City of Sitka Former Waste-to-Energy Plant,
Temporary Solid Waste Transfer Station, and
Sheldon Jackson College Steam Generation Facility

Portion of USS 407, Tract B, Sheldon Jackson College,
802 Sawmill Creek Road, Sitka, Alaska

Expanded Site and Off-site Migration Characterization Report and Sample Results

Prepared for:
For the City and Borough of Sitka

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1.0 Introduction

James Clare, P.E. and the City and Borough of Sitka (CBS) offer the following off-site characterization report and sample analytical results, requested by the Department of Environmental Conservation (ADEC) Contaminated Sites Program. This report describes sampling conducted on July 24-25, 2001, as specified in the ADEC-approved work plan, approved June 13, 2001, near the former Sitka Waste-to-Energy Plant (WTE), presently the Solid Waste Transfer Station (SWTS) and Sheldon Jackson College Steam Boiler facilities. This report includes investigation methods, laboratory results, evaluation of data, and conclusions about off-site contaminant migration and characteristics.

2.0 Summary

Sampling for this characterization phase focused on areas beyond the outer perimeter of the former WTE operations area and along expected off-site contaminant migration paths near and from the site. Analyses of samples focused on contaminants discovered at levels of concern during the site soil characterization phase conducted previously.

Sample results indicate petroleum hydrocarbon contaminant presence in sediment and soil to the south-southwest, south and south-southeast of the active site. Dioxin/furan presence exists in soils to the north and west and at lower concentrations in drainage sediment to the south and southeast.

Samples from north and west of the site boundaries contained total chromium at concentrations slightly above defined clean-up levels. South-southeast and southeast runoff drainage sediment had high total chromium, cadmium and lead concentrations. Sediment sampling in runoff drainage before the flume (2SE08) demonstrated presence of these heavy metals at lower concentrations near or below the clean-up goals.

Aqueous samples exhibited low or non-detected contamination, except for two Alaska Method petroleum hydrocarbon samples taken south and southeast of the former WTE site. A single total aqueous hydrocarbon (TAqH) sample demonstrated aromatic (TAH) and polynuclear (PAH) hydrocarbons well below the strictest freshwater Alaska Water Quality Standard criteria in runoff drainage. The TAqH sample addition, at the request of ADEC's project manager and not specified in the work plan, required modified SW-846 Method 8270C-SIM for PAH portion and 8021B for TAH portion.

Field and analytical observations suggest biogenic origin or background presence for petroleum hydrocarbons found in samples taken. Sample area conditions suggest alternative origins for some contamination found. Greater heavy metal and petroleum hydrocarbon contamination appears along stormwater drainage routes near campus roads.

Greater dioxin and furan concentrations exist in off-site samples to the north of the site, than from samples taken to the west and southeast.

The Results Summary Tables on the following pages show detected target compounds and their relationship to pre-defined clean-up goals. The Dioxin Fact Sheet, page 6, helps explain some of the entries on the summary table and in the dioxin/furan laboratory report.

page 4 is the data summary table

Results Summary Table

Inorganic and Petroleum Hydrocarbon Target Analytes Detected

Bold Indicates Result or Limit Exceeds State Clean-up Level (SCL)

Location	Target Analyte/CASNo	Units	Result	SCL	MDL	PQL
2N01	Soil:					
	Cadmium / 7440-43-9	mg/kg	1.57	4.5	0.0039	0.039
	Chromium 7440-47-3	mg/kg	33.7	23	0.070	0.70
2N02	Soil:					
	Cadmium / 7440-43-9	mg/kg	1.15	4.5	0.0046	0.046
	Chromium 7440-47-3	mg/kg	31.5	23	0.083	0.83
2W03	Soil:					
	Mercury / 7439-97-6	mg/kg	2.5/0.221	1.24	0.025/0.0059	1.1/0.12
	Cadmium / 7440-43-9	mg/kg	1.60	4.5	0.015	0.15
	Chromium 7440-47-3	mg/kg	23.4	23	0.26	2.6
	DRO	mg/kg	360	100	9.6	54
2S04	Sediment:					
	Mercury / 7439-97-6	mg/kg	1.8/1.27	1.24	0.035/0.0078	1.4/0.16
	Cadmium / 7440-43-9	mg/kg	0.687	4.5	0.022	0.22
	Chromium 7440-47-3	mg/kg	27.8	23	0.39	3.9
	Lead / 7439-92-1	mg/kg	87.8	400	0.20	1.9
	DRO	mg/kg	1400	100	120	660
2S05	Aqueous:					
	Mercury / 7439-97-6	mg/L	0.00040/ND	0.002	0.000050	0.00020
	Cadmium / 7440-43-9	mg/L	0.00893	0.005	0.000052	0.00020
	Chromium 7440-47-3	mg/L	0.00720	0.1	0.00050	0.0015
	Lead / 7439-92-1	mg/L	0.0685	0.015	0.000040	0.00015
	DRO	mg/L	3.1	1.5	0.27	1.4
	RRO	mg/L	8.2	1.1	0.76	3.8
	Sediment:					
	Mercury / 7439-97-6	mg/kg	ND/0.413	1.24	0.039/0.013	1.6/0.28
	Cadmium / 7440-43-9	mg/kg	18.4	4.5	0.031	0.31
	Chromium 7440-47-3	mg/kg	15.6	23	0.55	5.5
	Lead / 7439-92-1	mg/kg	166	400	0.28	2.7
	DRO	mg/kg	19,000	100	480	2,700
	RRO	mg/kg	89,000	2000	1,000	5,300
SE6	Aqueous:					
	Mercury / 7439-97-6	mg/L	ND/ND	0.002	0.000050	0.00020
	Cadmium / 7440-43-9	mg/L	0.00207	0.005	0.000052	0.00020
	Chromium 7440-47-3	mg/L	0.00228	0.1	0.00050	0.0015
	Lead / 7439-92-1	mg/L	0.0331	0.015	0.000040	0.00015
	DRO	mg/L	0.24	1.5	0.027	0.14
	RRO	mg/L	0.64	1.1	0.076	0.38
	Sediment:					
	Mercury / 7439-97-6	mg/kg	3.3/1.74	1.24	0.018/0.0093	0.75/0.19
	Cadmium / 7440-43-9	mg/kg	125	4.5	0.021	0.21
	Chromium 7440-47-3	mg/kg	110	23	0.37	3.7
	Lead / 7439-92-1	mg/kg	1,770	400	1.9	18
	DRO	mg/kg	11,000	100	350	1,900
	RRO	mg/kg	52,000	2000	760	3,900
2ESE07	Aqueous:					
	Mercury / 7439-97-6	mg/L	0.0064/ND	0.002	0.000050/	0.00020/
	Cadmium / 7440-43-9	mg/L	0.064.1	0.005	0.000052	0.00020
	Chromium 7440-47-3	mg/L	0.0627	0.1	0.00050	0.0015
	Lead / 7439-92-1	mg/L	1.160	0.015	0.000080	0.00030
	DRO	mg/L	80	1.5	0.55	2.7
	RRO	mg/L	220	1.1	1.5	7.6
	Sediment:					
	Mercury / 7439-97-6	mg/kg	2.2/2.35	1.24	0.032/0.0092	1.3/0.19
	Cadmium / 7440-43-9	mg/kg	79.3	4.5	0.027	0.27
	Chromium 7440-47-3	mg/kg	71.7	23	0.49	4.9
	Lead / 7439-92-1	mg/kg	1,050	400	2.5	24
	DRO	mg/kg	45,000	100	660	3,700
	RRO	mg/kg	160,000	2000	1,400	7,400
2SE08	Aqueous:					
	Total Hydrocarbons	µg/L	0.074	15	0.247-1.165	1.053-3.52
	Total Aromatic Hydrocarbons	µg/L	ND	10	0.24-1.1	1.0-3.2
	Mercury / 7439-97-6	mg/L	ND/ND	0.002	0.000050	0.00020
	Cadmium / 7440-43-9	mg/L	0.00123	0.005	0.000052	0.00020
	Chromium 7440-47-3	mg/L	ND	0.1	0.00050	0.0015
	Lead / 7439-92-1	mg/L	0.00606	0.015	0.000040	0.00015
	DRO	mg/L	35	1.5	0.55	2.7
	RRO	mg/L	100	1.1	1.5	7.6
	Sediment:					
	Mercury / 7439-97-6	mg/kg	ND/0.200	1.24	0.016/0.0043	0.67/0.089
	Cadmium / 7440-43-9	mg/kg	3.73	4.5	0.014	0.14
	Chromium 7440-47-3	mg/kg	28.7	23	0.25	2.5
	Lead / 7439-92-1	mg/kg	32.5	400	0.13	1.2
	DRO	mg/kg	16,000	100	370	2,100
	RRO	mg/kg	73,000	2000	810	4,100

This a previous location or is this correct?

