00	1,116.11	**905**	**1,900**	92.3	1.3	**963**	91.6	**1,500**	<1.0	1,160
EW-2	06/26/17	3.66	1,116.60	**27.9**	8.9	<1.0	16.2	<2.0	<1.0	5.8	<1.0	<3.0
Sewer Line Trench Wells												
SL-3	06/26/17	5.92	1,112.65	**82.5**	31.7	<1.0	3.6	<2.0	<1.0	4.5	<1.0	<3.0
SL-4	06/26/17	7.77	1,112.01	**19.5**	<1.0	<1.0	2.2	<2.0	<1.0	<1.0	<1.0	<3.0

Notes: 1) Concentrations exceeding their respective SHS-RUA values are shown in **bold**.
2) DUP = blind duplicate sample.
3) Samples were analyzed by EPA Method 5030B / 8260B.

Noteworthy reductions in dissolved phase contaminant concentrations have been observed since excavation, as shown in the table below:

Well	Pre-Excavation Total COC Concentration 4-Quarter Average (ug/L)	Current Total COC Concentration (ug/L)	Percent Reduction
MW-1 / MW-1R	33,725	37	99.9%
MW-3 / MW-3R	6,468	2,099	67.5%
MW-4 / MW-4R	9,518	2	100.0%
MW-8	1,444	3,010	*increase*
MW-10	78	0	100.0%
MW-13	140	132	5.7%
MW-15	169	39	76.9%
EW-1 / EW-1R	13,368	6,613	50.5%
EW-2	20,042	59	99.7%

The soil surrounding EW-2, located on the east side of the UST cavity, could not be excavated. Therefore, the reduction in contaminant concentration (99.7%) in this well is likely due to desorption of soil contaminants in the UST cavity through RegenOx application and subsequent extraction.

Similarly, the contaminant reduction in EW-1/EW-1R(50.5%) may be due, in part, to RegenOx treatment of the UST cavity, but also to excavation of impacted soils outside the cavity. During excavation the initial EW-1 was replaced by EW-1R. Initially EW-1 was installed to approximately 5-feet bgs using an air-knife. EW-1R was installed using a trackhoe. When the gravel backfill of the cavity was encountered, EW-1R was installed in the excavation and the area around the well backfilled with pea gravel. The concentrations in EW-1R reflect contaminant concentrations in the UST cavity, which is the source area.

Collectively the EW-1R and EW-2 analytical data indicate that significant adsorbed phase mass remains in the cavity that needs to be addressed.

A PlumeStop barrier was installed between EW-1R and downgradient wells MW-3R and MW-4R to capture dissolved phase contaminants on sub-micron sized carbon particles. The data for MW-4R (100% reduction in contaminant concentration) indicate that the western portion of the barrier successfully trapped dissolved phase contaminants. However, the data for MW-3R (67.5% reduction) suggest that the eastern portion of the barrier was only partially effective in trapping contaminants. IGI has presented this data to Regenesis, manufacturer of PlumeStop, in an effort to understand the reasons for the less than optimal performance.

Dissolved phase contaminant concentrations increased in MW-8, located downgradient of the UST cavity, EW-1R and MW-3. This well is also located downgradient of sewer line points SL-3 and SL-4. This area of the sewer line historically served as a receptor for a PVC drain from the UST cavity. Backfill in this area was noted to be highly impacted during excavation. It is likely that the soil disturbance contributed to dissolved phase contamination in MW-8.

Since dissolved phase contamination is leaving the property, additional remediation is warranted.

2.0 PROPOSED REMEDIATION

IGI proposes additional remedial measures to address the adsorbed phase mass in the UST cavity and dissolved phase mass in downgradient areas. Proposed treatment includes the following:

- Additional treatment of the UST cavity to remove adsorbed phase contamination.
- Treatment of the sewer line backfill in the area surrounding SL-3 and SL-4.
- Additional treatment of the dissolved phase plume in the area downgradient of the UST cavity using Carbon Based Injectate (CBI) technology.

Treatment of the UST cavity and sewer line backfill will be implemented and evaluated prior to initiating CBI treatment.

2.1 Treatment of UST Cavity

IGI proposes to apply a surfactant product into well points that access the porous backfill of the UST cavity. The process includes the injection of the surfactant into the cavity which is followed by a retention period prior to extraction. This product and process were discussed with Mr. Tom Fuller when he was the PADEP Case Manager. IGI has selected surfactant over RegenOx because it is a more effective chemical treatment when significant adsorbed phase contamination is present.

The goal is to maximize contact between the surfactant and adsorbed phase mass in the soil or tank cavity backfill materials so that contaminant mass can be transferred to the aqueous phase and extracted from the subsurface.

Multiple surfactant applications are planned. Generally, the retention time is shorter for initial injection/extraction events and lengthens as the amount of adsorbed contamination decreases.

Initially a vacuum truck will be utilized to extract groundwater from the cavity. Historically, less than 1,000-gallons of groundwater have been able to be extracted in each 8-hour vacuum event. Vacuum trucks have capacities ranging from 2,800 to 5,400 gallons. Therefore, pumps will also be used for extracting and conveying groundwater to a frac tank for temporary storage onsite until a full truckload of extracted groundwater is generated.

2.1.1 Surfactant Product Selection

IGI evaluated available surfactant products and selected a nonionic surfactant product supplied by Ivey International Inc. Ivey-sol® 103 (Ivey-sol) surfactant technology is comprised of a nonionic formulation of surfactants that have these important properties:

- The surfactants have an affinity for petroleum constituents such as gasoline, thereby desorbing contaminants from the soil, gravel and UST surfaces.
- The surfactants are highly water soluble.
- The surfactants are biodegradable.

These first two properties allow adsorbed phase mass to become miscible in the aqueous phase, making desorbed contaminants more available for extraction. The nonionic surfactants stabilize the oil/water mixture but do not emulsify the oil/water mixture as ionic surfactants do. The affinity of the surfactant for contaminants can be overcome by passage through an oil/water separator.

