HVDPE Pilot Test Workplan for the Former Holley Automotive/Coltec Industries Facility Water Valley, Mississippi

Nazmi Talimcioglu, Ph.D., P.E., CGWP, LSRP

April 6, 2018

Prepared for: EnPro Industries, Inc.
5605 Carnegie Boulevard, Suite 500
Charlotte, NC 28209

Prepared by: First Environment, Inc.
91 Fulton Street
Boonton, New Jersey 07005

Protected by the Common Interest Privilege

CERTIFICATION STATEMENT

I, Nazmi "Mete" Talimcioglu, Ph.D., P.E., CGWP, LSRP, certify that I am currently a registered professional engineer in the State of Mississippi and had primary direct responsibility for the implementation of the subject HVDPE Pilot Test Work Plan. I certify that this HVDPE Pilot Test Work Plan was completed in conformance with the laws and regulations of the State of Mississippi. I certify that all information and statements in this certification form are true.

29008	04-06-2018	
Mississippi Professional Engineer No.	Date	Nazmi Talimcioglu, Ph.D., P.E., CGWP, LSRP

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High Vacuum Dual-Phase Extraction System (HVDPE) Pilot Test Workplan

As stated in the Corrective Action Work Plan (CAWP), Rev. 1, dated January 12, 2018, First Environment, Inc. (First Environment), on behalf of EnPro Industries, Inc. (EnPro), proposes to conduct a pilot-scale study in the southern portion of the former Holley Automotive/Coltec Industries Facility located in Water Valley, Mississippi (the "Plant") where chlorinated volatile organic compounds (cVOCs) were detected during the MiHpt investigation. The specific objectives of the HVDPE pilot test are to:

- Demonstrate the ability of HVDPE to facilitate removal of DNAPL (if present) and associated contaminated groundwater, depress the groundwater table, evaporate cVOCs from the dewatered soil matrix, and capture and treat cVOC vapors from the induced vadose zone while extracting impacted groundwater for ex-situ treatment.
- Identify preliminary site-specific design criteria necessary to implement and operate an effective full-scale HVDPE system.

Technology Description and Pilot Scale Tests

HVDPE is a process which volatilizes sorbed phase VOCs and removes those compounds from the unsaturated zone while removing liquid phase contaminants from the underlying aquifer. Pilot scale tests are commonly performed as a first step in understanding site conditions as a project moves from conceptual to final design. The primary objective of pilot testing is to gather site-specific data such as hydraulic conductivity and air permeability of the soil and the effectiveness of mass removal in both liquid and gaseous phases. As such, the primary objective of a HVDPE pilot test is different than the one for a conventional soil vapor extraction (SVE) system, which only considers contaminant mass removal from the vadose zone.

As high vacuum on the order of magnitude of approximately 20 to 25 inches of mercury (equivalent to approximately 272 to 340 inches of water) is applied to the soil, gradual drying of the vadose zone occurs while pore water is mobilized by pressure gradients. This results in a lowering of the water table, creating a progressive cone of depression while exposing contaminant laden soils to suction caused by induced vacuum. The applied vacuum evaporates the sorbed phase VOCs, which are simultaneously captured by the suction generated in the cone of depression. Meanwhile, groundwater is extracted either by means of a submersible pump or a dropdown pipe (a.k.a. stinger) installed in an extraction well and connected to the vacuum blower. The well cap is sealed in order to sustain vacuum in the well casing. The extracted liquid is passed through a vapor-liquid separator (VLS) and is generally treated by either filtration through serially connected granular activated carbon (GAC) or by an air stripper

unit. Picture 1 depicts a typical extraction system with two high vacuum blowers connected to a VLS vessel:

Picture 1 – Typical High Vacuum Dual Phase Extraction System Blowers and VLS Vessel Connection

The treated water is either stored on site for subsequent disposal at a publicly owned treatment works (POTW) facility or at a privately owned water treatment plant or is discharged to a surface water body under a national (or state) pollution discharge elimination system (NPDES) permit. The extracted vapors are treated either by GAC filtration or a thermal or catalytic oxidizer unit before being emitted to the atmosphere under an applicable air quality permit (if required)...

