



## REMEDIAL ACTION PLAN

SHEBOYGAN RIVER AND HARBOR SUPERFUND SITE  
TECUMSEH DEWATERING SITE, SHEBOYGAN FALLS, WI AND  
MARYLAND AVENUE DEWATERING SITE, SHEBOYGAN, WI

SME Project Number: 069638.00.025.001

August 10, 2017



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# 1. INTRODUCTION

We prepared this Remedial Action Plan (RAP) to address previously undiscovered, historical polychlorinated biphenyl (PCB) impact in soils at the Tecumseh Falls dewatering facility of the Sheboygan River and Harbor Superfund Site (Site). The PCB impact was discovered during the post remedial sampling of the facility to evaluate the potential that release of sediment during dewatering may have affected the soil. The RAP is also intended to address the Maryland Avenue dewatering facility where lead and polynuclear aromatic hydrocarbons (PAHs) were encountered in shallow soils at concentrations exceeding commercial/industrial preliminary remedial goals (PRGs).

The objective of this RAP is to evaluate the need for remediation at the two dewatering sites and the remedial options to protect human health and the environment. Descriptions of the Site history and known current environmental conditions; data evaluation, proposed remedial methods, reporting; and the estimated project schedule are presented in the following sections.

## 2. SITE HISTORY AND CURRENT CONDITIONS

The following subsections summarize the Site history, current Site conditions, and environmental conditions identified during previous investigations of the Property.

### 2.1 SITE HISTORY

Tecumseh, a manufacturer of refrigeration and air conditioning compressors and gasoline engines, was located adjacent to the Sheboygan River in Sheboygan Falls, Wisconsin. Polychlorinated biphenyls (PCBs) were found in sewer lines that lead to the River from Tecumseh and in hydraulic fluids used in Tecumseh Products Company's Diecast Division manufacturing processes. Prior to remediation, the contamination level was high in the sediments immediately surrounding the Tecumseh Falls Site, but decreased in concentration downstream.

The Record of Decision (ROD) listed the risks at the Sheboygan River and Harbor Superfund site to be from the chemicals of concern, metals and PCBs. Metals, PCBs, and polynuclear aromatic hydrocarbons (PAHs) were the as potential chemicals of concern (PCOC). The metals listed as the target of concern for the Remedial Investigations were cadmium, chromium, copper, lead, mercury, nickel, and zinc. Pesticides, dioxins, and dibenzofurans were not present in the sediment and as such, were no longer PCOC.

Between 2005 and 2013, Pollution Risk Services (PRS) and others remediated the river sediments. PRS dewatered the dredged sediment at the Tecumseh Falls and Maryland Avenue sites (Figure 1).

### 2.2 CURRENT CONDITIONS

Following the sediment remediation activities, the two dewatering sites have remained vacant. In accordance with the approved Sampling and Analysis Plans, SME sampled the areas where one of the geo-tubes broke releasing water outside of the dewatering pads, the wastewater treatment facilities, and the Confined Treatment Facility (CTF) or Sediment Management Facility (SMF) in 2016.

The results of this Phase II ESA demonstrated that soil at the Tecumseh Falls facility is impacted with concentrations of PCBs and PAHs; however, the impact was not the result of dewatering releases or activities by PRS. The impacted soil represents an undiscovered historical release from historical operations that occurred prior the remediation performed by PRS.

The concentrations of PAHs and PCBs at several locations at the Tecumseh Falls facility exceed the 2016 cleanup criteria or screening levels for commercial/industrial receptors. As such, impacted soil in these areas must be addressed through remediation or an engineering control before the Tecumseh facility meets the risk goals. The total cumulative direct contact risk is acceptable for commercial/industrial receptors as long as the soil impacted with PAH and PCB at concentrations above the PCSLs are addressed via remediation or engineering controls. There is no residual impact from at the former CTF and SMF from sediment management activities completed by Tecumseh prior the remediation performed by PRS. Figure 2 shows the location of the impacted soils.

The results of this Phase II ESA demonstrated that soil at Maryland Avenue facility was impacted with concentrations of PAHs and lead; however, the impact is not the result of dewatering releases or activities by PRS. The impacted soil represents an undiscovered historical release from historical operations that occurred prior the remediation performed by PRS.

The concentrations of PAHs and/or lead at several locations exceeded the 2016 cleanup criteria or screening levels for commercial/industrial receptors (Figure 3). As such, SME evaluated if the impacted soil in these areas need to be addressed to protect human health and the environment.

### 3. REMEDIAL EVALUATION

#### 3.1 TECUMSEH FALLS

The two remedial options are either removal of impacted soil and off-site disposal or capping of the impacted soil to prevent direct contact with soils. The former building slab already acts as an engineering control for the soil located beneath it. The draft *Institutional Control, Implementation, and Assurance Plan* addresses this engineering control in Sections 2.3, 2.8, 3.1, 3.3, and 6.3. To be consistent, SME and PRS propose to expand the engineering control to cover the adjoining impacted soils. This option is the most economical by approximately an order of magnitude.

SME will install temporary surface water run-off controls to prevent migration of the impacted soils until we perform remedial activities. Please reference SME Serial Letter #39 (August 10, 2017) for a discussion of the proposed controls.