As a nonionic surfactant, Ivey-sol is not dispersive, so expansion of a dissolved phase plume as soil contaminants are desorbed is not the concern it would be for ionic surfactants. IGI will implement a monitoring program during the treatment process to ensure that surfactant does not expand the groundwater plume. An SDS and technical information for Ivey-sol is provided as **Attachment A**.

2.1.2 Control of Surfactant during Remediation

One important element of control is being able to extract any liquid mixture that is introduced into the subsurface. There are two main control points for extraction: a) two extraction wells

connected to and downgradient of the UST cavity and b) six sewer line trench extraction points located further downgradient.

The first control points are the two extraction wells EW-1R and EW-2. While both can be used, EW-1R will be used to extract most of the groundwater from the UST cavity. After each surfactant flush and period of retention, a vacuum truck or pump will be utilized to dewater the UST cavity to remove the surfactant along with liberated contaminant mass.

While IGI does not expect to lose control of the injected surfactant, we have considered this possibility. A loss of control of the surfactant wash would be indicated by the presence of surfactant in monitoring wells downgradient of the UST cavity. Field testing for surfactant will be ongoing during treatment as described below in the performance and surfactant monitoring section.

If, during the collection of data in performance and surfactant monitoring, surfactant is detected downgradient from the UST cavity, it can be intercepted at the second control point, the sewer line trench well points. While there are six sewer line points (SL-1 through SL-6) it is likely that SL-3 or SL-4 would be used for extraction because they are in more direct line with the groundwater flow direction from the UST cavity.

Control is also enhanced by other factors, including:

- The use of a nonionic surfactant. This type of surfactant provides better control as compared to ionic surfactants.
- The UST cavity has a clay barrier around its perimeter.
- A dye study showed the majority of dye that was injected into the UST cavity remained there for approximately 7 months. Therefore, surfactant is not expected to migrate rapidly from the UST cavity.
- The groundwater table in the UST cavity will be drawn down using a vacuum truck prior to the injection of surfactant. Care will be taken to avoid creating an increase in hydraulic gradient during the introduction of the surfactant/water mixture into the UST cavity.
- Performance and surfactant monitoring will be completed as described below during and between injection events:
    - Monitoring of dissolved phase constituents in groundwater to evaluate the impact of the surfactant washes.
    - Surfactant field testing to demonstrate control of the injected surfactant.
    - Monitoring of water table elevations in the UST cavity and selected monitoring wells to demonstrate control of the groundwater plume.

2.1.3 Summary of Previous Dye Study

A Dye Study was completed in November 2015 prior to implementation of remediation. The goal of the dye study was to identify what happens to water injected into the UST cavity. Potable water with dye was injected directly into UST cavity points CP-2, CP-3 and CP-4. In high concentrations the dye is visible with the naked eye. At lower concentrations an ultraviolet light is needed to detect the dye. The presence of dye was evaluated in area wells immediately after injection and continued for 11 weeks post-injection.

Dye was immediately and highly visible in extraction well EW-2. Trace fluorescence (visible under ultraviolet light) was observed in monitoring well MW-3 and extraction well EW-1 within hours after injection, and later in MW-1. Trace fluorescence was observed in MW-15 after approximately 4 months.

The dye study showed a very strong connection between the UST cavity and EW-2. The majority of the dye remained in and proximal to the UST cavity for more than 7 months.

Since EW-1R was reconstructed to have a direct connection to the UST cavity after the dye study was performed, there would be an immediate and highly visible impact noted in EW-1R if the dye study were performed today.

Based on the results of the dye study, it is anticipated that most of the surfactant will remain within the UST cavity.

2.1.4 Surfactant Treatment Program

The basic surfactant treatment program will follow the steps outlined below.

- Extract groundwater from the UST cavity.
- Before the groundwater level in the UST cavity can recover, introduce the surfactant/water mixture into cavity injection points CP-1 through CP-7.
- Following a surfactant retention time of 24 to 48 hours, extract the liquid.
- Based on historical data from previous extraction events, the target volume for extraction and the surfactant/water mixture that would be introduced into the cavity is estimated at approximately 800 gallons. The volume of surfactant to be introduced will be equal to or less than the volume removed.
- All of the fluid extracted from the UST cavity will be transported off site and disposed/recycled at an approved facility. The extracted fluid has been profiled for disposal with Penn-Ohio Corporation in Ashtabula, Ohio.

Ivey-sol will be delivered to the site in 55-gallon drums. The product will be mixed at a 1:25 ratio (32 gallons of Ivey-sol to approximately 800 gallons of dechlorinated potable water) for the initial application events. A 1:50 ratio will be used for subsequent events. A 1,000-gallon polyethylene tank shall be used for mixing. Mixing will be accomplished using a pump and circulating the liquid. The product will be delivered to the UST cavity by gravity flow.

Surfactant treatment will be completed incrementally. The retention time will vary from shorter periods near the start of treatment (24 hours) to longer periods as the adsorbed mass decreases. IGI will focus on maximizing contact time while, at the same time, ensuring control of the plume through extraction.

The initial treatment cycle (four surfactant injections) is described below:

Day 1

- Complete baseline performance and surfactant monitoring.
- Extract groundwater from the UST cavity using a vacuum truck.
- Introduce the surfactant/water mixture into the UST cavity.

Day 2

- Complete performance and surfactant monitoring.

- Extract surfactant/water mixture and contaminant mass from the UST cavity.
- Introduce the surfactant/water mixture into the UST cavity.

Day 4

- Complete performance and surfactant monitoring.
- Extract surfactant/water mixture and contaminant mass from the UST cavity.
- Introduce the surfactant/water mixture into the UST cavity.

Day 8

- Complete performance and surfactant monitoring.
- Extract surfactant/water mixture and contaminant mass from the UST cavity.
- Introduce the surfactant/water mixture into the UST cavity.