Picture 2 depicts a typical pilot test setup with two (2) serially connected water GAC units (blue drums), and the two (2) serially connected air GAC units (yellow drums):

Picture 2 – Typical Use of Water and Air GAC Units during a HVDPE Pilot Test

Because of the time requirement to achieve steady-state conditions, the HVDPE pilot tests are generally conducted at the highest vacuum setting attainable and sustainable for a given site. The HVDPE pilot tests are typically performed under a single vacuum application. During the pilot test, the following observations are noted:

- vacuum distribution throughout the test area using observation vapor points and/or monitoring wells;
- radius of influence of the applied vacuum;
- contaminant vapor and groundwater recovery rates;
- non-aqueous phase liquid (NAPL) recovery rates (if NAPL exists);
- analytical quality of extracted groundwater and contaminant vapors; and
- total mass removal rate.

Proposed HVDPE System Pilot Test Details

To determine the potential effectiveness of HVDPE, First Environment proposes to conduct a twenty-four (24) to forty-eight (48) hour pilot test using smaller scale equipment, detailed below,

and the below-referenced extraction and observation wells located on the south side of the Plant building. During the pilot test, First Environment will utilize the newly installed monitoring well, MW-70, as an extraction well. The attached Figure 1 depicts the locations of the newly installed monitoring wells. First Environment selected MW-70 based on the March 2018 sampling results (TCE concentration of 40,800 µg/L). Furthermore, MW-70 is the closest well to the former AST area and is located directly adjacent to the Plant building.

The pilot test will proceed by connecting a vacuum drop tube ("stinger") to the blower. The stinger will be placed into MW-70. A custom made PVC well cap will be constructed to provide a complete seal of the well casing containing the stinger and the flexible extraction hose, similar to the one depicted in Picture 2. The extraction hose will be connected to the vacuum blower via the VLS vessel as depicted in the attached Process and Instrumentation Diagram. A pre-fabricated mobile system in a trailer will be rented for the duration of the proposed test from Specialty Systems Integrators, Inc., Plymouth, Minnesota. This rental unit has the following main features as indicated in the specifications cut sheet provided in the Appendix:

1. Vacuum Blower: 6.5 kW, 3ph 230/460 VAC rotary claw vacuum pump, capable of achieving 200 acfm @ 20 inches Hg with a relief valve and an inline particulate filter.
2. VLS Vessel: 60-gallon capacity with High/High level switch, 6-inch cleanout port, drain port with isolation ball valve, and clear liquid level see-through side tube.
3. Transfer Pump: centrifugal pump with high vacuum seal to pump extracted liquids to the air stripper.
4. Air Stripper: 3-tray ploy compact air stripper with a regenerative blower capable of delivering 150 cfm at 40 inches of water.
5. Various Appurtenances: dilution valves, flow meter, vacuum gauges, temperature gauges, Pitot tube for air flow measurement, Schedule 40 PVC piping (manifold and transfer piping).
6. Electronic System Controller Panel.

Although not depicted in the Process and Instrumentation Diagram, First Environment will acquire two (2), 180-pound GAC units specifically designed for air and will connect them to the blower output (exhaust) port, which runs out of the trailer (designated as "outside wall" in the drawing). The "out-to-roof" valve will be completely closed. Similar to the one depicted in Picture 2, the air GAC units will be serially connected with PVC piping. A 10-foot long exhaust stack will also be constructed of the same material and will be installed at the second GAC unit output port in a similar fashion as depicted in Picture 2.

The electrical power source for the system requires three-phase 230 VAC (or alternatively 460 VAC), which will be supplied by either a direct connection to the existing power grid (if feasible) or by a mobile power generator capable of providing the required voltage and amperage. Electrical wiring will be conducted by a state licensed electrician per NEC code.