#### 3.2 MARYLAND AVENUE

The impacted soil is limited to four locations and exposure to only those soils would not be a representative site exposure to future receptors. The USEPA guidance *Calculating Upper Confidence Limit for Exposure Point Concentration at Hazardous Waste Sites* (OSWER 9285 6-10), is an update to the *Risk Assessment Guidance Document for Superfund* (RAGs). This guidance states: “Unless there is site-specific evidence to the contrary, an individual receptor is assumed to be equally exposed to media within all portions of the exposure unit over time frame of the risk assessment.” RAGs stated the USEPA recommends using the average concentrations to represent “a reasonable estimate of the concentration over time.” However, the OSWER update recommended using a 95% UCL as a reasonable exposure point concentration.

The concentrations of the chemicals of concern (COCs) that exceeded the 2016 screening levels at the Maryland Avenue facility are summarized below. The average COC concentrations in the soil intervals within the POC are provided demonstrating that within the POC, only the concentrations of benzo[a]pyrene are close to the screening level. However, all of the COCs will be evaluated by comparing the 95% UCL to the screening levels.

CHEMICALS OF CONCERN			SAMPLE DEPTH INTERVAL			AVERAGE	2017 RSL OR CLEANUP CRITERIA <sup>1</sup>
			0-0.5	0.5-1.5	1.5-3.5		
Samples	B1	Benzo[a]pyrene	6.92	0.414	0.0406	2.5	21
	B1-1W		4.28	0.102	<0.0032	1.46	
	H4	Benzo[a]pyrene	27.7	2.02	1.97	10.6	21
		Benzo[b]fluoranthene	32.5	2.61	2.31	12.5	210
		Lead	1,530	219	174	641	800
	H4-2NW	Benzo[a]anthracene	29.2	4.00	0.387	11.2	210
		Benzo[a]pyrene	23.2	3.73	0.455	9.1	21
		Benzo[b]fluoranthene	38.2	5.68	0.569	14.8	210

Results in mg/kg.  
<sup>1</sup> Using 10<sup>-5</sup> carcinogenic risk and THQ of 1.0

SME calculated the 95% UCL using the UEPA program, ProUCL. The results are summarized below and are provided in Appendix A.

CHEMICAL OF CONCERN	EXPOSURE POINT CONCENTRATION	RSL OR CLEANUP CRITERIA
Benzo[a]pyrene	5.21	21
Benzo[a]anthracene	3.48	210
Benzo[b]fluoranthene	8.04	210
Lead	175	800

Results in mg/kg.

The exposure point concentrations are less than the screening level and exposure to site soils does not pose and unacceptable risk at a carcinogenic risk of 10<sup>-5</sup> and THQ of 1.0. As such, SME and PRS recommended that no further action is required at the Maryland Avenue facility.

## 4. CONCLUSIONS

The soil at the Tecumseh Falls facility should be capped to protect the public and groundwater. The soil at the Maryland Avenue facility does not pose a risk to the public.

## **FIGURES**

**FIGURE 1 - SITE LOCATION MAP AND DEWATERING SITES**

**FIGURE 2 - TECUMSEH PCB IMPACT AREA**

**FIGURE 3 - MARYLAND AVENUE IMPACT AREA**





Cincinnati ph: 513.898.9430  
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**Project**