Correction made to lead result, 1,050 not 1.050

CASNo = Chemical Abstract Service Number

SCL = State Clean-up Level

MDL= Method Detection Limit

PQL = Practical Quantitation Limit or Reporting Limit

cutoff = 43 pg/g
(Region 3 EPA)

pg/g = ~~mg/kg~~ ng/Kg

Results Summary Table

Dioxin and Furan Analytes Detected (pg/g)

Method 8290 PCDD/PCDF Analysis (b), MIT3 (DB-5)

Sample No.→	2N01	2N02	2W03	2S04	2SE08
Analytes↓					
Isomers					
2378-TCDD	27.1	13.6	1.6J	1.2J	3.1
12378-PeCDD	83.2	43.7	5.4J	3.4J	12.4J
123478-HxCDD	96.2	50.8	8.7J	{4.2}J	17.9
123678-HxCDD	242	128	13.5J	13.7JB	57.5
123789-HxCDD	256	154	13.7J	11.4JB	47.4
1234678-HpCDD	2550	1390	117	152	535
OCDD	6760	3730	314	468	1500
2378-TCDF	328	182	{55.4}	15.8	66.4
12378-PeCDF	151	66.3	230	9.6J	25.6
23478-PeCDF	279	129	27.5J	10.9JB	47.6
123478-HxCDF	550	257	291	24.7JB	103
123678-HxCDF	317	148	139	15.0J	58.0
234678-HxCDF	482	273	57.9	31.2	88.6
123789-HxCDF	24.9	12.9	93.4	3.1J	6.1J
1234678-HpCDF	15870	878	577	80.7B	311
1234789-HpCDF	189	113	434	17.0J	39.7
OCDF	1120	633	6350	155B	171
Totals:					
TOTAL TCDD	906	429	19.5	34.9	115
TOTAL PeCDD	1180	632	53.0	42.4	233
TOTAL HxCDD	2770	1490	130	123	615
TOTAL HpCDD	5140	2720	206	272	1240
TOTAL TCDF	1790	920	291	84.2	327
TOTAL PeCDF	3280	1420	718	118	536
TOTAL HxCDF	2730	1290	863	141	551
TOTAL HpCDF	2580	1380	1240	150	485

237 ng/Kg = 0.000237 mg/Kg

EPA TEFs

~~.024 ppt~~ ~~[illegible] ppt~~ ~~[illegible] ppt~~ ~~0.008 ppt~~

Total, 1989a (DB-5) as 2378-TCDD	471	237.0	111.6	22.6	84.3
Method 8290X (DB-225) as 2378-TCDF	69.6	31.8	23.8	2.9	15.2

.0000843

B = Flag used to indicate analyte detected in laboratory method blank as well as in associated field sample. Used only when analyte concentration found in sample is less than 20 times that found in the associated blank. Flag denotes possible contribution from background laboratory contamination to the analyte concentration detected in the field sample.

J = Flag used to indicate a concentration based on an analyte to internal standard ratio which is below the calibration curve. Values outside the calibration curve are estimates only.

{ } = Denotes EMPC, or Estimated Maximum Possible Concentration

EPA Risk Based Concentration = 0.004 ug/Kg
(at 10^{-4} cancer risk)

= ~~[illegible]~~ = 0.000004 mg/Kg

so @ a 10^{-5} risk
the cleanup level becomes
0.000043 mg/Kg

Q: What is an EMPC and how do I interpret EMPC values?

A: EMPC stands for Estimated Maximum Possible Concentration. A PCDD/PCDF analyte is quantitated as an EMPC when the analyte meets the retention time criteria of a dioxin or a furan, but not the isotopic ratio criteria. Interferences such as PCBs can cause the peak ratio to be outside QC limits. Low level peaks that are close to the detection limits can be significantly affected by instrument and chemical noise and thus, can have ratios that fall outside of QC limits.

EMPC values are addressed differently by the analytical methods and by various regulatory agencies. Methods 8290, 8280, and 23 require that EMPC values be reported and flagged as such. Method 1613 requires that EMPC values be reported as the analyte detection limit. These values are not flagged. Check with your regulatory agency to see how they require EMPC values to be reported.

Q: Why do I have two reports for some samples and only one report for others?

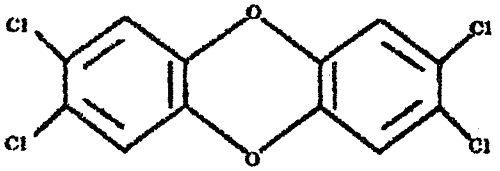
A: All samples submitted for PCDD/PCDF analysis are initially analyzed on a DB-5 gas chromatographic column. This GC column is specific for the 2, 3, 7, 8-TCDD analyte, but not for the 2, 3, 7, 8-TCDF analyte. If 2, 3, 7, 8-TCDF is detected on the DB-5 column, the sample may need to be analyzed using a DB-225 gas chromatographic column which is isomer specific for 2, 3, 7, 8-TCDF. Methods 8290 and 1613A require that samples with 2, 3, 7, 8-TCDF above the Target Detection Limit be analyzed on the DB-225 column. Method 23 required that every sample with 2, 3, 7, 8-TCDF detected, no matter what level, be analyzed on the DB-225 column. Method 8280 does not require the second column confirmation. For all methods, unless stated otherwise in the Case Narrative, results for all analytes except 2, 3, 7, 8-TCDF should be taken from the DB-5 report while results for 2, 3, 7, 8-TCDF should be taken from the DB-225 report.

Q: Why do I have seventeen individual analytes and eight totals listed on my report?

A: Every PCDD/PCDF isomer that contains chlorines in at least the 2, 3, 7, and 8 substitution position is reported individually (specifically) as these analytes are generally considered the most toxic. Of the 210 different chlorinated dioxin and furan isomers, there are 17 that fall into this category. The total values reported for each chlorination level contain the concentrations/amounts for the specific isomers plus all of the other isomers in that class. Note that there is no total reported for either 1, 2, 3, 4, 6, 7, 8, 9-OCDD or 1, 2, 3, 4, 6, 7, 8, 9-OCDF as there is only one isomer in each class.

Q: Do I need to correct my results for the standard recoveries? dilution?

A: No, the results are corrected as reported. The internal standard recoveries and any dilution is also taken into account on the report. As all of the PCDD/PCDF methods are based on isotope dilution methodology, the results are automatically corrected for the internal standard recoveries. Post-extraction dilutions do not affect the results either because the standards used for quantitation are diluted along with the analytes.



2, 3, 7, 8-TCDD

Excerpt from SW-846 Method 8290 regarding 2,3,7,8-TCDD Toxicity Equivalents

7.9.7 The 2,3,7,8-TCDD toxicity equivalents (TE) of PCDDs and PCDFs present in the sample are calculated, if requested by the data user, according to the method recommended by the Chlorinated Dioxins Workgroup (CDWG) of the EPA and the Center for Disease Control (CDC). This method assigns a 2,3,7,8-TCDD toxicity equivalency factor (TEF) to each of the fifteen 2,3,7,8-substituted PCDDs and PCDFs (Table 3) and to OCDD and OCDF, as shown in Table 10. The 2,3,7,8-TCDD equivalent of the PCDDs and PCDFs present in the sample is calculated by summing the TEF times their concentration for each of the compounds or groups of compounds listed in Table 10. The exclusion of other homologous series such as mono-, di-, and tri- chlorinated dibenzodioxins and dibenzofurans does not mean that they are non-toxic. However, their toxicity, as known at this time, is much lower than the toxicity of the compounds listed in Table 10. The above procedure for calculating the 2,3,7,8-TCDD toxicity equivalents is not claimed by the CDWG to be based on a thoroughly established scientific foundation. The procedure, rather, represents a "consensus recommendation on science policy". Since the procedure may be changed in the future, reporting requirements for PCDD and PCDF data would still include the reporting of the analyte concentrations of the PCDD/PCDF congener as calculated in Secs. 7.9.1 and 7.9.4.