The extracted groundwater will be passed through the three-tray air stripper unit already installed in the rental treatment system (similar to the one depicted in Picture 3) and will be temporarily containerized in a rental 25,000-gallon or larger capacity frac tank (similar to the one depicted in Picture 4), which will be mobilized to the site prior to the pilot test.

Picture 3 – A typical Compact Tray Air Stripper System

Picture 4 – A Typical Frac Tank used during HVDPE Pilot Tests

First Environment will contract with a vendor to supply one or more vacuum trucks, which will be employed to transfer extracted groundwater to the existing Treatment System No. 2 periodically during the entire duration of the test. The extracted groundwater will be further treated using the existing Treatment System No. 2 and will be discharged to the Otoucalofa Creek under the current NPDES permit.

Proposed HVDPE System Pilot Test Operation Details

As mentioned above, First Environment will utilize the monitoring well MW-70 as the extraction well during the pilot test. Upon completion of the pilot test system assembly and prior to turning the system on, First Environment will place electronic data transducers in the following observation wells if no apparent free phase product exists in the wells:

1. MW-60 (inside the plant),
2. MW-62 (inside the plant),
3. MW-63 (inside the plant),
4. MW-65 (south side of the plant),
5. MW-66 (south side of the plant),
6. MW-67 (south side of the plant),
7. MW-69 (south side of the plant),

8. MW-71 (south side of the plant),
9. MW-72 (south side of the plant),
10. MW-36 (south side of the plant).

First Environment will obtain manual depth-to-water measurements from all monitoring wells, including the observation wells, in close proximity to MW-70 using an electronic water level indicator to establish the baseline. Upon equilibration of the groundwater temperatures with the transducers in observation wells, First Environment will reset the electronic transducer data to read the baseline levels as “zero” condition.

As in the case of the extraction well (MW-70), custom-made PVC well caps will be constructed of Schedule 40 PVC pipes and lids to completely seal the well casing while accommodating the transducer cable. Similar to the one depicted in Picture 5, this cap will be fitted with a valve and flexible tubing to be used to measure vacuum within the well casing.

Picture 5 – A Typical Custom Made Well Cap shown with a Magnehelic Gauge

Once all the preparations for the test are completed and baseline conditions are established, First Environment will start the system. Total airflow will be measured using an inline flow meter and will be recorded concurrently with vacuum measurements. Electronic pressure transducers

will continuously measure and record drawdown values during the pilot test in each observation well. During the pilot test, the applied vacuum at the blower will be maintained at the maximum capacity (estimated up to 25" Hg). The sustainable air flow rate will also be maintained in the extraction well. The observation wells will be monitored for induced vacuum using portable magnehelic gauges (similar to the one shown in Picture 5). The vacuum readings will initially be collected within 10-minute intervals and recorded. After equilibrium is established, the vacuum readings will be collected at 30-minute intervals for the first six (6) hours of the test. For the remainder of the test, intermittent vacuum readings will be collected, as appropriate.

During the pilot test, three (3) sets of influent and effluent air samples will be collected for subsequent laboratory TO-15 analyses. The first round of sampling will be collected within the first hour of the test's initiation. The second round will be collected twenty-four (24) hours later. The third round will be collected within the last hour of the proposed duration of the test.