**SHEBOYGAN RIVER AND HARBOR SUPERFUND SITES**

**Project Location**

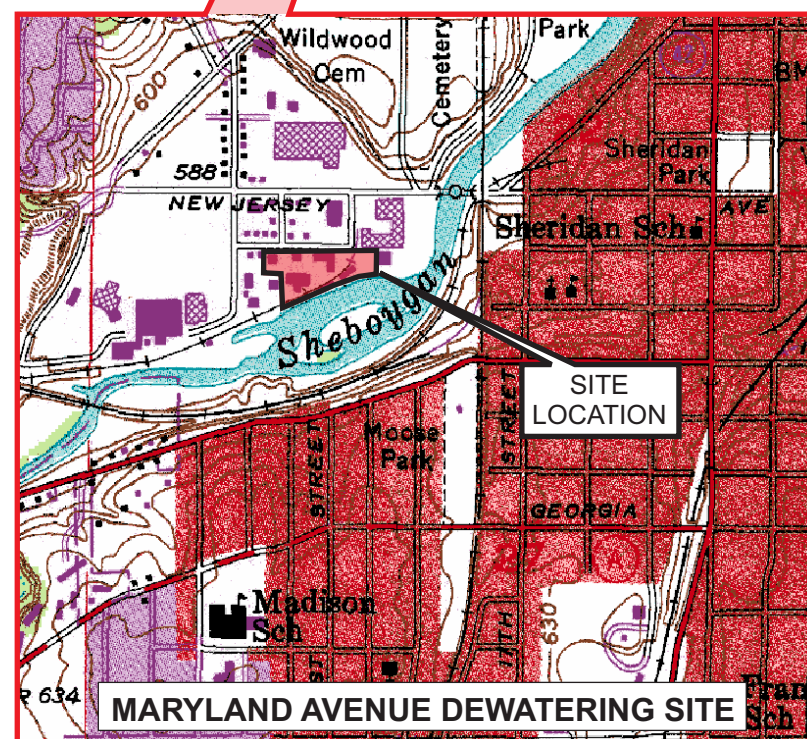
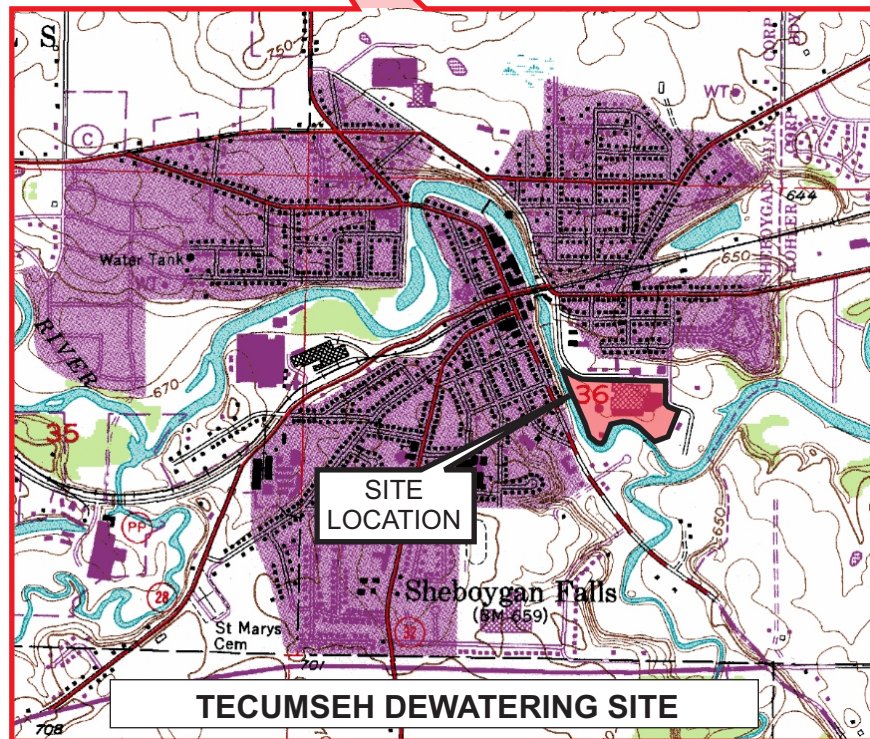
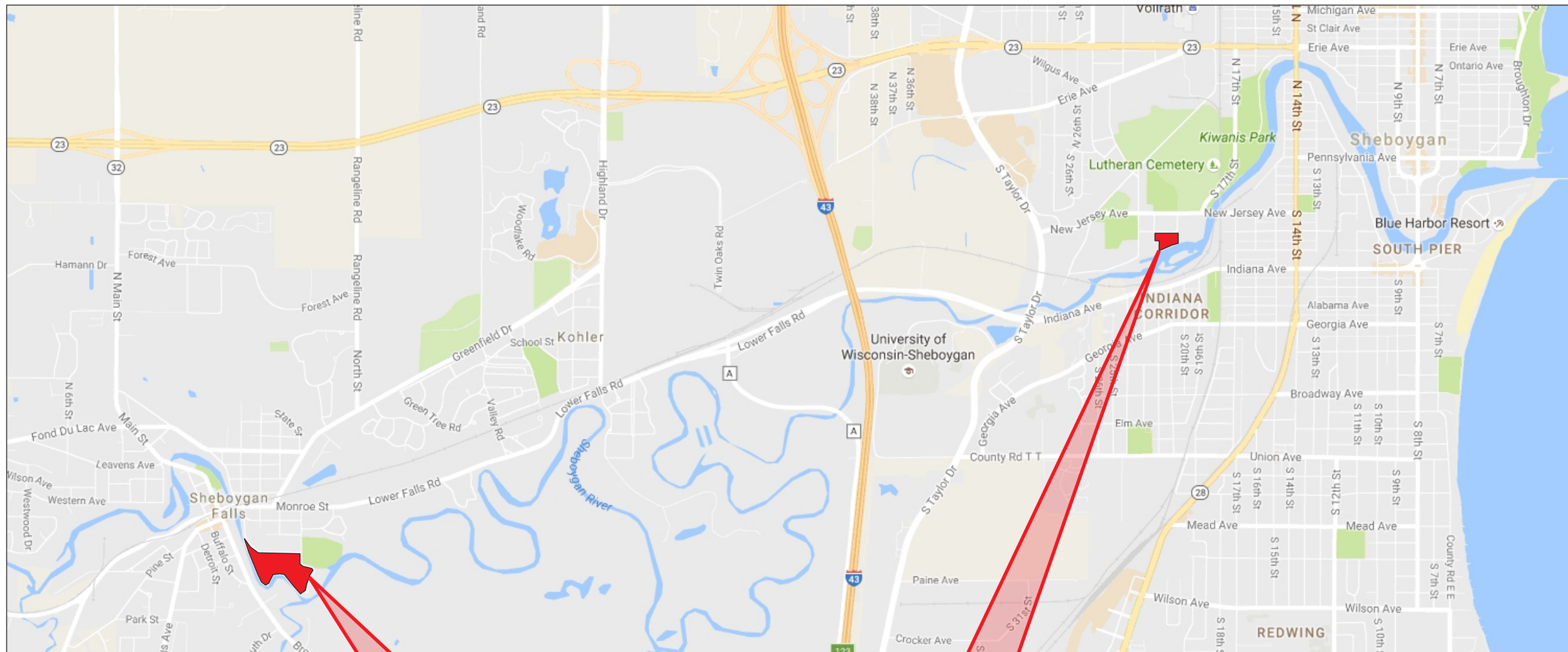
**SHEBOYGAN AND SHEBOYGAN FALLS, WISCONSIN**

**Sheet Name**

**DEWATERING SITES LOCATION MAP**

No.	Revision Date
Date	9-12-2016
CADD	JWH
Designer	JWH
Scale	NOT TO SCALE
Project	069638.00.024.001
Figure No.	1