Day 12

- Complete performance and surfactant monitoring.
- Extract surfactant/water mixture and contaminant mass from the UST cavity.
- Flush the cavity using water only to remove residual surfactant.
- Extract the water/surfactant mixture from the UST cavity.

At the end of this treatment cycle the groundwater in the cavity will be allowed to recover to pre-treatment levels.

Following this initial treatment cycle, data will be evaluated and additional treatment cycles may be planned. The expectation is that contaminant concentrations in the UST cavity will be reduced by at least 50% following the initial treatment cycle. Additional treatment cycles will be implemented in order to achieve the goal of a 90% reduction in contaminant concentrations in the UST cavity.

2.1.5 Performance and Surfactant Monitoring

IGI will conduct performance and surfactant monitoring to evaluate the impact of the surfactant washes, demonstrate control of the dissolved phase contaminants in the UST cavity and to ensure all of the surfactant is ultimately removed from the cavity. The data will be used to adjust the injection program as necessary and to determine how many injections are necessary to meet the remedial objective.

2.1.5.1 Performance Monitoring

Groundwater elevations will be monitored in the UST cavity, extraction wells EW-1R, EW-2, monitoring wells MW-1R, MW-2, MW-3R, MW-4R, MW-8, MW-10 and MW-13 and sewer line points SL-3 and SL-4 throughout the injection and extraction process to ensure that there is no significant change in groundwater levels. Samples of groundwater will be collected from EW-1R, EW-2, MW-3R and MW-8 before and after the first surfactant injection, and at the completion of a treatment cycle for laboratory analysis of unleaded gasoline parameters by Method 5030/8260B.

2.1.5.2 Surfactant Monitoring

Groundwater in extraction wells EW-1R and EW-2 and monitoring wells MW-1, MW-3R, MW-4R and MW-8 will be tested for the presence of surfactant throughout the injection and extraction process.

Two field tests are available for monitoring surfactants: one based on changes in surface tension, the other on the formation of bubbles. Both tests are described in **Attachment B**. IGI has selected the surface tension test as the primary field test for use at this site. Surfactants work by reducing the surface tension and making hydrophobic contaminant molecules miscible in water. The presence of surfactants can be qualified by measuring the change in surface tension. A baseline sample of the groundwater in the UST cavity will serve as the basis for comparing changes in surface tension.

Test Procedure

Using a pipette, gently place a drop of the sample onto specially treated paper having a hydrophobic surface. An untreated sample will form a mounded (domed) droplet. A sample containing surfactant will spread out. The degree of spreading is roughly proportional to the amount of surfactant present in the sample. Multiple tests can be performed simultaneously on the same sample. An example of the test results is shown below.

Interpretation of Results

The test is qualitative and the results are interpreted as "present" or "absent." "Present" results may also be labeled as strong or weak.

Selected samples will be sent to a PA-certified laboratory for third party surfactant analysis by Method 5540 C-2011.

2.1.5.3 Monitoring Schedule

Samples will be collected and analyzed from selected wells listed above in accordance with the schedule below.

Sample	Time	Test	Wells
Baseline	Before surfactant injection	Depth to water measurement	UST cavity, EW-1R, EW-2, MW-1R, MW-3R, MW-4R, MW-8, MW-10, MW-13
		Field surfactant test	EW-1R, EW-2, MW-1R, MW-3R, MW-4R, MW-8, SL-3, SL-4
		Laboratory surfactant test	EW-1R, MW-3
		8260B VOCs	EW-1R, EW-2, MW-3R, MW-8

Sample	Time	Test	Wells
Post-surfactant injection	Immediately following injection	Depth to water measurement	UST cavity, EW-1R, EW-2, MW-1R, MW-3R, MW-4R, MW-8
		Field surfactant test	EW-1R, EW-2, MW-1R, MW-3R, MW-4R, MW-8, SL-3, SL-4
		Laboratory surfactant test	EW-1R, MW-3R
		8260B VOCs	NONE
Pre-extraction	Immediately prior to extraction, after designated retention time	Depth to water measurement	UST cavity, EW-1R, EW-2, MW-1R, MW-3R, MW-4R, MW-8, MW-10, MW-13
		Field surfactant test	EW-1R, EW-2, MW-1R, MW-3R, MW-4R, MW-8, SL-3, SL-4
		Laboratory surfactant test	NONE
		8260B VOCs	EW-1R, EW-2, MW-3R, MW-8
Post-treatment	Days to weeks following treatment cycle	Field surfactant test	EW-1R, EW-2, MW-1R, MW-3R, MW-4R, MW-8, SL-3, SL-4
		Laboratory surfactant test	EW-1R, MW-3R
		8260B VOCs	EW-1R, EW-2, MW-3R, MW-8

2.2 Treatment of the Sewer Line

Impacts to soil and groundwater remain in the sewer line trench, primarily between points SL-3 and SL-4. IGI proposes to use Ivey-sol surfactant to "wash" this zone.

A total of 800 gallons of diluted (1:50) Ivey-sol will be introduced into SL-3 and SL-4 by gravity flow. A pump will then be used to extract groundwater/surfactant from SL-4 and inject it into SL-3. Recirculation of groundwater in the sewer line trench will continue for three to four hours. On the following day, at least 1200 gallons of groundwater will be extracted from SL-3 and SL-4. Field testing will be used to confirm that the injected surfactant has been captured. If necessary, water will be injected and extracted to "rinse" the trench.

The sewer line trench is plugged at manholes to the east and west of SL-3 and SL-4 (see Figure 1). Essentially, the plugs isolate the groundwater within the trench. Therefore, loss of control of the injected surfactant is not expected.

Samples from monitoring wells MW-8 and MW-13 will be tested for surfactant during recirculation and extraction. If any surfactant is detected in these wells, groundwater will immediately be extracted from the sewer line trench.