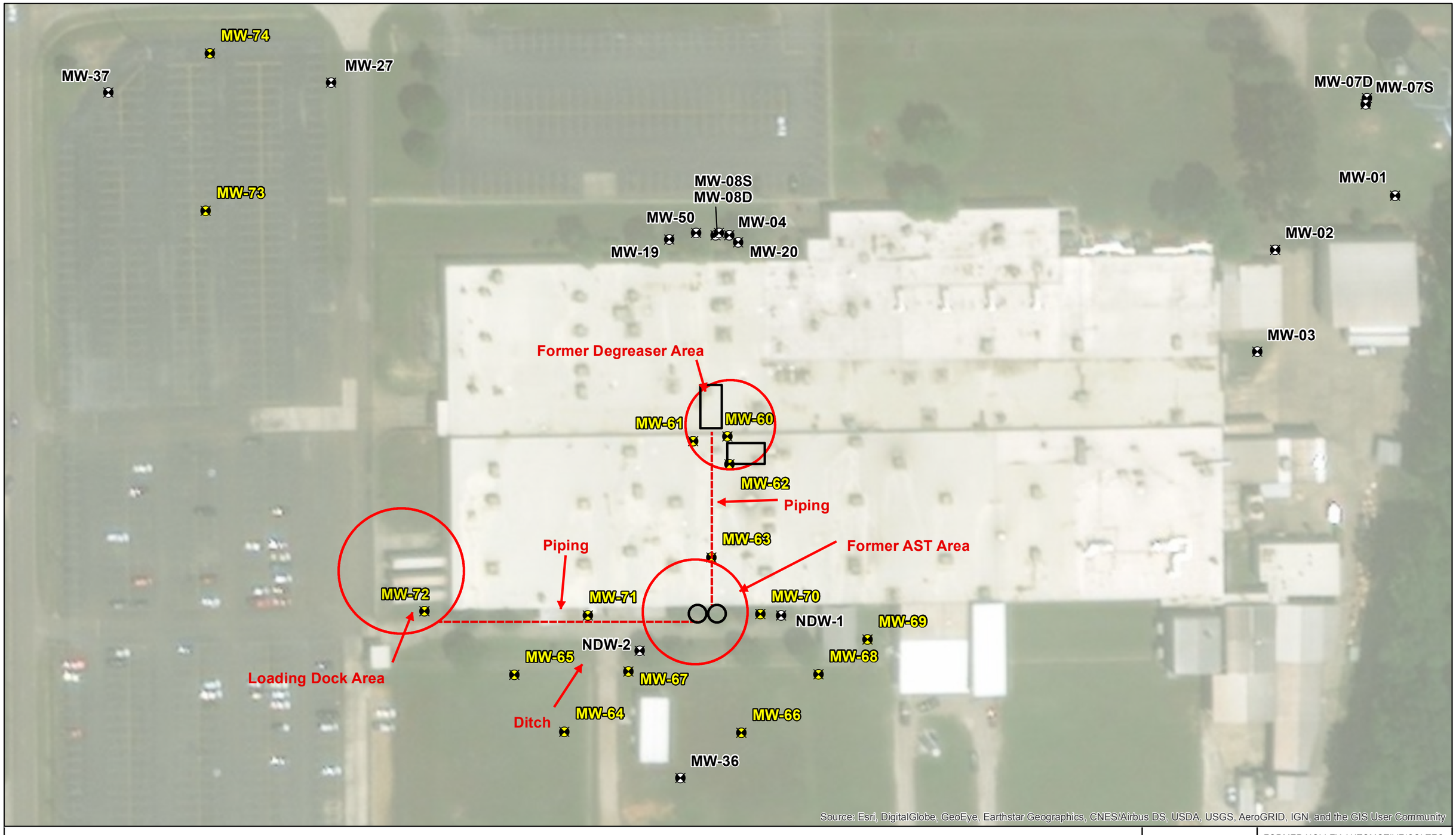
A flow meter on the discharge point for the extracted groundwater treatment system will record total extracted liquids. Influent (before treatment) and effluent (after treatment) groundwater samples will be collected within the last hour of the test for subsequent laboratory testing (TCL VO+15 parameters via EPA method 8260C). In addition, during the test, water levels at the monitoring wells that are not being used as observation wells will manually be measured and recorded periodically to identify the effects of formation dewatering.

The pilot test is expected to last between 24 and 48 hours.