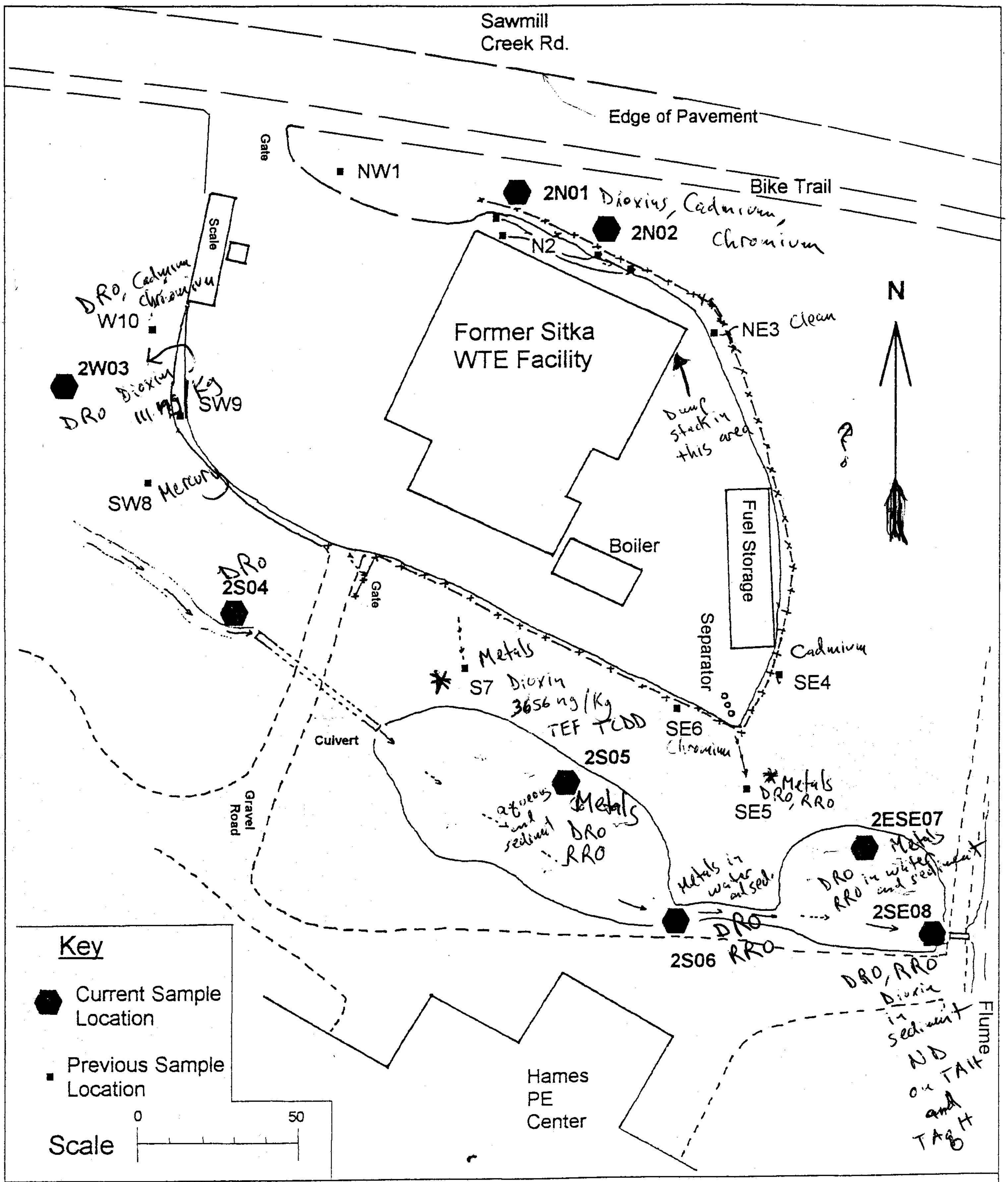
7.9.7.1 Two GC Column TEF Determination

7.9.7.1.1 The concentration of 2,3,7,8-TCDD (see note below), is calculated from the analysis of the sample extract on the 60 m DB-5 fused silica capillary column. The experimental conditions remain the same as the conditions described previously in Sec. 7.8, and the calculations are performed as outlined in Sec. 7.9. The chromatographic separation between the 2,3,7,8-TCDD and its close eluters (1,2,3,7/1,2,3,8-TCDD and 1,2,3,9-TCDD) must be equal or less than 25 percent valley.

7.9.7.1.2 The concentration of the 2,3,7,8-TCDF is obtained from the analysis of the sample extract on the 30 m DB-225 fused silica capillary column. However, the GC/MS conditions must be altered so that: (1) only the first three descriptors (i.e., tetra-, penta-, and hexachlorinated congeners) of Table 6 are used; and (2) the switching time between descriptor 2 (pentachlorinated congeners) and descriptor 3 (hexachlorinated congeners) takes place following the elution of C -1,2,3,7,8-PeCDD. The 13 12 concentration calculations are performed as outlined in Sec. 7.9. The chromatographic separation between the 2,3,7,8-TCDF and its close eluters (2,3,4,7-TCDF and 1,2,3,9-TCDF) must be equal or less than 25 percent valley.

NOTE: The confirmation and quantitation of 2,3,7,8-TCDD (Sec. 7.9.7.1.1) may be accomplished on the SP-2330 GC column instead of the DB-5 column, provided the criteria listed in Sec. 8.2.1 are met and the requirements described in Sec. 8.3.2 are followed.

7.9.7.1.3 For a gas chromatographic peak to be identified as a 2,3,7,8-substituted PCDD/PCDF congener, it must meet the ion abundance and signal-to-noise ratio criteria listed in Secs. 7.8.4.2 and 7.8.4.3, respectively. In addition, the retention time identification criterion described in Sec. 7.8.4.1.1 applies here for congeners for which a carbon-labeled analogue is available in the sample extract. However, the relative retention time (RRT) of the 2,3,7,8-substituted congeners for which no carbon-labeled analogues are available must fall within 0.006 units of the carbon-labeled standard RRT. Experimentally, this is accomplished by using the attributions described in Table 11 and the results from the routine calibration run on the SP-2330 column.



Former Sitka Waste-To-Energy Facility

Expanded Off-site Sampling and Characterization

Site Diagram

September 2001

Prepared By:
James Clare, P.E.

3.0 **Purpose**

This report, expanded site and off-site investigation, and sample results provide further characterization representing presence and quality of contamination from facility operations, in the background, or otherwise present in off-site environment. Results and findings should help ADEC, CBS, and SJC determine risks of off-site contaminant migration or deposition from the former WTE. Based on those determinations, the entities may determine appropriate response actions or assessment methods.

4.0 **Project Location**

The WTE site sits on the south side of Sawmill Creek Road a few hundred feet east of Jeff Davis Street in Sitka, Alaska on the west coast of Baranof Island, Section 36, Township 55 South, Range 63 East, CRM. The site property lies on the north edge of the Sheldon Jackson College (SJC) main campus, behind the Hames Physical Education Center (Hames PE). This characterization phase focused on soil and drainage features and media nearby, off-site, and physically present before development of the WTE facility, its foundation fill, and other site improvements.