2.3 Treatment of the Dissolved Phase Plume by CBI

IGI proposes to apply a remedial technique called Carbon Based Injectate (CBI) treatment to address the dissolved phase plume downgradient and crossgradient of the UST cavity after surfactant treatment is completed. Since the volume of injectate and locations of injection points is based on contaminant concentrations, the final design will be completed after post surfactant groundwater analytical data is received and evaluated.

Therefore, at this time the CBI approach is conceptual. It is likely to be implemented and we are currently in the process of obtaining competitive bids from companies who apply CBI, although each with a different approach. At the conclusion of the surfactant treatment and post-treatment monitoring, IGI will prepare a RAP addendum No. 3 that summarizes the results of the surfactant treatment, presents the case for CBI treatment and provides the CBI approach to address the remaining dissolved phase groundwater plume.

3.0 PERMITTING

The US EPA issued approval or "rule authorization" for the proposed injections of Ivey-sol at the site. An Underground Injection Control (UIC) program permit is not required.

4.0 QUARTERLY GROUNDWATER MONITORING AND REPORTING

Quarterly groundwater monitoring will be ongoing. IGI will determine, based on the quarterly analytical data, if and when the RAP Addendum No. 3 will be prepared and submitted. In the event the surfactant wash results in a continued decreasing trend in monitoring wells downgradient of the UST cavity, IGI may continue post surfactant groundwater monitoring up to three quarters before preparing the RAP Addendum No. 3.

All site monitoring wells, including MW-1R through MW-15 plus EW-1R and EW-2 and P-2R will be included in the quarterly groundwater monitoring. Groundwater samples will be submitted to a certified laboratory for analysis of diesel fuel parameters (post-2008 short list: benzene, ethylbenzene, cumene, MTBE, naphthalene, toluene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene) by EPA method 5030B/8260B. IGI will employ appropriate chain-of-custody procedures, and samples will be stored and shipped on ice to maintain proper temperature.

Remedial progress will be summarized in quarterly RAPRs, which will be submitted to the PADEP within 30 days after the end of each quarter, in accordance with 25 PA Code § 245.312. Each RAPR will be sealed by a Professional Geologist.

5.0 REVISED SCHEDULE

A revised remedial schedule is provided below.

Activity	Timeframe
Quarterly Groundwater Monitoring	Ongoing
Surfactant Treatment of the UST Cavity	Will begin within one month of RAP Addendum No. 2 approval
Surfactant Treatment of the Sewer Line Trench	Will occur after the first cycle of UST surfactant treatment has been completed.
Evaluation of Surfactant Treatment; Submission of RAP Addendum No. 3	Within three quarters of completion of surfactant treatment