Pilot Test Data Analysis

Upon completion of the pilot test, First Environment will analyze the field and laboratory data to determine the effective radius of influence, air permeability data, and vacuum distribution within the tested area. This analysis will lead to assessing the feasibility and efficacy of the HVDPE system, as well as the site-specific cVOC removal rate. Based on these findings, if deemed feasible, First Environment will design a full-scale HVDPE system as discussed in Section 7.1 of the CAWP. The full-scale system design will be provided to the MDEQ in a subsequent CAWP Addendum, which will detail all pilot test data and analysis, technical specifications of the proposed system, its appurtenances, and other regulatory requirements (i.e., permits, etc.).

FIGURE



Legend

- February 2018 Monitoring Well Locations
- Existing Monitoring Well Locations

0 20 40 80 Feet

1 in = 80 ft

N W E S

FIRST ENVIRONMENT

91 Fulton Street
Boonton, New Jersey 07005

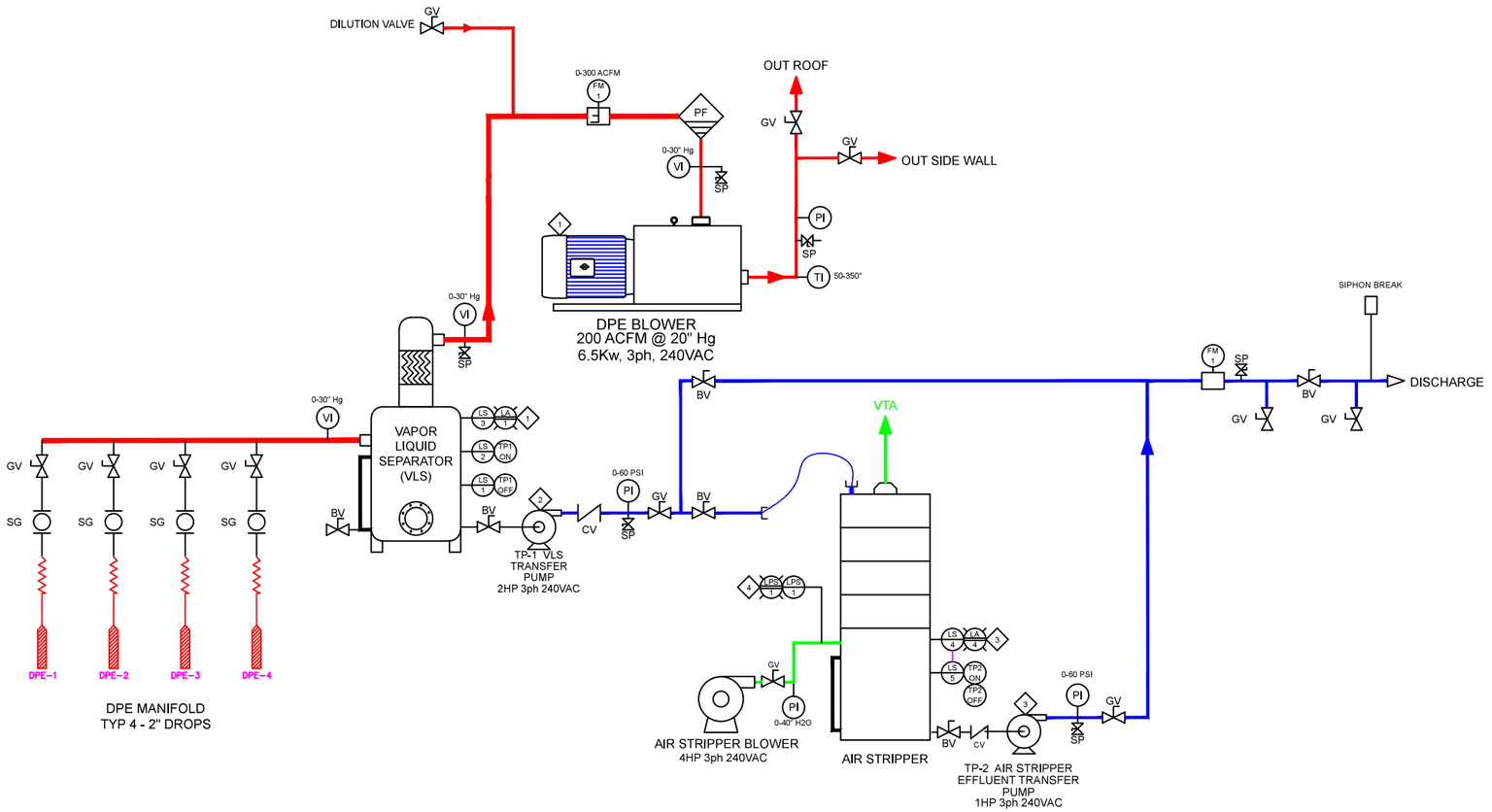
FORMER HOLLEY AUTOMOTIVE/COLTEC INDUSTRIES FACILITY
600 Highway 32E, Water Valley, MS
FIGURE 1
MONITORING WELL LOCATIONS