5.0 **Sample Area Description**

All samples were taken from locations as described generally in the workplan. All sample locations had nearby established trees and brush creating vegetative canopy. Large, dense trees surrounded and hung over all sample locations, except sample locations 2W03, where muskeg meadow, bushes and grasses predominate, and 2SE08, where more low-lying vegetation, especially water grasses and skunk cabbage predominate due to the pond there. Sample locations 2S05 and 2ESE07, at the edge of ponds had many larger overhanging trees close by, as well as the pond vegetation experienced at 2SE08.

The area sampled south of the former WTE site sits closer to active areas on the SJC campus. A gravel road runs west-east between the sample area and the SJC Hames PE Center. A gravel path, as wide as a road, runs north-south along the flume to the east of the sample area. And a gravel road, running north-south, leads between the WTE site and SJC campus, intersecting the perpendicular road. Various solid waste litters the sample area, including old building materials, vegetative or yard waste, old concrete and lumber, metallic objects, plastic litter, bottles, waste sand or filter media from the swimming pool, and scattered grave markings. Much of this solid waste and litter occurs in the overgrown areas south and southwest of the WTE site fill. Signs exist of campus or cemetery maintenance use of the path to dump vegetative clearing debris near 2ESE07 and 2SE08. For several weeks an older vehicle sat parked among the bushes near 2S05 and 2S06 sample locations.

One drainage ditch west of the former WTE fill flows from Sawmill Creek Rd. and Jeff Davis St.

6.0 **Sampling Methods and Procedures**

6.1 Sampling site conditions

Staff on duty at the SWTS indicated that sampling would not likely interfere with operations at the facility. Little coordination was necessary between routine SWTA functions and the sampling. No facility operations interfered with sampling.

All sample locations appeared relatively undisturbed and as if they had existed that way for many years.

Wet weather early on the first day presented the substantial challenge in obtaining representative samples and documenting the sampling work.

Except for locations 2N01 and 2N02, soil and sediment appeared very wet at all locations. These conditions correspond with topographical surveys that identify nearby ground surface conditions as "swamp", "wet muskeg", or "frequent standing water". The two dryer locations to the north had a very thin layer of well-drained, recent organic deposits, with mostly spruce and hemlock needles, overlying well-drained fine gravel (D-1) fill. 2W03 had dense grass roots among sparse, wet, light brown colored soil, a short distance from standing and slow flowing water. At remaining locations, sediment samples, taken below the standing or flowing water surface or in completely saturated soil, were black in color with sulfide odor. Most water from the site and surrounding area eventually gathers south of the site and slowly flows toward the wet bog ponds about one hundred feet (100') south and southeast of the facility site. The bog drains through a culvert (location for samples taken at 2SE08) leading to the open flume that flows to the south across the Sheldon Jackson College campus.

6.2 Sample Locations

Sample locations selected considered criteria described in the work plan with little variation. The site diagram depicts places where sampling occurred. The following paragraphs describe sampling location details.

The samples at **2N01** and **2N02** came from the top few millimeters of soil, outside the fence, several feet from the top of the rock retaining wall and composite sample **N2**, taken during the site soil characterization sampling in January 2001. The **2N01** sample location sits 16.5 feet off the north wall of the former WTE building and about 4 feet east of the northwest corner of the building. The **2N02** sample location sits 18 feet off the building and 42 feet east of the building's northwest corner.

2W03 sample location sits beyond the first pre-existing drainage west of the facility site fill and on the slight down-slope toward the next drainage channel winding through that very wet meadow area. That sample location lies approximately along the extended line of the south site fill slope toe 29 feet from the southwest corner of the fill and about 49 feet from earlier sample location SW9.

2S04 sample came from wet soil on the north edge of the drainage about 13.5 feet before it flows into the culvert pipe under the gravel access road running from the facility site to the SJC campus and about 30.5 feet from the south toe of the site fill slope.

The **2S05** samples came from deposits and water in the pond about 38 feet south of the toe of the site fill slope and about 78.5 feet east of the culvert outlet.

2S06 samples came from sediment and water in a flowing channel between the two primary boggy ponds, from a location about 36 feet from the northern most rear wall of Hames PE Center and about 74 feet from the west edge of the path that parallels the flume.

Sediment and water for samples taken at **2ESE07** came from the north pond edge at a location about 82.5 feet from inner northern rear wall of Hames PE Center and about 43 feet from the west edge of the path next to the flume.

The **2SE08** sediment and water samples came from directly before the inlet to the culvert draining water from ponds, wet soils and ditches around the former WTE site. The sample location sits approximately 3 feet from the west edge of the path and about 43.5 feet from the inner north rear wall of the Hames PE Center.

6.3 Background Soil Conditions

1998 work directed by ADEC summarized Sitka area soil background chemical concentrations. Those data include background dioxin and furan concentrations. ADEC specified no background sampling for this project.

6.4 Sampling Methods

James Clare, P.E. collected all samples and wrote this report of findings and conclusions.

James Clare, P.E. collected samples into laboratory-supplied jars and bottles, affixed identifying labels, stored and handled samples as specified. Chain-of-custody shipment of five (5) Method 8290 samples went to Triangle Laboratory, Inc. (TLI), ADEC approved for dioxin analyses, via FedEx. Thirty-four (34) samples went chain-of-custody to Analytica Alaska, Inc. (AAI), an ADEC approved laboratory, via Alaska Airlines Air Freight.

TLI sample kit provided four ounce (4 oz.), or one hundred twenty-five milliliter (125ml), amber jars with Teflon liners in screw caps for samples of dioxin/furans by 8290. AAI sample kit provided one liter (1L) amber bottles for the PAH TAqH portion by 8270C SIM; forty milliliter (40 ml) VOA twin vials for TAH TAqH portion by 8021B; 1L amber bottles with HCL preservative for aqueous diesel range organic (DRO) and residual range organic (RRO) petroleum hydrocarbon compounds by method AK 102/103; 1L poly bottles for aqueous metals by 6020 and 7470A; 4 oz amber jars with Teflon liners in screw caps for soil and sediment DRO/RRO by AK 102/103 and mercury by 7471A; and 8 oz. amber jars with Teflon liners in screw caps for soil and sediment metals by 6020. Sample kits provided extra sample containers.

Jar labels included sample number, collector's initials, time, date, sample location, specified analysis, and facility name. Field book notations included sample location, facility name, sample matrix, sample number, volume taken, specified analysis, date and time. Notes included observed soil types, depths and measured location of each sample, observed moisture presence in sample soil, and notes pertaining to the photographic log of sample locations.

Soil, sediment and aqueous sampling took place. One soil sample encountered groundwater and saturated soils. Two soil samples were relatively dry and came from a very thin lens of surface soil lying above clean gravel fill. All sediment and aqueous samples came from below the surface of standing or flowing water.

Samples filled their containers as much as possible leaving little to no airspace between the sample and the container lid. Soil and sediment samples were dense enough to limit free air space without tapping the jars, as recommended in analytical method procedures. Aqueous sampling intended to limit air space below the lid as much as possible.

Use of decontaminated trowels and spoons eliminated excess sample soil from the container rim and threads that would limit an effective container seal. No sampling of decontamination final rinse water occurred.

6.5 Sampling Equipment and Decontamination Procedures

Sampling equipment, in addition to laboratory-supplied sample kits, included stainless steel sampling spoons or trowels, mixing and cleaning bowls or trays. Sampling equipment included tri-sodium phosphate decontamination solvent, hot water, de-ionized distilled water for final equipment rinsing, a clean decontaminated shovel to expose soils for sampling and permanent marking pen for labels.

To reduce chances of cross contamination of samples by equipment, before and between sampling, the sampler cleaned all equipment with tri-sodium phosphate solution in hot water, followed by a hot water rinse, then a final rinse with de-ionized distilled water.

The sampler used care to avoid sample contamination from gloves, boots, other clothing, or any potentially contaminated non-sample materials. Samples came from the portion of soil that did not contact the sample excavation shovel.

6.6 Sample Preservation and Handling

Laboratory sample kits included clear preservation and handling instructions.

Each cooler had several frozen ice packs kept over sample jars. Jars stayed in coolers until use. Each filled sample jar went directly back to the cooler.