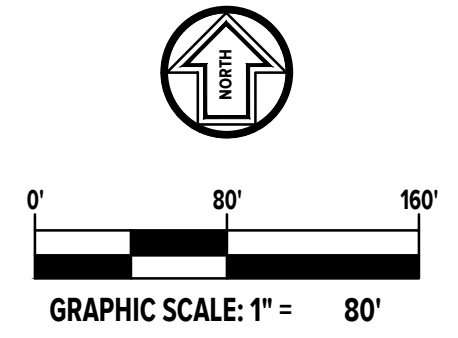
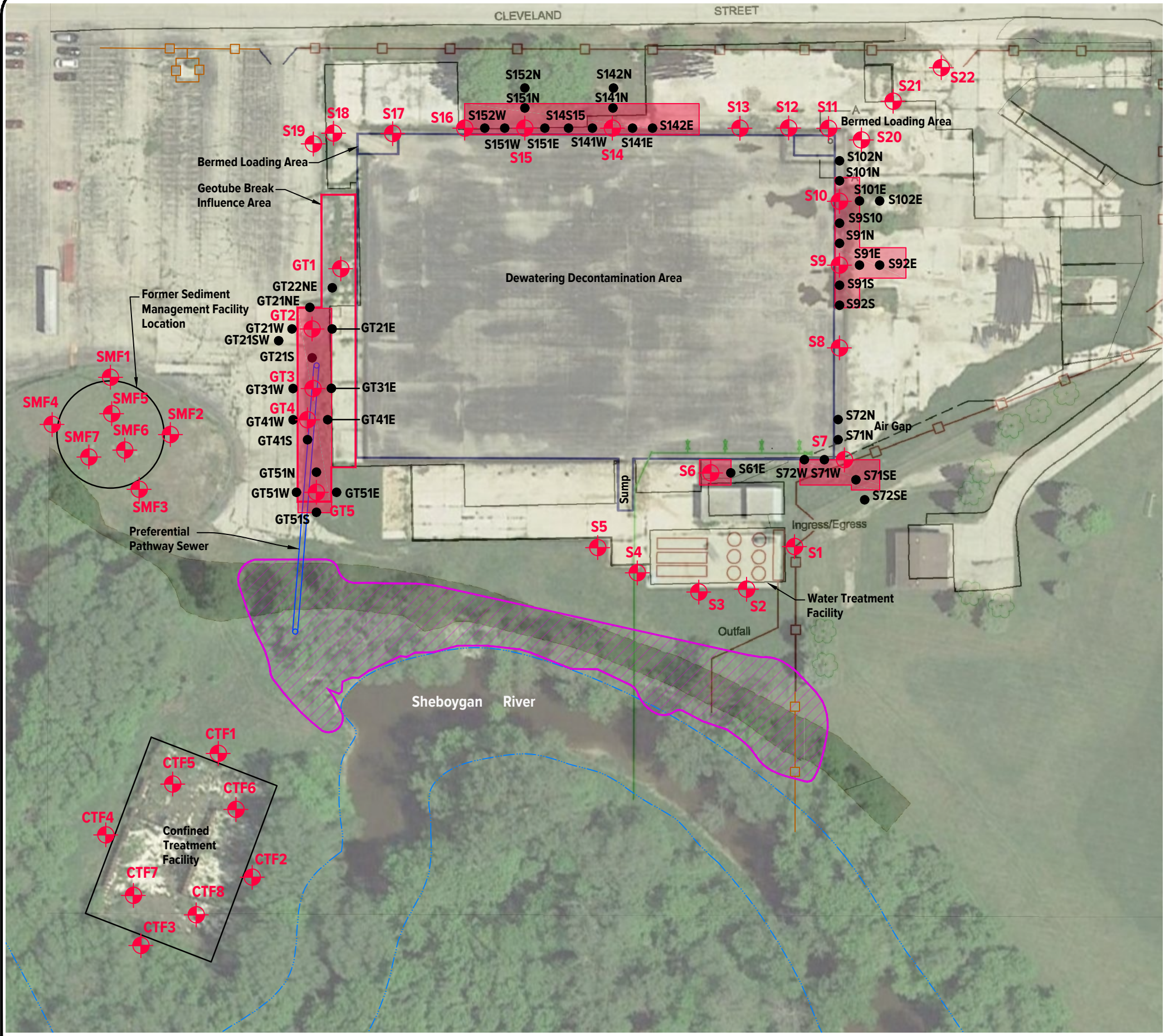
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NOTE: DRAWING INFORMATION TAKEN FROM GOOGLE MAPS AND USGS 7.5-MINUTE TOPOGRAPHIC MAPS OF THE SHEBOYGAN SOUTH AND SHEBOYGAN FALLS QUADRANGLES, WISCONSIN, 1994.



FILE LOCATION: \\sme-inc\p2\WIP\069638.00\CAD\069638.00.025.001\rev\069638.00-SB-TEC.dwg  
 PLOT DATE: Jul 13, 2017 - 3:22pm - jblake



**LEGEND**

- EXISTING TREE AND/OR BRUSH
- EXISTING ROAD
- EXISTING CONCRETE
- EXISTING FENCE
- FORMER DREDGE SLURRY PIPE
- FLOOD CONTROL BERM
- ORIGINAL SOIL SAMPLE LOCATION
- STEP-OUT SAMPLE LOCATION
- SOIL PREVIOUSLY REMEDIATED BY EXCAVATION
- IMPACTED SOIL

NOTE:  
 DRAWING INFORMATION TAKEN FROM PRS 2006  
 CONSTRUCTION DOCUMENTATION REPORT AND  
 GOOGLE EARTH PRO WITH IMAGE DATE 6-1-2015.