Revised	Drawn	Checked	Approved	Date
	LS	IC	MS	02/27/2018

APPENDICES

LEGEND

- SOLENOID VALVE
- BUTTERFLY VALVE
- GLOBE VALVE VALVE (GLV)
- BALL VALVE (BV)
- GATE VLAVE (GV)
- SWING CHECK VLAVE (CV)
- THREADED UNION
- SAMPLE VLAVE (SP)
- VALVE NORMALLY OPEN
- VALVE NORMALLY CLOSED
- VACUUM RELIEF VALVE (VRV)
- PRESSURE RELIEF VALVE (PRV)
- PARTICULATE FILTER (PF)
- PRESSURE INDICATOR (PI)
- VACUUM INDICATOR (VI)
- TEMPERATURE INDICATOR (TI)
- SIGHT TUBE (SG)
- LEVEL SWITCH No (x) (LS x)
- PRESSURE (VACUUM) SWITCH No (x) (PS x)
- ANALOG PRESSURE TRANSMITTER No (x) (Pt x)
- ANALOG TEMPERATURE TRANSMITTER No (x) (Tt x)
- ANALOG FLOW TRANSMITTER No (x) (Ft x)
- ANALOG VACUUM TRANSMITTER No (x) (Vt x)
- ANALOG LEL TRANSMITTER No (x) (LEL x)
- HIGH LEVEL ALARM No (x) (LA Hx)
- LOW FLOW ALARM No (x) (FA Lx)
- LOW VACUUM ALARM No (x) (VA Lx)
- HIGH VACUUM ALARM No (x) (VA Hx)
- HIGH LEL ALARM No (x) (LEL Hx)
- MOTOR OVERLOAD No (x) (MF x)
- FATAL ALARM No (x) (x)
- CONTROL PANEL READOUT (XX x)
- MOTOR (M)
- AIR SPARGE FLOW METER (FM)



SPECIALTY SYSTEMS INTEGRATORS
14150 23rd Avenue North, Plymouth, MN 55447
Tel: 763 450 2600 Fax: 763 450 2601 www.2ssi.com

TITLE:

PROCESS & INSTRUMENTATION DIAGRAM
SPECIALTY SYSTEMS INTEGRATORS
MPE RENTAL SYSTEM

DWN: MV	DATE: 7/20/2017
CHKD: MV	DRAWING #: RENTAL-P&ID
REV.: 1	

SPECIALTY SYSTEMS INTEGRATORS INC.
14150 23rd Ave N; Plymouth, Minnesota 55447 | tel: 763-450-2600 | WWW.2SSI.COM | email: sales@2ssi.com

7/20/2017

SSI DPE Rental Trailer

Electrical Usage (Assuming a 84% Power Factor & 92% Motor Efficiency)