Sealing individual sample jars separately in plastic bags did not occur. Bubble wrap bags held more than one jar from a single location in some cases and careful cooler loading grouped jars from each location together. The laboratory reported no jars broken during shipping.

6.7 Sampling Precision and Bias

Although planning pre-determined distinct representative areas for samples, random sample media collection and sample homogenization benefit greater precision, or the ability to replicate results.

Field and, particularly, analytical quality assurance benefits detection accuracy, or the tendency for results to represent the actual concentration of the contaminants sought at a particular location. The sampler and analytical laboratories undertook extraordinary efforts to assure sample quality and representation.

Targeted sampling reduces randomness in site characterization and relies on professional judgment that introduces bias. Though not offering statistical integrity, the cost benefits, worst-case judgment assumptions, and comparative data give a greater degree of confidence to the target sampling.

6.8 Quality Assurance and Quality Control

The procedures described above offer typical QA/QC measures for soil characterization. No indications exist demonstrating compromised sample quality for this project.

Wet organic soils commonly cause matrix interference. As noted in the lab report, the soil samples from this site caused such matrix interference.

7.0 **Analytical Methods**

Triangle Laboratory, Inc. (TLI), of Durham, North Carolina, performed EPA SW-846 Method 8290 on three soil samples from locations 2N01, 2N02, and 2W03, and two sediment samples taken at locations 2S04 and 2SE08.

Analytica Alaska, Inc. (AAI) analyzed various specified soil, sediment and water samples for SW-846 Method 6020 cadmium, chromium and lead, mercury presence by SW-846 Methods 7470A and 7471A, DRO and RRO by AK 102/103, and TAqH by SW-846 Method 8270C-SIM for the PAH portion and by SW-846 Method 8021B for TAH portion. Refer to the Results Table and the laboratory report for samples, their locations and the analyses performed. AAI used their new mass-spectrometer facility in Juneau to perform 6020 metals analysis, their Colorado facility to perform 8270C-SIM, 7470A and 7471A methods, and their Anchorage facility to perform AK 102/103 and 8021B analyses.

Both laboratories reported receipt, preservation and analyses conducted as specified in the work plan and according to method specifications.

This phase of the project did not include setting analytical specifications in a formal agreement between the City and Borough of Sitka and the laboratories.

The labs reported quality control and assurance, calibration data, and blank runs for each analysis. AAI provided a single printed copy and electronic versions of their laboratory reports and supporting documents. Triangle Laboratories, Inc. provided a single printed copy of the method 8290 report.

8.0 Discussion and Evaluation of Laboratory Results

Analytical results of samples discovered significant concentrations of heavy metals, petroleum hydrocarbons, and dioxins and furans. Lab analysts indicated hydrocarbon chromatograms appeared more biogenic than typical of petroleum. Total aqueous polynuclear and aromatic hydrocarbons at 2SE08 were not detected above or near Alaska Water Quality Standards criteria for freshwater aquatic life protection, propagation or aquaculture.

Not all detection and reporting limits were below the defined clean-up levels. In each case where detection limits were above clean-up levels, results determinations required application of high dilution factors. This occurs when matrix interference or high contaminant concentrations exist. However, results were above the clean-up levels, causing no uncertainty about analytical detection.

Laboratory QA/QC included control samples, trip blanks, and matrix spikes. The lab report gives analytical laboratory QA/QC procedures and discussions.

9.0 Off-site Characterization Conclusions and Recommendations

Contaminants of significant concern in soil and water surrounding the former WTE site include heavy metals, petroleum hydrocarbons, dioxins and furans. These contaminants may have migrated from the WTE site operations area carried by stormwater run-off or deposited from former incinerator stack exhaust gas emissions. However, off-site conditions and sampling suggest other sources probably contributed to some heavy metal and a portion of the petroleum hydrocarbon contamination found south of the site. Some evidence suggests vegetation may contribute to the hydrocarbons detected.

Dioxin and furan contaminant concentrations were greater close to the former WTE building, and seem to gradually decrease further from the site, with the lowest concentration found at 2SE08. Results demonstrate that particular segments of the off-site perimeter have greater contamination than others. Dioxin and furan compounds would have associated with particles in sediment deposition if transported by site run-off. Former WTE plant exhaust emissions might have caused atmospheric transport with deposition at higher concentrations further from the site.

Sample results demonstrate soil, sediment substrate, and surface water contamination surrounding the former WTE site. The contamination may have migrated off the WTE site in run-off or may have origins other than the former WTE plant and site. Signs of dumping appear in the vicinity of samples taken at locations 2S04, 2S05, 2S06, 2ESE07, and 2SE08.

Water surface sheen and hydrocarbon droplets appeared more biogenic than typical of petroleum.

Heavy metals and petroleum hydrocarbons appear concentrated near samples 2S06 and 2ESE07, although quite high at other locations

Response efforts could remove contaminated sediment from the site and surrounding area. Such actions might suspend stabile sediment in drainage water causing impacts to downstream water bodies receiving site run-off or pond and ditch drainage from south of the site. Ponds and drainages south of the site appear to adequately retain any migrating contamination transported by stormwater runoff.

To adequately characterize the former WTE site, evaluation must consider results from January2001 sampling with sample results presented with this report. Likewise, the characterization must consider physical conditions in the sampled areas and observations made by the analytical lab chemists and project managers examining the samples.

Laboratory Report Documents List
Expanded Site and Off-site Migration Characterization

Analytica Alaska, Inc. Reports

A0107094: Petroleum Hydrocarbons and TAH - Sample ID page, case narrative page.
AqTAH by SW-846 Method 8021B on Sample at 2SE08, page 3 of 18.
Sediment DRO/RRO by AK-102/103 on sediment samples, pages 4-5 of 18.
DRO/RRO by Ak 102/103 on aqueous samples, pages 6-7 or 18.
DRO by AK 102 on sediment and soil samples, page 8 of 18.
Method Blank Reports, pages 9-12 of 18.
QC Recovery Report, pages 13-17 of 18.
Key - data flags and definitions, page 18 of 18.
Supporting Documentation, 7 pages.

B0107293: PAH and Mercury - Sample ID page, case narrative page.
AqPAH by SW-846 modified Method 8270C-SIM on 2SE08 , page 9 of 21.
Sediment and aqueous Mercury by SW-846 Methods 7471A and 7470A, pages 3-12 of 21.
Method Blank Report, pages 13-14 of 21.
QC Recovery Report, pages 15-20 of 21.
Key - data flags and definitions, page 21 of 21.
5 pages supporting documentation.