Project  
**SHEBOYGAN RIVER  
 SUPERFUND SITE**

Project Location  
**SHEBOYGAN  
 FALLS,  
 WISCONSIN**

Sheet Name  
**PHASE II SAMPLE  
 LOCATIONS AND  
 EXTENT OF  
 IMPACTED SOIL-  
 TECUMSEH SITE**

No.	Revision Date

Date	<b>7-13-17</b>
CADD	<b>GBK/JAB</b>
Designer	<b>KE</b>
Scale	<b>1" = 80'</b>
Project	<b>069638.00.025.001</b>

Figure No.  
**2**

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Project

**SHEBOYGAN RIVER SUPERFUND SITE**

Project Location

**SHEBOYGAN, WISCONSIN**

Sheet Name

**PHASE II SAMPLE LOCATIONS AND EXTENT OF IMPACTED SOIL-MARYLAND AVENUE SITE**

No.	Revision Date

Date **7-1-17**

CADD **JAB**

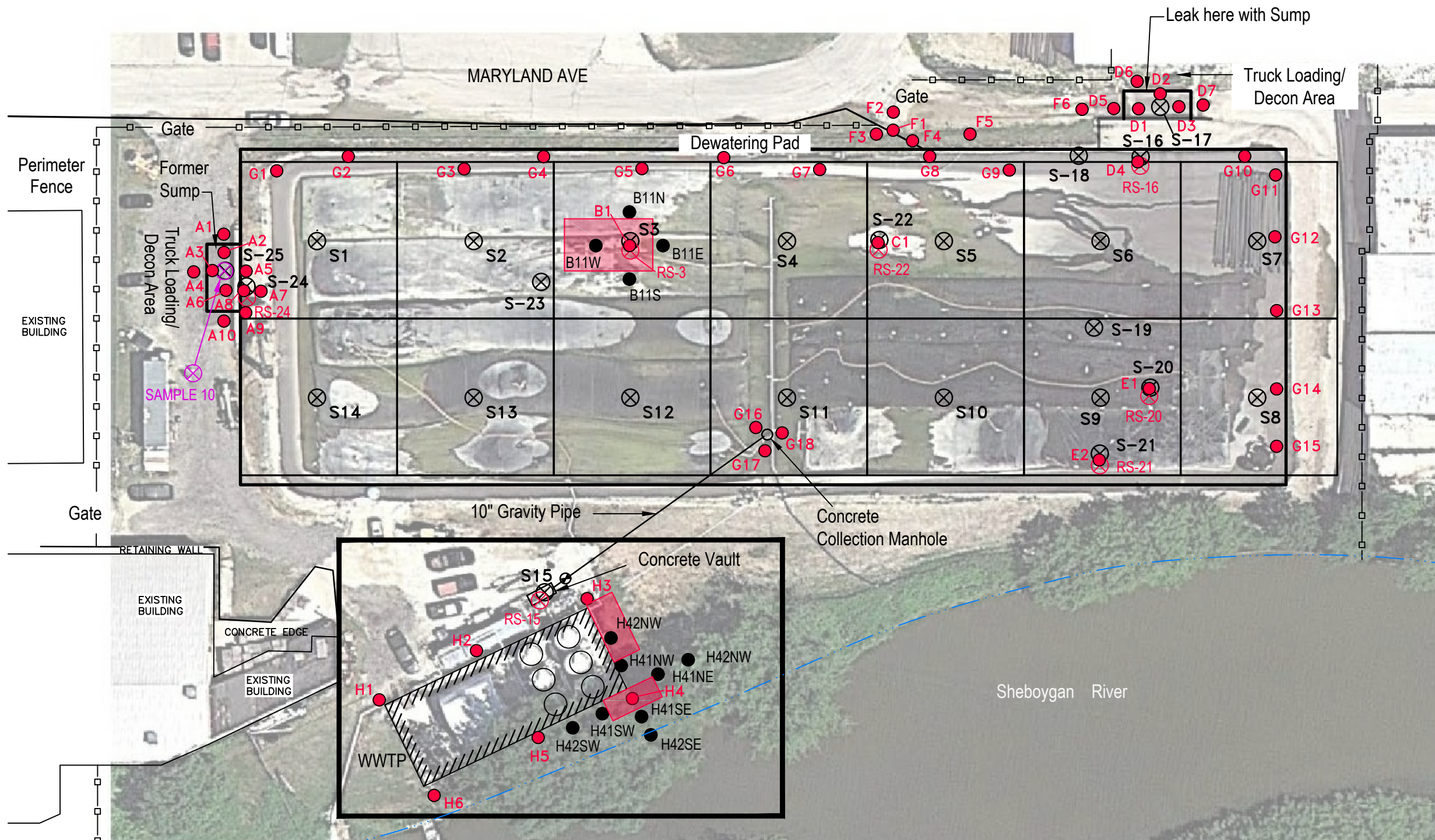
Designer **KE**

Scale **1" = 50'**

Project **069638.00.025.001**

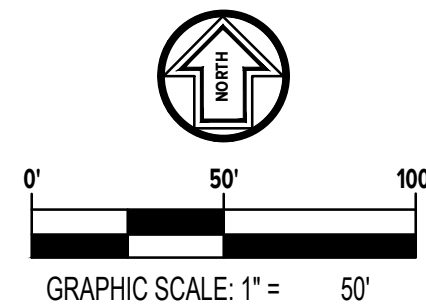
Figure No. **3**

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**LEGEND**

- SAMPLING GRID: 5,000 sq. ft.
- S1 ⊗ PREVIOUS ASPHALT SAMPLE LOCATION
- RS3 ⊗ PREVIOUS SUB-BASE SAMPLE LOCATION
- ⊗ PREVIOUS SOIL SAMPLE LOCATION
- ORIGINAL SOIL SAMPLE LOCATION
- STEP OUT SAMPLE LOCATION
- ⊗ WWTP WASTEWATER TREATMENT PLANT
- IMPACTED SOIL