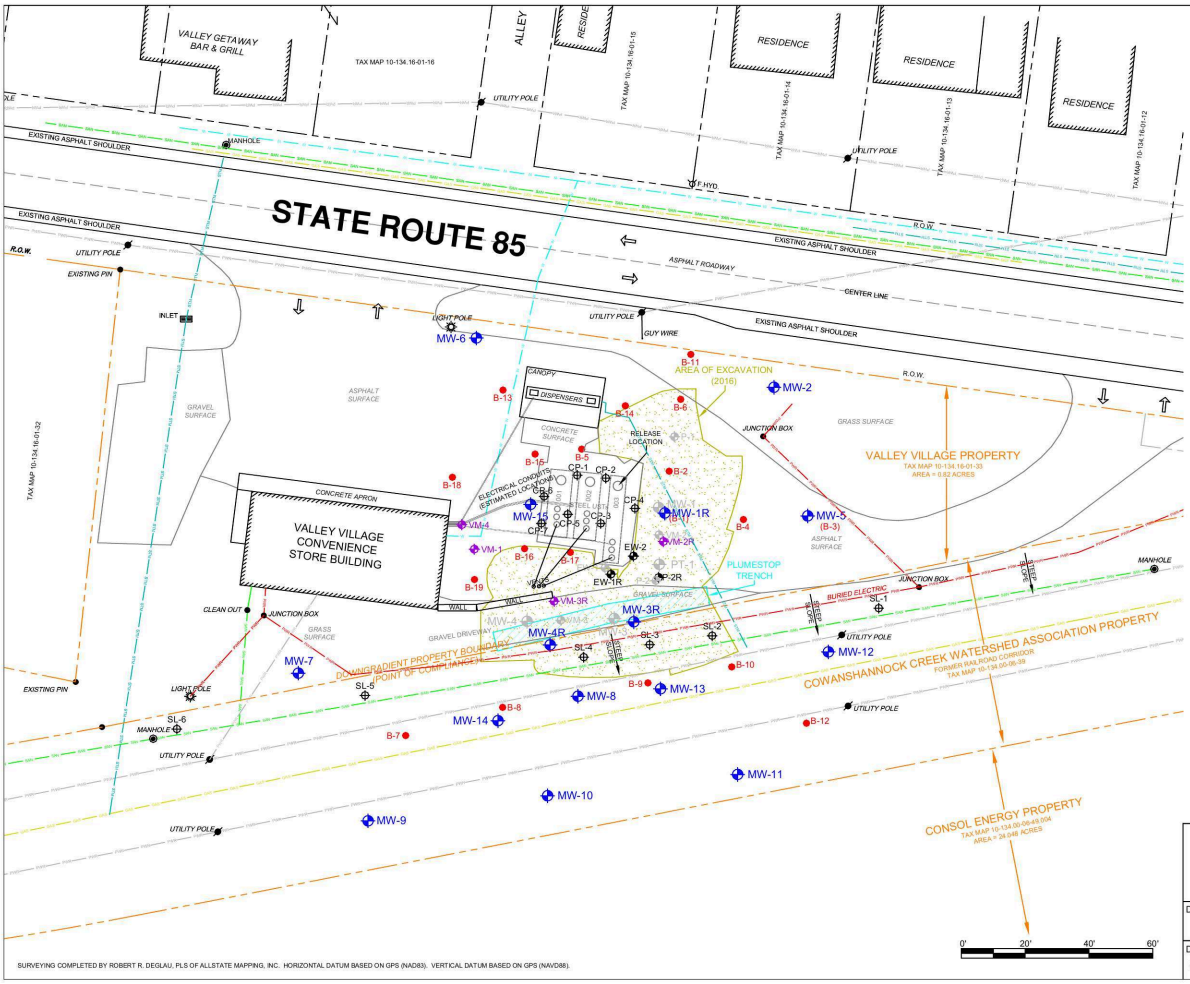
6.0 CONCLUSIONS

Attainment of the SHS-RUA was demonstrated for soil following the excavation of impacted soil in 2016. While groundwater contaminant concentrations have decreased, attainment of the SHS-RUA will not be possible without additional remediation.

Adsorbed phase mass in the UST cavity serves as a continually emitting source of dissolved phased contamination. Surfactant injection of the UST cavity is proposed to address adsorbed phase mass in the UST cavity and a downgradient sewer line trench.

After a period (no more than three quarters) of monitoring, Carbon Based Injectate technology is proposed to address any residual groundwater contamination. The final design for that technology will be provided in RAP Addendum No. 3.

FIGURES



LEGEND

- MW-1 MONITORING WELL
- EW-2 EXTRACTION WELL
- P-2R PIEZOMETER
- CP-1 UST CAVITY INJECTION WELL
- SL-1 SANITARY SEWER TRENCH INJECTION / EXTRACTION WELL
- VM-1 SOIL VAPOR MONITORING POINT
- B-2 SOIL BORING
- EW-1 FORMER WELL
- PROPERTY BOUNDARIES
- WATER LINE
- NATURAL GAS LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- OVERHEAD ELECTRIC LINES
- UNDERGROUND ELECTRIC LINES

NOTES:

1) THE FOLLOWING WELLS WERE REMOVED DURING EXCAVATION IN SEPTEMBER-OCTOBER 2016: MW-1, MW-3, MW-4, EW-1, P-1, P-2, VM-2, VM-3, PT-1. REPLACEMENT WELLS MW-1R, MW-3R, MW-4R, EW-1R, P-2R, VM-2R, AND VM-3R WERE INSTALLED IN NOVEMBER 2016. WELLS P-1 AND PT-1 WERE NOT REPLACED.

SURVEYING COMPLETED BY ROBERT R. DEGLAU, PLS OF ALLSTATE MAPPING, INC. HORIZONTAL DATUM BASED ON GPS (NAD83). VERTICAL DATUM BASED ON GPS (NAVD88).

FIGURE 1

SITE MAP
VALLEY VILLAGE
10243 STATE ROUTE 85, KITTANNING, PA 16201
REMEDIAL ACTION PLAN - ADDENDUM NO. 2

DRAWN	REVISED	CHECKED
JLS	AMG	AMG
DATE	DATE	DATE
09/12/2014	01/20/17	03/30/2017

INSITE GROUP, INC.
611 SOUTH IRVINE AVENUE
SHARON, PENNSYLVANIA 16146

ATTACHMENT A

Ivey International Inc.
"Today's Environmental Solutions For A Better Tomorrow"

MSDS NUMBER: 160202

MATERIAL SAFETY DATA SHEET
Ivey-sol® Surfactant Technology

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Ivey-sol®
Chemical Name:	Not Applicable (mixture)
Chemical Family:	Non-ionic Surfactants
Formula:	Not Applicable (mixture)
Synonym(s):	Ivey-sol® 103, Ivey-sol® 106, Ivey-sol® 108
HS Code:	3402.13.1000

CONTACT BY COUNTRY:

Canada:

Canada Colors & Chemical — 6605 Hurontario Street, Suite 400, Mississauga, ON, L5T 0A3
Tel: + 1-416-848-7692 www.canadacolors.com

United States:

EnviroSupply & Service, Inc. — 1791 Kaiser Ave., Irvine, California, USA 92614
Tel: + 1-949-757-0353 www.EnviroSupply.net

Prepared By:	Technical Products Department (Ivey International Inc.)
Telephone Number:	+ 1-604-538-1168 or Toll Free + 1-800-246-2744
Prepared (Last Updated):	February 2, 2016

Ivey International Inc. (IVEY) urges each customer or recipient of this MSDS to study it carefully to become aware of and understand the proper use and handling of the subject product. The reader should consider consulting reference materials, and/or IVEY technical support personnel, and/or other recognized experts, as necessary or appropriate to the use and understanding of the data contained in this MSDS. To promote the safe handling, storage and use of this product, each customer or recipient should (1) notify his employees, agents, contractors, and others whom he knows or believes will use this product, of the information in this MSDS and any other information regarding product use, storage and handling, (2) furnish this same information to each of his customers for the product, and (3) request his customers to notify their employees, customers, and other users of the product, and of this information.

SECTION 2: COMPOSITION INFORMATION

Components:	Ivey-sol® (biodegradable) non-ionic surfactants (blend)
Generic Description:	Water based biodegradable wetting agents and surfactants.

Ivey-sol®/SPT® Technology - Stock Mixtures. Patented and/or proprietary blends. Information in this MSDS is applicable for all component products listed.

SECTION 3: HAZARDS IDENTIFICATION

Effects of a Single Exposure.

Swallowing:	Non to slightly toxic. May cause abdominal discomfort and nausea for some individuals.
Skin Absorption:	No evidence of harmful effects.
Inhalation:	No evidence of harmful effects.

Skin Contact:	Brief contact should not result in any significant effects. Prolong Exposure may cause mild irritation with local itching and redness for individuals with sensitive skin.
Eye Contact:	May cause mild to moderate irritation.
Effects of Repeated Exposure:	Repeated skin contact may cause mild dermatitis (dryness of skin).
Medical Conditions:	Existing dermatitis may be aggravated through repeated skin contact.
Other Effects:	None currently known.