Component	Qty	HP	Voltage	Amps L1	Amps L2	Amps L3	Each Watts	Total Watts	KW	% Usage	Total KW (Usage)
DPE Blower	1	6.5kW	208	24	24	24	6,674	6,674	6.67	100%	6.67
VLS Transfer Pump	1	2	208	7.8	7.8	7.8	2,169	2,169	2.17	100%	2.17
Air Stripper Blower	1	4	208	15	15	15	4,171	4,171	4.17	100%	4.17
Air Stripper Effluent Transfer Pump	1	1	208	4.8	4.8	4.8	1,335	1,335	1.33	100%	1.33
XP Heater	1	1800 watt	208		7.5	7.5	2,086	2,086	2.09	50%	1.04
XP Exhaust Fan	1	1/4	115			10	1,537	1,537	1.54	50%	0.77
Control Panel Control Circuit	1		115	15			1,725	1,725	1.73	100%	1.73
			Total Amps:	67	59	69					

Voltage:	208 VAC
Phase:	3 Phase
Power Service Recommendation:	80 Amps

SPECIALTY SYSTEMS INTEGRATORS INC.
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March 25, 2018 SSI Quote #XXX

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Site: SVE/MPE Trailered System

The SVE/MPE system is a compact trailered system that is fully integrated as a complete functional system. The system components are as follows:

1 *RemediVac™ MPE System*

(1) SSI Oil-Free Rotary Claw Vacuum Pump (Performance = 200 ACFM @ 20" Hg)

- 6.5kW, 3ph, TEFC, 230/460 VAC motor
- Extremely efficient Rotary Claw Design
- Maintenance Free Non-Contacting Design
- Built-in Vacuum Relief Valve
- Inline Particulate Filter

(1) TotalSep™ Vapor/Liquid Separator Tank

- Two-Phase Separation Process
- 60-gallon air/water separator tank
- Primed and painted
- Level switches for transfer pump control & High/High Level Switch
- 6" cleanout port
- Clear liquid level site tube
- Drain port with isolation ball valve

(1) Liquid Pump-out System

- Centrifugal pump with high Vacuum seal

(1) Lot of the following instrumentation and valves:

- (1) Dilution Valve w/flow meter port
- (3) Vacuum Gauges
- (1) Temperature gauges
- (1) Main Line port for Pitot Tube Air Flow Meter

(1) 4 Point Manifold (Schedule 40 PVC Construction) (1) 2-inch Main Header (PVC) with side inlet to manifold points

- (4) 2" Gate Valves
- (4) Vacuum Gauges
- (4) Clear Site Tubes

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2 *Water Treatment Equipment*

(1) 3-Tray Poly Compact Air Stripper to include:
- Regenerative blower capable of delivering 150 CFM of air at 40" W.C. The internal blower construction shall be AMCA "B" (non-sparking). TEFC, 240vac, 3ph motor
- The air stripper will include the following instrumentation:
  - 1 - Pressure Gauge
  - 1 - Set of Sump level floats

(1) System effluent water flowmeter with totalizer

3 System Controller with Telemetry (NEMA 4)

SSI's control panel assembled inside a NEMA4 box per UL698A Listing (Industrial Control Panels relating to Hazardous Locations). Each motor and/or device will be controlled via Hand-Off-Auto (HOA) switch.

Motors will be controlled by a manual IEC starters with lockout tag-out switch lever. Signal from system control devices such as floats and switches will be wired as Intrinsically Safe.

The proposed control panel will include the following control circuits:
- DPE Blower
- DPE Effluent Transfer Pump
- Air Stripper Influent Transfer Pump
- Air Stripper Blower

Intrinsically Safe Inputs
- VLS High-High Level Switch
- VLS Pump Start/Stop Level Switches
- (1) High Level in Air Strippers' Sumps

OPTIONAL TELEMETRY PACKAGE
- Cell based Alarm notification via Text or email (Monthly fees apply)

4 *Remediation System Trailer*

System trailer will be 8'6" wide x 12-foot-long and includes the following features:
- Insulated and heated
- Rear ramp doors
- Trailer will include an explosion-proof (XP) heater, XP exhaust fan with intake louvers, XP light fixture with switch.
- Electrical wiring will be wired per NEC code as Class I, Division 2 in the equipment room