NOTE:  
DRAWING INFORMATION TAKEN FROM DEWATERING PAD  
DECOMMISSION DRAWING (DATED NOVEMBER 17, 2010)  
PREPARED BY POLLUTION RISK SERVICES.

FILE LOCATION: \\sme-inc\p2\WIP\069638.00\CAD\069638.00.025.001\rev\069638.00-SB.dwg

PLOT DATE: Jul 13, 2017 - 3:20pm - jblake

**APPENDIX 1**  
**PROUCL DOCUMENTATION**



A	B	C	D	E	F	G	H	I	J	K	L
1			<b>General UCL Statistics for Full Data Sets</b>								
2	<b>User Selected Options</b>										
3	From File		Sheet1.wst								
4	Full Precision		OFF								
5	Confidence Coefficient		95%								
6	Number of Bootstrap Operations		2000								
7											
8											
9	<b>Benzo(a)pyrene</b>										
10											
11	<b>General Statistics</b>										
12	Number of Valid Observations			75		Number of Distinct Observations			70		
13											
14	<b>Raw Statistics</b>					<b>Log-transformed Statistics</b>					
15	Minimum			0.0013		Minimum of Log Data			-6.645		
16	Maximum			27.7		Maximum of Log Data			3.321		
17	Mean			1.183		Mean of log Data			-2.491		
18	Geometric Mean			0.0828		SD of log Data			2.449		
19	Median			0.0611							
20	SD			4.204							
21	Std. Error of Mean			0.485							
22	Coefficient of Variation			3.552							
23	Skewness			5.508							
24											
25	<b>Relevant UCL Statistics</b>										
26	<b>Normal Distribution Test</b>					<b>Lognormal Distribution Test</b>					
27	Lilliefors Test Statistic			0.389		Lilliefors Test Statistic			0.0739		
28	Lilliefors Critical Value			0.102		Lilliefors Critical Value			0.102		
29	<b>Data not Normal at 5% Significance Level</b>					<b>Data appear Lognormal at 5% Significance Level</b>					
30											
31	<b>Assuming Normal Distribution</b>					<b>Assuming Lognormal Distribution</b>					
32	95% Student's-t UCL			1.992		95% H-UCL			5.207		
33	<b>95% UCLs (Adjusted for Skewness)</b>					95% Chebyshev (MVUE) UCL			4.372		
34	95% Adjusted-CLT UCL (Chen-1995)			2.312		97.5% Chebyshev (MVUE) UCL			5.642		
35	95% Modified-t UCL (Johnson-1978)			2.044		99% Chebyshev (MVUE) UCL			8.137		
36											
37	<b>Gamma Distribution Test</b>					<b>Data Distribution</b>					
38	k star (bias corrected)			0.263		<b>Data appear Lognormal at 5% Significance Level</b>					
39	Theta Star			4.501							
40	MLE of Mean			1.183							
41	MLE of Standard Deviation			2.308							
42	nu star			39.44							
43	Approximate Chi Square Value (.05)			26.05		<b>Nonparametric Statistics</b>					
44	Adjusted Level of Significance			0.0468		95% CLT UCL			1.982		
45	Adjusted Chi Square Value			25.84		95% Jackknife UCL			1.992		
46						95% Standard Bootstrap UCL			1.962		
47	Anderson-Darling Test Statistic			4.292		95% Bootstrap-t UCL			4.372		
48	Anderson-Darling 5% Critical Value			0.881		95% Hall's Bootstrap UCL			5.299		
49	Kolmogorov-Smirnov Test Statistic			0.196		95% Percentile Bootstrap UCL			2.144		
50	Kolmogorov-Smirnov 5% Critical Value			0.113		95% BCA Bootstrap UCL			2.447		
51	<b>Data not Gamma Distributed at 5% Significance Level</b>					95% Chebyshev(Mean, Sd) UCL			3.299		
52						97.5% Chebyshev(Mean, Sd) UCL			4.215		
53	<b>Assuming Gamma Distribution</b>					99% Chebyshev(Mean, Sd) UCL			6.014		
54	95% Approximate Gamma UCL (Use when n >= 40)			1.792							