Section 4: FIRST AID MEASURES

Swallowing:	If patient if fully conscious, give two glasses of water
Skin Absorption:	Wash exposed skin with soap and water. Obtain medical attention if irritation or dermatitis persists. Wash exposed clothing before reuse.
Inhalation:	Not applicable.
Eye Contact:	Immediately flush eyes with water and continue to flush as required. Remove any contact lenses, if worn. Obtain medical attention if deemed necessary.
Note to Physician:	There is no required antidote. Treatment should be directed to control symptoms and the clinical condition of the patient.

Section 5: FIRE FIGHTER MEASURES

Flammability:	Not Flammable
Auto Ignition Temperature	Not Available
Upper Flammable Limit	Not Established
Lower Flammable Limit	Not Established
Explosive Date:	
Explosive Power:	Not Available
Rate of Burning:	Not Available
Hazardous Combustion products:	Not applicable
Special Protective Equipment:	Not Applicable
Extinguishing Media:	Not Applicable
Extinguishing Media to be avoided:	Not
Applicable Special Fire Fighting Procedures:	Not Applicable

Section 6: ACCIDENTAL RELEASE MEASURES

Step to take if material is released or spilled:

Eliminate and/or contain source with inert material (sand, earth, absorbent pads, etc.). Wear basic eye and skin protection. Floor may be slightly slippery; so use care to avoid falling. Avoid discharge to natural waters, and/or dilute with water. Transfer liquids to suitable containers for recovery, re-use or disposal. Contact III for technical assistance if required.

Section 7: HANDLING AND STORAGE

Handling Procedures:	Avoid contact with eyes, skin, and clothing. Do not swallow. Keep Containers closed or sealed when not in use. Wash thoroughly after handling.
Storage:	Keep closed or sealed when not in use. Do not allow to freeze.
Ventilation:	General mechanical room ventilation should be satisfactory.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Gloves / Type Gloves / Type:	Latex, or similar would be sufficient.
Respiratory / Type:	None expected to be needed. However, if an engineered/industrial application where vapors and/or misting may occur, wear MSHA/NIOSH approved half mask air purifying respirator.

Eye / Type:	Mono Goggles or similar.
Footwear / Type:	No special requirements.
Clothing / Type:	Wear an apron and /or coveralls.
Other / Type:	Eye bath.
Engineering Controls:	General mechanical room ventilation should be satisfactory.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Water Based Liquid
Appearance:	Clear to slightly Cloudy White Color
Odor:	Mild
Molecular Weight:	Mixture (not applicable)
Boiling Point:	Not Applicable
Freezing Point:	Approx. 0°C (32°F)
Pour Point:	Not Applicable
Melting Point:	Not Applicable
Specific Gravity:	0.99-1.04 (Water = 1.0)
Vapor Pressure:	<0.01 mm Hg
Vapor Density:	> 1 (Air = 1.00)
pH:	Not Available (Typically 6.5-7.5 Range)
Solubility in Water:	100%
Evaporation Rate:	<0.01
Coefficient of Oil/Water Distribution:	Not Determined

Section 10: STABILITY AND REACTIVITY

Stability:	Stable
Conditions to Avoid:	Prolonged excessive heat may cause product decomposition. Freezing should also be avoided as it may cause product decomposition. In some cases it may cause irreversible changes.
Incompatible Materials:	Normally un-reactive; however avoid strong bases at high temperatures, strong acids, strong oxidizing agents, and materials with reactive hydroxyl compounds. These compounds would damage the mixture and reduce its effectiveness during application.
Hazardous Decomposition Products:	Not applicable.
Hazardous Polymerization:	Will not occur.

Section 11: TOXICOLOGICAL INFORMATION

Exposure Limit of Material:	Not Established
LD/50:	Not Available
LC/50:	Not Available
EL:	Not Established
Carcinogenicity of Material:	None Known
Reproductive Effects:	Not Available
Irritancy of Material:	See Section 3
Sensitizing Capability:	Not Available
Synergistic Materials:	Not Available

LD: Lethal Dose LC: Lethal Concentration EL: Exposure Limit

Section 12: ECOLOGICAL CONSIDERATIONS

Environmental Toxicity:	Low Potential to affect aquatic organisms*
Biodegradability:	>90% in 28 days**
LC/50:	48 Hour: 0.11 %, Species: Daphnia magna
LC/50:	96 Hour: 0.07695%, Species: Rainbow Trout

* When used in accordance with Ivey International Inc. In-situ and Ex-situ Remediation Applicable Guidelines.

** Based on actual testing or on data for similar material(s). Degradation Biodegradation reached in Modified OECD Screening Test (OECD Test No.301 E) after 28 days: 90 %. Biodegradation reached in CO2 Evolution Test (Modified Sturm Test, OECD Test No. 301 B) after 28 days: 70 %.

All available ecological data have been taken into account for the development of the hazard and precautionary information contained in this Material Safety Data Sheet.

Section 13: DISPOSAL CONSIDERATIONS

Waste Disposal Method:	For aqueous Ivey-sol® mixture solutions; aerobic biological wastewater treatment systems are effective in treating said mixtures. Ivey-sol® does not have any known negative affect on coagulant or flocculent water treatment processes.

Section 14: TRANSPORTATION INFORMATION

UN Number:	Not Applicable
TDG Classification:	Not Required
Shipping Name:	Ivey-sol®
Packing Group:	Not Applicable
Special Shipping Instructions:	Do not allow to freeze

Section 15: REGULATORY INFORMATION

WHMIS Classification:	Not controlled as per WHMIS Regulation.
CPR Compliance:	This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the
CPR. CEPA Compliance:	All ingredients of this product are listed on the DSL.