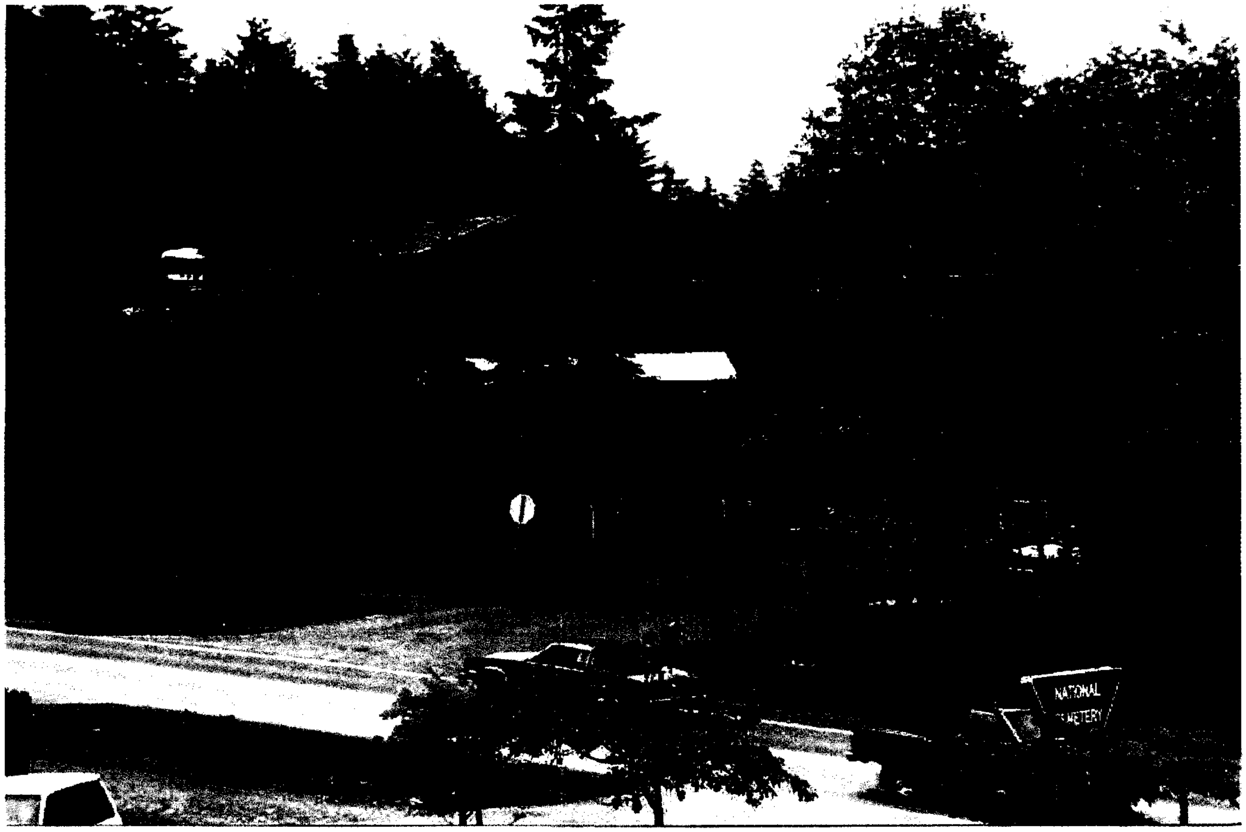
J0107080: Metals by SW-846 Method 6020 and second run by 7470A and 7471A.
Sample ID page, case narrative page.
Sediment and aqueous Cadmium, Chromium, Lead and Mercury, pages 3-14 of 23.
Method Blank Report, page 15 of 23.
QC Recovery Report, pages 16-22 of 23.
Key - data flags and definitions, page 23 of 23.

Triangle Lab Report - 597 pages

52843: Case narrative, pages 1-10.
Document control, pages 11-25.
Sample data summary, pages 26 - 33.
Method blank report, pages 34-62.
2N01 DB-5 with TEFs and 225 results, pages 63-94.
2N02 DB-5 with TEFs and DB-225 results, pages 95-126.
2W03 DB-5 with TEFs and DB-225 results, pages 127-159.
2S04 DB-5 with TEFs and DB-225 results, pages 160-195.
2SE08 DB-5 with TEFs and DB-225 results, pages 196-229.
TLI LCS (control spike) and LCSD (control spike duplicate), pages 230-263.
Calibration data, pages 264-596.

Former Sitka Waste-to-Energy Plant

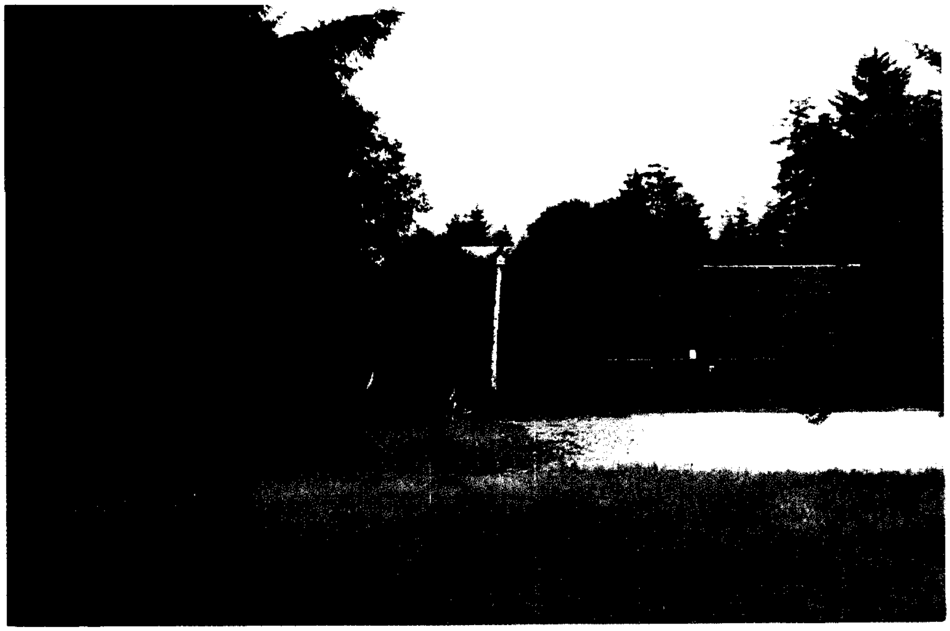
Off-site Sampling and Characterization Photographs



R2 P24 – looking southwest at former Sitka WTE Site
7-27-01

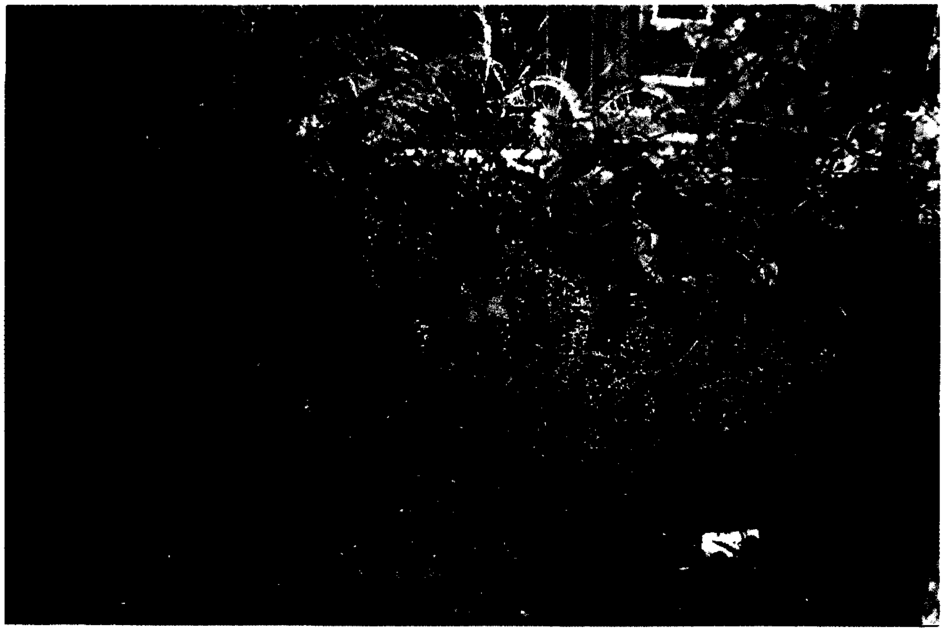
Prepared by:

James Clare, P.E.
August 2001



R2 P24 – looking north from SJC campus toward
former WTE site with building roof visible behind trees
Hames PE Center at right
7-27-01

R2 P23 – looking north from SJC campus toward
former WTE site along north- south gravel access road
Hames PE and east-west access road at right off camera
7-27-01