A	B	C	D	E	F	G	H	I	J	K	L	
55	95% Adjusted Gamma UCL (Use when n < 40)				1.806							
56												
57	<b>Potential UCL to Use</b>									Use 95% H-UCL	5.207	
58												
59	<b>ProUCL computes and outputs H-statistic based UCLs for historical reasons only.</b>											
60	<b>H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.</b>											
61	<b>It is therefore recommended to avoid the use of H-statistic based 95% UCLs.</b>											
62	<b>Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.</b>											
63												
64	<b>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</b>											
65	<b>These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)</b>											
66	<b>and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.</b>											
67												
68												
69	<b>Benzo(a)anthracene</b>											
70												
71	<b>General Statistics</b>											
72	Number of Valid Observations				75	Number of Distinct Observations				71		
73	Number of Missing Values				6							
74												
75	<b>Raw Statistics</b>					<b>Log-transformed Statistics</b>						
76	Minimum			0.00165	Minimum of Log Data			-6.407				
77	Maximum			29.2	Maximum of Log Data			3.374				
78	Mean			1.232	Mean of log Data			-2.58				
79	Geometric Mean			0.0758	SD of log Data			2.445				
80	Median			0.0398								
81	SD			4.464								
82	Std. Error of Mean			0.515								
83	Coefficient of Variation			3.624								
84	Skewness			5.553								
85												
86	<b>Relevant UCL Statistics</b>											
87	<b>Normal Distribution Test</b>					<b>Lognormal Distribution Test</b>						
88	Lilliefors Test Statistic			0.391	Lilliefors Test Statistic			0.11				
89	Lilliefors Critical Value			0.102	Lilliefors Critical Value			0.102				
90	<b>Data not Normal at 5% Significance Level</b>					<b>Data not Lognormal at 5% Significance Level</b>						
91												
92	<b>Assuming Normal Distribution</b>					<b>Assuming Lognormal Distribution</b>						
93	95% Student's-t UCL			2.09	95% H-UCL			4.701				
94	<b>95% UCLs (Adjusted for Skewness)</b>					95% Chebyshev (MVUE) UCL						3.958
95	95% Adjusted-CLT UCL (Chen-1995)			2.433	97.5% Chebyshev (MVUE) UCL			5.107				
96	95% Modified-t UCL (Johnson-1978)			2.145	99% Chebyshev (MVUE) UCL			7.363				
97												
98	<b>Gamma Distribution Test</b>					<b>Data Distribution</b>						
99	k star (bias corrected)			0.253	<b>Data do not follow a Discernable Distribution (0.05)</b>							
100	Theta Star			4.872								
101	MLE of Mean			1.232								
102	MLE of Standard Deviation			2.45								
103	nu star			37.92								
104	Approximate Chi Square Value (.05)			24.82	<b>Nonparametric Statistics</b>							
105	Adjusted Level of Significance			0.0468	95% CLT UCL			2.079				
106	Adjusted Chi Square Value			24.61	95% Jackknife UCL			2.09				
107					95% Standard Bootstrap UCL			2.097				
108	Anderson-Darling Test Statistic			5.13	95% Bootstrap-t UCL			4.89				



A	B	C	D	E	F	G	H	I	J	K	L
109	Anderson-Darling 5% Critical Value				0.886	95% Hall's Bootstrap UCL				5.827	
110	Kolmogorov-Smirnov Test Statistic				0.215	95% Percentile Bootstrap UCL				2.147	
111	Kolmogorov-Smirnov 5% Critical Value				0.113	95% BCA Bootstrap UCL				2.56	
112	<b>Data not Gamma Distributed at 5% Significance Level</b>					95% Chebyshev(Mean, Sd) UCL				3.478	
113						97.5% Chebyshev(Mean, Sd) UCL				4.45	
114	<b>Assuming Gamma Distribution</b>					99% Chebyshev(Mean, Sd) UCL				6.36	
115	95% Approximate Gamma UCL (Use when n >= 40)				1.882						
116	95% Adjusted Gamma UCL (Use when n < 40)				1.898						
117											
118	<b>Potential UCL to Use</b>					Use 95% Chebyshev (Mean, Sd) UCL				3.478	
119											
120	<b>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</b>										
121	<b>These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)</b>										
122	<b>and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.</b>										
123											
124											
125	<b>Benzo(b)fluoranthene</b>										
126											
127	<b>General Statistics</b>										
128	Number of Valid Observations				75	Number of Distinct Observations				73	
129											
130	<b>Raw Statistics</b>					<b>Log-transformed Statistics</b>					
131	Minimum			0.00145	Minimum of Log Data			-6.536			
132	Maximum			38.2	Maximum of Log Data			3.643			
133	Mean			1.645	Mean of log Data			-2.157			
134	Geometric Mean			0.116	SD of log Data			2.479			
135	Median			0.0887							
136	SD			5.812							
137	Std. Error of Mean			0.671							
138	Coefficient of Variation			3.532							
139	Skewness			5.545							
140											
141	<b>Relevant UCL Statistics</b>										
142	<b>Normal Distribution Test</b>					<b>Lognormal Distribution Test</b>					
143	Lilliefors Test Statistic			0.389	Lilliefors Test Statistic			0.0772			
144	Lilliefors Critical Value			0.102	Lilliefors Critical Value			0.102			
145	<b>Data not Normal at 5% Significance Level</b>					<b>Data appear Lognormal at 5% Significance Level</b>					
146											
147	<b>Assuming Normal Distribution</b>					<b>Assuming Lognormal Distribution</b>					
148	95% Student's-t UCL			2.763	95% H-UCL			8.039			
149	<b>95% UCLs (Adjusted for Skewness)</b>					95% Chebyshev (MVUE) UCL			6.611		
150	95% Adjusted-CLT UCL (Chen-1995)			3.208	97.5% Chebyshev (MVUE) UCL			8.542			
151	95% Modified-t UCL (Johnson-1978)			2.835	99% Chebyshev (MVUE) UCL			12.33			
152											
153	<b>Gamma Distribution Test</b>					<b>Data Distribution</b>					
154	k star (bias corrected)			0.263	<b>Data appear Lognormal at 5% Significance Level</b>						
155	Theta Star			6.249							
156	MLE of Mean			1.645							
157	MLE of Standard Deviation			3.207							
158	nu star			39.5							
159	Approximate Chi Square Value (.05)			26.1	<b>Nonparametric Statistics</b>						
160	Adjusted Level of Significance			0.0468	95% CLT UCL			2.749			
161	Adjusted Chi Square Value			25.89	95% Jackknife UCL			2.763			
162					95% Standard Bootstrap UCL			2.736			