Section 16: OTHER INFORMATION

Available Literature and Brochures:	Additional information on this product may be obtained by calling our customer service representatives at 1-800-246-2744 or 604-538-1168.
Recommended Uses and restrictions:	For the application of air, soil, groundwater, shoreline, and off-shore spill petroleum reclamations purposes. Secondary recoveries of petroleum products form crude-oil, oil-shale, and oil-sands. Additional information on uses can be made available by contacting out technical sales director in your area by visiting www.iveyinternational.com, or by calling toll free 1-800-246-2744 or 604-538-1168.
Legend:	TS - Trade Secret D2B - Toxic Material causing Other Effects. Mm - Millimeters LD - Lethal Dose LC - Lethal Concentration EL - Exposure Limit Hg - Mercury (760 mm Hg = 1 Atmosphere, Sea Level)

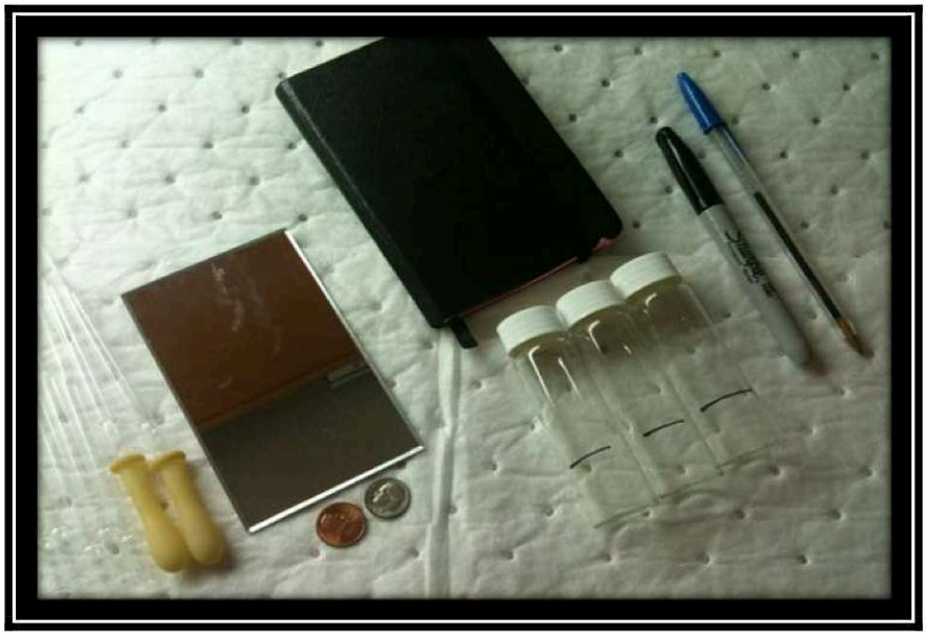
Ref: Ivey-sol®/MSDS/Revised February 2, 2016

ATTACHMENT B

Surface Tension & Agitation Field Tests

During in-situ Ivey-sol® surfactant enhanced contaminant remediation injection events, it is possible for field staff to evaluate *'in real time'* if and when the Ivey-sol surfactants, and their associated desorbed contaminant mass, are being recovered at the extraction/recovery wells on-site. In response to client requests, Ivey International Inc. developed two simple, economical, and easy to use field test procedures to aid environmental consultants and contractors, during their Ivey-sol applications, to make better decisions regarding which time based water samples collected at the extraction/recovery wells should be submitted for laboratory analysis, and to evaluate the effectiveness of their Ivey-sol site applications, and determine status of each injection if performing multiple injection extraction events over a period of a few days. These visual field test methods are as follows:

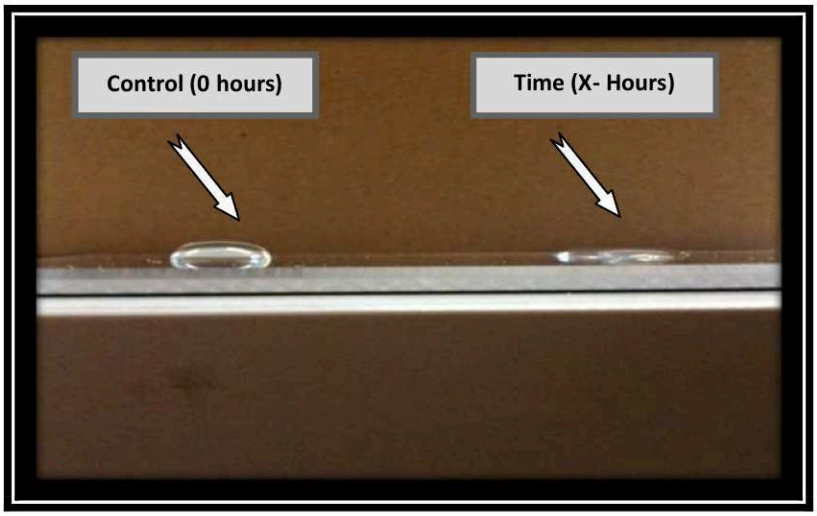
- ► Surface Tension Test; and
- ► Agitation Test



The components of the basic field test kits are shown in the above photograph. For the Surface Tension Test you require a small glass plate or mirror, glass droppers, and a penny and dime that can be used as size references for the surface tension test. The Agitation Test kit requires 40 ml clear vials, a small ruler (cm) and black marker. A field note book and pen to record observations completes the basic kits. With the exception of the glass plate, most environmental laboratories will provide the 40 ml vials and glass droppers to their clients for free, thus making this test kit easy and inexpensive to prepare. You can use one or both of these field tests to identify when the desorbed contaminants were being recovered at extraction/recovery wells. Each test is described with photographs below.