5 *Pricing:*

Item	Description	Unit	Quantity	Unit Price ($)	Total Price ($)
1.	SVE/MPE System Rental (6 Months minimum)	Month	x	$xx.xx	$xx.xx
2.	Optional SMS/Email Notification System	Month	x	$xx.xx	$xx.xx

SPECIALTY SYSTEMS INTEGRATORS INC.
14150 23rd Ave N; Plymouth, Minnesota 55447 | tel: 763-450-2600 | WWW.2SSI.COM | email: sales@2ssi.com

Specialty Systems Integrators, Inc. appreciates your interest in our products and we thank you for your time and consideration. If you have any questions or require any additional information concerning this quotation, please do not hesitate to contact us at (763) 450-2610.

Sincerely,

Samir Bouzrara
Specialty Systems Integrators
P: 763.450.2610 | C: 612.850.6750 | Email: samir@2ssi.com

SPECIALTY SYSTEMS INTEGRATORS INC.
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TERMS & CONDITIONS

Delivery: Parts orders are from stock or 2-3 weeks typical. Equipment is 4-6 weeks typical. Systems are 8-16 weeks typical. Actual delivery schedule determined at time of order placement subject to current workload, vendor schedules etc. If project expediting is necessary please indicate desired delivery and Specialty Systems Integrators, Inc will do everything possible to expedite.

Payment Terms: Parts and equipment orders: Net 30 OAC.
Projects or Systems: 10% down with PO. 40% with submittals. 40% at shipment. 10% upon final delivery or project completion.

Pricing: Pricing is valid for 45 days from proposal date. If expired, please contact Specialty Systems Integrators, Inc for an updated proposal.

Submittals: Submittals if required are provided as rapidly as possible. Submittals are provided in the standard Specialty Systems Integrators, Inc format, in digital Adobe pdf file format. The account must be current for submittals to be developed and provided.

Interpretations: Our offering is strictly limited to that which is described in the proposal above. No other equipment or services are included or implied unless in writing in the proposal. Contact Specialty Systems Integrators, Inc if there are any inaccuracies or omissions in the proposal.

Taxes, Fees and Permits: No taxes, state, federal or otherwise are collected by Specialty Systems Integrators, Inc. If you are subject to sales or other taxes you must report them and pay them to the appropriate authorities. No fees, government or otherwise are collected by Specialty Systems Integrators, Inc. Permit fees etc are collected only if they are described in the proposal.

Documentation: Detailed submittals, as-built drawings, IOM manuals, PE stamped documents etc are provided as described in the proposal.

Startup Assistance: Startup assistance can be provided for a field engineer to be onsite to assist in various startup activities. The field engineer will certify the installation is proper, test installed electrical components, check out mechanical installations, calibrate instruments, startup the system and train the operators as needed.
Startup assistance cost if not detailed in above proposal is priced as follows: $1500 for first day of travel. $950/day on-site thereafter. Costs include all travel and per-diem. Costs are for Con-US. For international startups please contact Specialty Systems Integrators, Inc for current pricing.

Warranty: Specialty Systems Integrators, Inc warrants it's products to be free from defects in materials and workmanship for 12 months from startup or 16 months from shipment, whichever occurs first. Specialty Systems Integrators, Inc reserves the right to repair or replace any defective item. Warranty does not include labor or shipping costs. Warranties of other vendor components etc may differ from our standard warranty and therefore shall be subject to that manufacturer's warranty. No other warranty is expressed nor implied.

Customer Acceptance – Purchase Order
By signing the acceptance below you agree that this is a binding purchase order from your company. You also agree to abide by the proposal payment terms.

ACCEPTANCE:

Accepted by: _____ Company: _____.

Printed Name & Title _____.

Purchase Order # _____ Date: _____.