A	B	C	D	E	F	G	H	I	J	K	L	
163	Anderson-Darling Test Statistic			4.059	95% Bootstrap-t UCL			5.841				
164	Anderson-Darling 5% Critical Value			0.881	95% Hall's Bootstrap UCL			7.705				
165	Kolmogorov-Smirnov Test Statistic			0.199	95% Percentile Bootstrap UCL			2.912				
166	Kolmogorov-Smirnov 5% Critical Value			0.113	95% BCA Bootstrap UCL			3.297				
167	<b>Data not Gamma Distributed at 5% Significance Level</b>					95% Chebyshev(Mean, Sd) UCL			4.571			
168						97.5% Chebyshev(Mean, Sd) UCL			5.836			
169	<b>Assuming Gamma Distribution</b>					99% Chebyshev(Mean, Sd) UCL			8.323			
170	95% Approximate Gamma UCL (Use when n >= 40)			2.49								
171	95% Adjusted Gamma UCL (Use when n < 40)			2.511								
172												
173	<b>Potential UCL to Use</b>					Use 95% H-UCL			8.039			
174												
175	<b>ProUCL computes and outputs H-statistic based UCLs for historical reasons only.</b>											
176	<b>H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.</b>											
177	<b>It is therefore recommended to avoid the use of H-statistic based 95% UCLs.</b>											
178	<b>Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.</b>											
179												
180	<b>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</b>											
181	<b>These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)</b>											
182	<b>and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.</b>											
183												
184												
185	<b>Lead</b>											
186												
187	<b>General Statistics</b>											
188	Number of Valid Observations			65	Number of Distinct Observations			54				
189	Number of Missing Values			10								
190												
191	<b>Raw Statistics</b>					<b>Log-transformed Statistics</b>						
192	Minimum			1.3	Minimum of Log Data			0.262				
193	Maximum			1530	Maximum of Log Data			7.333				
194	Mean			69.59	Mean of log Data			2.795				
195	Geometric Mean			16.37	SD of log Data			1.729				
196	Median			13.8								
197	SD			194.9								
198	Std. Error of Mean			24.17								
199	Coefficient of Variation			2.801								
200	Skewness			6.801								
201												
202	<b>Relevant UCL Statistics</b>											
203	<b>Normal Distribution Test</b>					<b>Lognormal Distribution Test</b>						
204	Lilliefors Test Statistic			0.363	Lilliefors Test Statistic			0.13				
205	Lilliefors Critical Value			0.11	Lilliefors Critical Value			0.11				
206	<b>Data not Normal at 5% Significance Level</b>					<b>Data not Lognormal at 5% Significance Level</b>						
207												
208	<b>Assuming Normal Distribution</b>					<b>Assuming Lognormal Distribution</b>						
209	95% Student's-t UCL			109.9	95% H-UCL			130.9				
210	<b>95% UCLs (Adjusted for Skewness)</b>					95% Chebyshev (MVUE) UCL			161.6			
211	95% Adjusted-CLT UCL (Chen-1995)			131.1	97.5% Chebyshev (MVUE) UCL			201.6				
212	95% Modified-t UCL (Johnson-1978)			113.3	99% Chebyshev (MVUE) UCL			280.1				
213												
214	<b>Gamma Distribution Test</b>					<b>Data Distribution</b>						
215	k star (bias corrected)			0.436	<b>Data do not follow a Discernable Distribution (0.05)</b>							
216	Theta Star			159.5								



	A	B	C	D	E	F	G	H	I	J	K	L
217	MLE of Mean					69.59						
218	MLE of Standard Deviation					105.4						
219	nu star					56.72						
220	Approximate Chi Square Value (.05)					40.41	<b>Nonparametric Statistics</b>					
221	Adjusted Level of Significance					0.0463	95% CLT UCL					109.4
222	Adjusted Chi Square Value					40.1	95% Jackknife UCL					109.9
223							95% Standard Bootstrap UCL					108.6
224	Anderson-Darling Test Statistic					2.458	95% Bootstrap-t UCL					178.1
225	Anderson-Darling 5% Critical Value					0.829	95% Hall's Bootstrap UCL					257.4
226	Kolmogorov-Smirnov Test Statistic					0.155	95% Percentile Bootstrap UCL					112.7
227	Kolmogorov-Smirnov 5% Critical Value					0.118	95% BCA Bootstrap UCL					144.8
228	<b>Data not Gamma Distributed at 5% Significance Level</b>						95% Chebyshev(Mean, Sd) UCL					175
229							97.5% Chebyshev(Mean, Sd) UCL					220.6
230	<b>Assuming Gamma Distribution</b>						99% Chebyshev(Mean, Sd) UCL					310.1
231	95% Approximate Gamma UCL (Use when $n \geq 40$ )					97.68						
232	95% Adjusted Gamma UCL (Use when $n < 40$ )					98.44						
233												
234	<b>Potential UCL to Use</b>						Use 95% Chebyshev (Mean, Sd) UCL					175
235												
236	<b>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</b>											
237	<b>These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)</b>											
238	<b>and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.</b>											
239												



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