Surface Tension Test:

The physical interaction between water molecules, known as hydrogen bonding, gives rise to surface tension and explains why water beads. In the presence of the Ivey-sol surfactant, the surface tension of water can be reduced from 73 dynes to < 30 dynes. The photograph below shows water (Left) taken from an extraction/recovery well before performing an Ivey-sol injection, while the drop on the right shows the water extracted from the extraction/recovery well(s) several hours (Time 'X') after the Ivey-sol injection.



To undertake the Surface Tension Test at a site, you collect a water sample from each of the extraction/recovery wells you will be pumping from before the Ivey-sol injection. These samples serve as '*Control*' reference baseline samples for the evaluation of the Ivey-sol application process. After the Ivey-sol injection, you collect '*Time*' based (1 hour, 2 hours, 3 hours, etc.) groundwater samples at each of the extraction/recovery wells to permit a time based evaluation of the Ivey-sol application and help determine when the desorbed contaminants are being liberated and their associated mass is recovered at the designated extraction/recovery wells on-site.

Once the control and time based samples are collected, you put 20 droplets of the Control (baseline) sample on the clean glass surface to form a single reference droplet (about the size of a dime or penny). Then 20 drops of the time based (Time 'X') sample, as shown in above photograph. As the Ivey-sol surfactant lowers the surface tension of the water, the angle of incidence of the droplet to the glass decreases (become more flat) over time. This reduction in angle of incidence is a good visual indicator of the presence of Ivey-sol surfactant and associated contaminant mass liberated for recovery at the extraction/recovery wells.

You can also visualize the general shape of the droplet. The control is usually quite round, while the time based samples become increasingly more irregular in shape. The photograph below shows the side by side comparison of a baseline reference (control) droplet to the 50, 100, 150 time unit based (i.e., minutes or hours) water samples. At 50, the surface tension is lower (droplet is flatter) than the baseline, and the shape is just a little less circular. At 150, the droplet is very flat and very thin and very irregular in shape. The interpretation would generally be that at 50, the Ivey-sol and associated desorbed contaminants were just arriving at the extraction well(s), while at 150, they were at their highest concentration before decaying back to baseline conditions over the next 150 to 180 time units.

Water samples collected before 50 may not be as indicative for evaluating the efficacy (performance) of the Ivey-sol as would the samples collected after 50 time units. The client would likely submit a sample at time 0, 50, 150, 200, 300, and potentially 350 or 400, based on this field test.

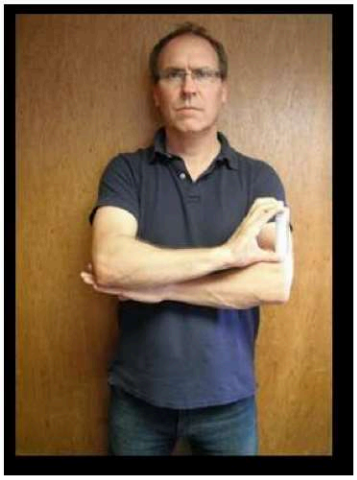
Agitation Test:

This test, like the surface tension test, involves the collection of a control (baseline) Time '0' baseline reference sample, and several time based water samples from each extraction/recovery well(s) on site. An example of such is shown in the photograph below.

To undertake the Agitation Test, you take 40 ml clear vials and mark them all at 3 cm from bottom with a black marker. This line indicates the *'fill to'* level for the water samples to keep all consistent. The cap is placed on the sample. These time based samples are then placed between the index finger tip and thumb of right hand (left if left handed), with the left forearm horizontal to the ground at stomach level (See photographs below). The right forearm is placed on top of the left and rotated up through 90 degrees vertically over 1 second period and repeated 5 times (See photographs below). The vials are *NOT* vigarously shaken as too inconsistent a procedure.

The samples are then visually inspected and the thickness of any bubbles are measured and recorded. Each time based sample can be visually compared to the control baseline reference sample, and each other, over a designated time period. The basline will generally have no bubbles, while the time based samples will start to have a few bubbles over time that go from < 0.5 mm, to 1 mm, to 2 mm, etc. then reach a maximum mm thickness before slowly reducing in thickness until no persistance of bubbles is observed and the baseline (pre Ivey-sol injection) conditions have returned.

The appearance of persistant bubbles is a visual indicactor that the Ivey-sol surfactant and associated contamination have arrived at the extraction/recovery wells. As the thickness of bubbles increases, so does the associated concentration of Ivey-sol and desorbed contaminants being extracted/recovered. As the concentration of Ivey-sol decreases with groundwater extraction, the observed bubbles will subside over time until original baseline groundwater conditions (pre Ivey-sol injection) are re-established.



The photograph below shows three water samples collected at a site during a multi-day Ivey-sol injection extraction pilot event. These samples were taken on day two. You will note just a few minor bubbles in the 07:40 sample (Day 2 Baseline), which increases to 1 mm by 10:30, then 2 mm by 16:40. The 07:40 sample indicated that the Ivey-sol injection from day 1 was essentially concluded with only residual concentrations present allowing them to complete the second injection moments later.

The 10:30 and 16:40 samples showed the presence of Ivey-sol and associated contaminant mass recovery at the extraction/recovery wells. These samples allowed the field technician, and/or project manager to make 'informed' decisions regarding which samples should be submitted to the laboratory for analysis and the real-time status of the Ivey-sol injection event for tracking mass recovery and the planning of a third injection on day three of the subject application.

A sample field observation table, to log surface tension and aggitation tests results, is provided (Modify to your needs) below on Page 7.

The Ivey-sol surfactants can selectively desorb sorbed contamination off the soil into the groundwater for enhanced contaminant mass recovery within the aqueous phase. This ability makes the contaminants more *'Physically Available'* for in-situ pump and treatment or push-pull applications and ex-situ soil washing. It makes the sorbed contaminants more *'Bio-Available'* for in-situ and ex-situ bioremediation. It can also make the contaminants more 'Chemically Available' for REDOX chemicalization. The mechanism of how the Ivey-sol desorbed the contaminants without forming a micelle (i.e., below the CMC) is illustrated below.