R2 P7 – looking south at 2N01
7-25-01

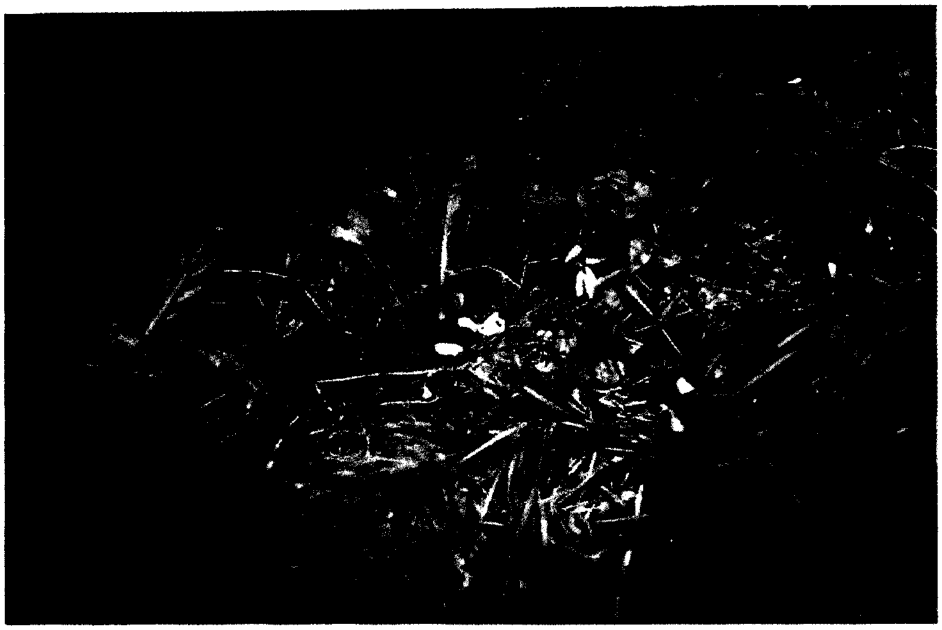
R2 P18 – looking south at 2N01
7-27-01

R2 P19 – looking southwest at 2N01
7-27-01

R2 P21 – looking southwest at 2N02
7-27-01

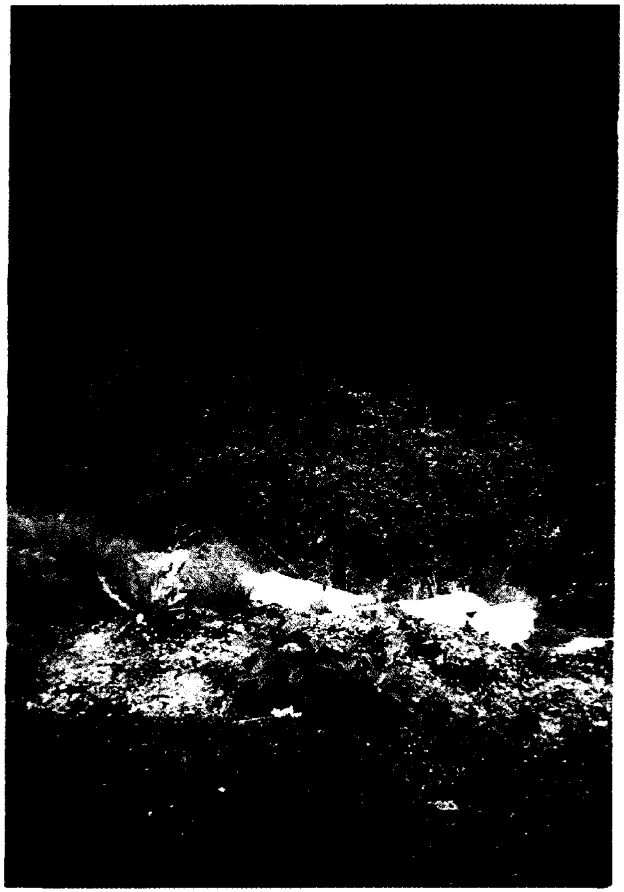
R2 P8 – looking south at 2N02
7-25-01

R2P20 – looking south at 2N02
7-27-01



R2 P4 – looking north at 2W03
7-25-01

R2 P5 – looking at building from 2 W03
7-25-01



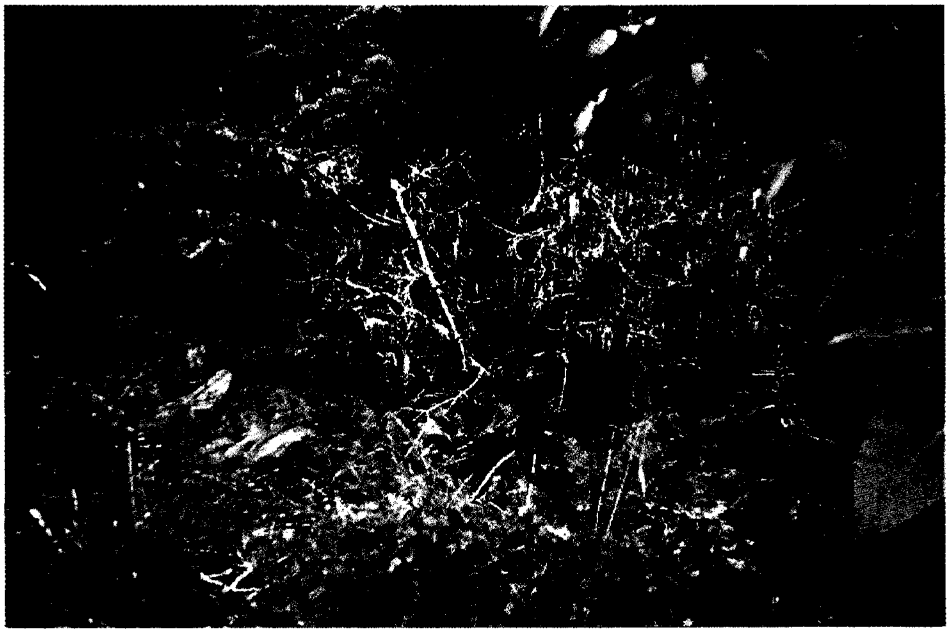
R2 P6 – looking at 2W03 from edge pavement near SW9
7-25-01

R2P2 – looking north northeast at 2S04
7-25-01

R2 P3 – looking east at culvert from 2S04
7-25-01

R2 P9 –looking south at 2S05 toward Hames PE
7-25-01

R2 P10 looking west at 2S05
7-25-01



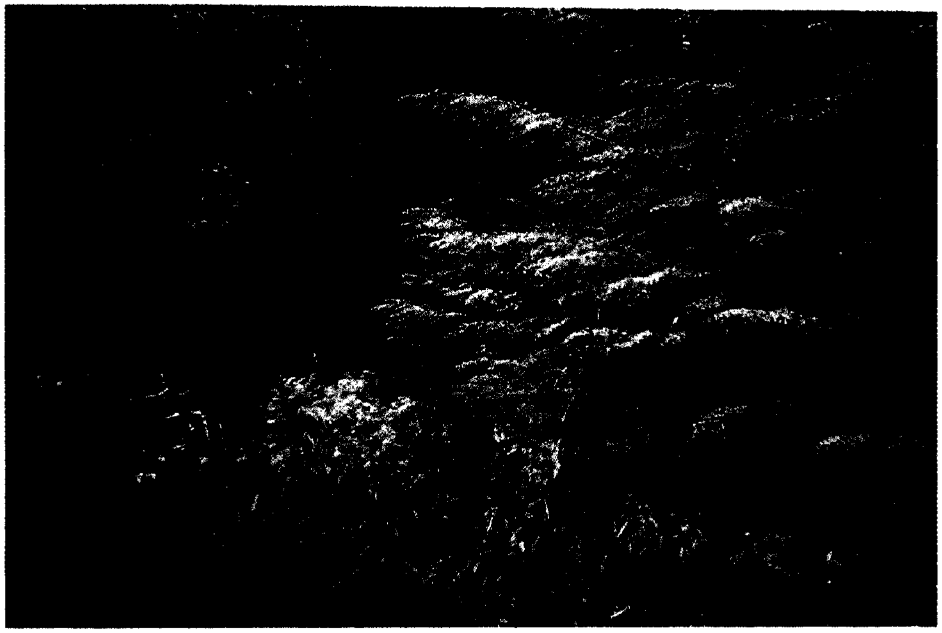
R2 P13 – looking north toward former WTE building and 2S05 @ center right
7-25-01

R2 P15 - looking north northwest toward building and 2S06
7-25-01

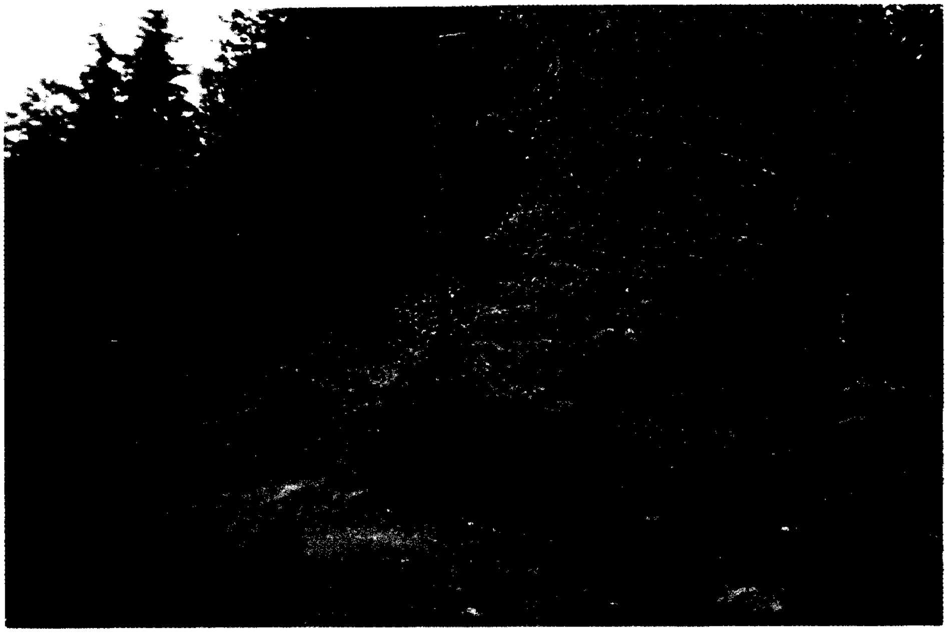
R2 P17 – looking west northwest with2S06 left and 2ESE07 right
7-27-01

R2 P11 – looking west at 2ESE07
7-25-01

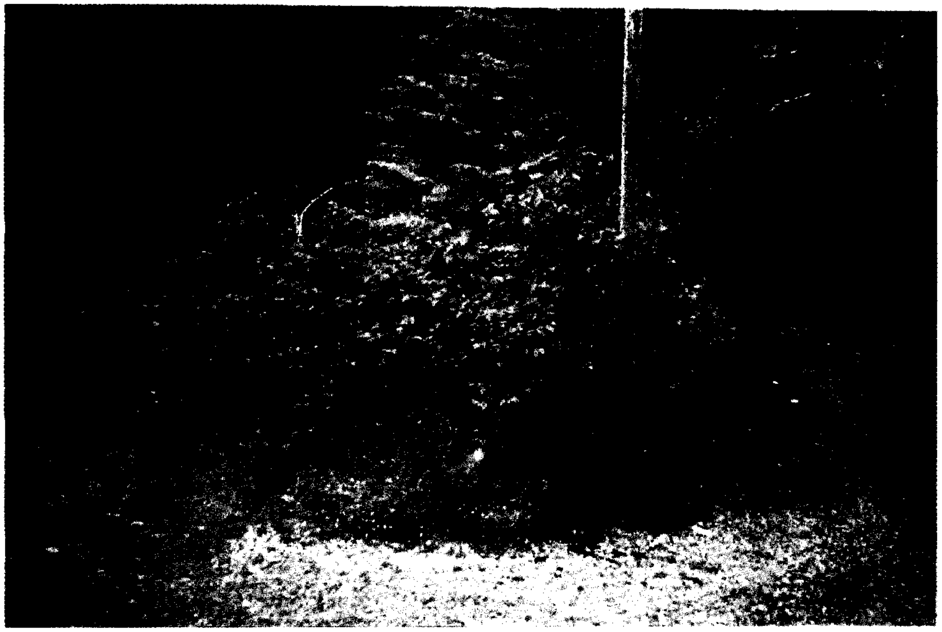
R2 P12 – looking south at 2ESE07
7-25-01



R2 P14 – looking northwest toward building and 2ESE07
Taken from 2SE08
7-25-01

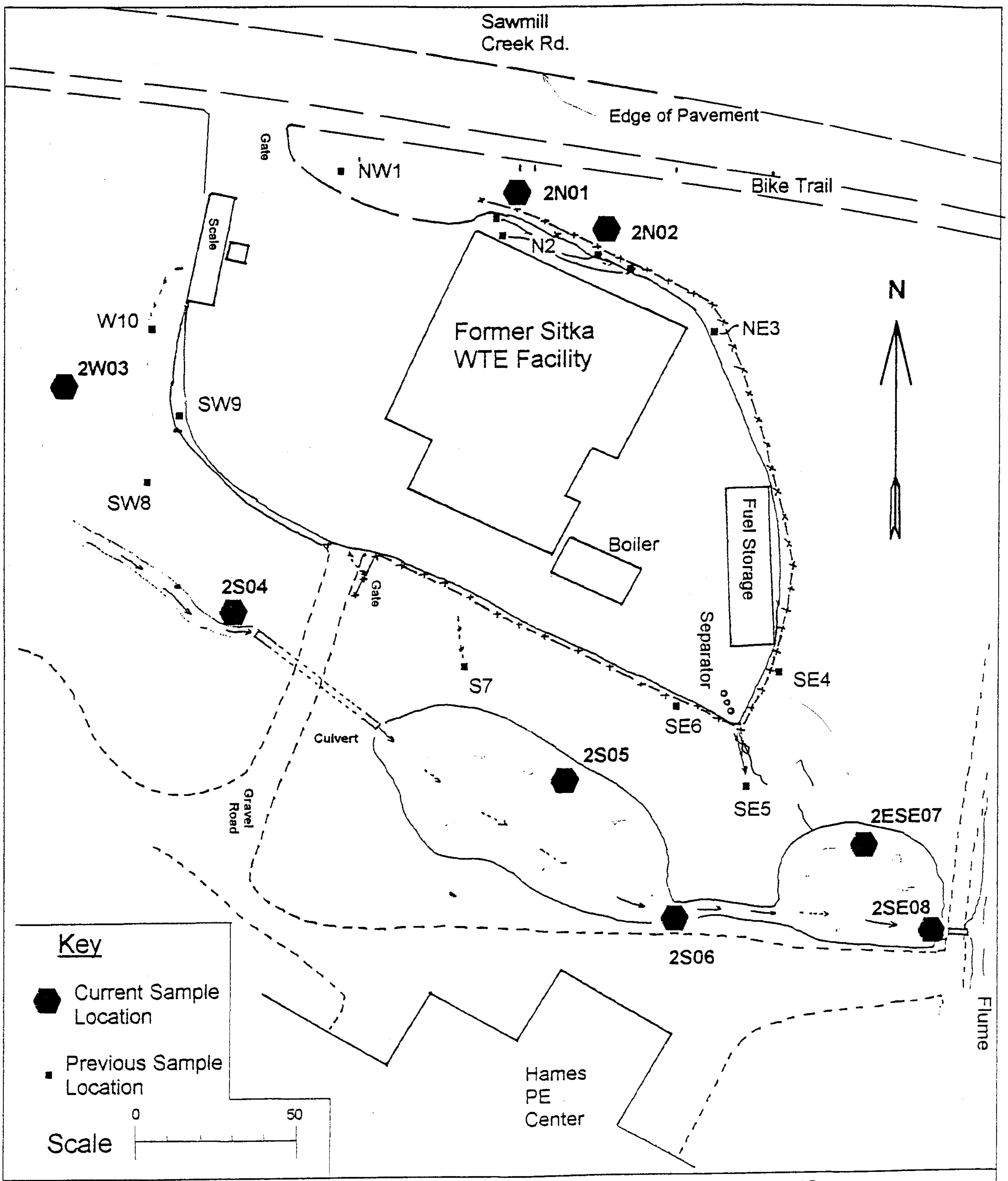


R1 P24 – looking north with 2SE08 center right of pole
And 2ESE07 center left of pole
7-24-01



R2 P16 – looking north with 2ESE07 left and 2SE08 right
7-27-01

R2 P1 – looking west and down at pond and 2SE08
7-25-01



Former Sitka Waste-To-Energy Facility
Expanded Off-site Sampling and Characterization

Site Diagram
September 2001

Prepared By:
James Clare, P.E.