A.10 SITE ST032 (AREAS OF MW-107 AND MW-246)

A.10.1 Site Background

Site ST032 covers approximately 22 acres and encompasses the areas around MW-107 and MW-246 in the central part of the EIOU. These MWs are placed in the area of Storm Sewer System A, which drains the industrial area of the EIOU. Miscellaneous chemical wastes generated from base shops and waste areas may have been discharged into the storm sewer and surface drainage systems in this area (Weston, 1995).

The Air Force conducted nine sampling rounds at sites within the EIOU during the RI. Results from Rounds 1 through 6 were used for preliminary screening of sites and data. Results from Rounds 7 through 9 were used for risk assessments based on comments from agencies. Sampling efforts are described in Section 2.0 of the EIOU RI (Weston, 1995a). Summary tables 2.2-1 through 2.2-3 and Appendix A of the RI indicate that four groundwater samples were collected from the area surrounding MW-107, and four groundwater samples were taken from the area surrounding MW-246. Samples were analyzed for VOCs, SVOCs, dioxins/furans, petroleum products, inorganic constituents, and total dissolved solids. In addition to groundwater sampling, subsurface soil samples were collected from two soil borings in the area surrounding MW-246. Sample locations, constituents analyzed, and results are presented in the EIOU RI (Weston, 1995a).

Classes of COCs detected in the groundwater at these MWs during the RI include VOCs and one SVOC. VOCs identified as COCs include benzene, TCE, 1,1-DCE, and xylenes. Bis(2-ethylhexyl)phthalate (a SVOC) was also identified as a COC. TPH was present as floating product and in the groundwater at concentrations up to 29,000,000 μ g/L near MW-246. Based on the contaminants identified during the RI, groundwater contamination at ST032 is found in two areas, Plume A and Plume B. Plume A is characterized by VOC and SVOC contamination, and is located in the MW-107 area. Plume B is characterized by a light aqueous-phase liquid floating product (LNAPL) and xylene contamination, and is located in the MW-246 area. Site location,

contaminant concentrations, and a conceptual site model are presented in Figure A-12. Soil contamination found during the RI includes VOCs, PAHs, pesticides, PCBs, and metals.

A.10.2 Feasibility Study

The alternatives evaluated in the FS for ST032 were Alternative 1 (no action), Alternative 2 (natural attenuation and monitoring), Alternative 3 (extraction, air stripper/catalytic oxidation, ion exchange, activated carbon, and discharge), Alternative 5 (extraction, UV-OX, ion exchange, activated carbon, and discharge), Alternative 7 (extraction, ion exchange, activated carbon, and discharge), and Alternative 9 (extraction, bioslurping, recovered product recycling, and off gas catalytic oxidation). As evaluated in the FS, Alternative 1 had the lowest cost, but also the lowest total score. Alternative 2 had a capital cost of \$18,600, a first year O&M cost of \$72,000, and a score of 16. Alternatives 3, 5, and 7 all had scores of 31. Capital and first year O&M costs for these three alternatives were \$2.2 million capital with \$177,000 O&M for Alternative 3; \$2.2 million capital with \$220,000 O&M for Alternative 5; and \$2.0 million capital with \$280,000 O&M for Alternative 7. Alternative 9 had a total score of 25, a capital cost of \$270,000, and first year O&M cost of \$17,000.

A.10.3 Selected Interim Remedial Actions/Objectives

The selected interim action for the groundwater at ST032 (Plume B) is Alternative 3, Extraction, Treatment, and Discharge. This will be accomplished through source control with free product removal such as bioslurping, or other free product removal method. Bioslurping results in groundwater and vapor that requires treatment. Alternative 3 will prevent further contamination of the groundwater from the free product.

Selection of an alternative for the Plume A groundwater is deferred until the final Groundwater ROD so that additional data can be collected and evaluated to support the use of natural attenuation as a remedial action. Additional site-specific data regarding natural attenuation will be developed for evaluation as part of the Basewide Natural Attenuation Assessment Plan. Natural attenuation appears to be a viable alternative for this site as a cost-effective way to meet CERCLA criteria because of the low TCE concentrations (maximum 64 μ g/L), and the plume appears to be stable. In addition, the presence of TPH for cometabolism and degradation products indicate natural attenuation is occurring.

The interface between the storm sewer and contaminated groundwater will be investigated during the RD (see Figure 3-6). At locations where the contaminated groundwater is found to be migrating to the storm sewer or creek, an interim remedial action, such as pump and treat, will be used to control significant migration. Where pump and treat is used, the effectiveness of this action will be monitored and if it is found that the pump and treat action is not adequately controlling the migration, a contingency action, such as repair or lining of the storm sewer will be initiated.

A.10.4 Conceptual Site Model

Contamination in the soils at the site include benzene, TCE, and 1,1-DCE, all of which are also found in the groundwater. The main source of groundwater contamination appears to be the floating product. Once this is removed, contaminant concentrations in the soil are expected to degrade naturally. The potential source of TCE was identified in the RI (Weston, 1995a) as an upgradient location (SS016). PCBs and metals are also soil COCs but are not identified as groundwater contaminants.





ST032 (Areas MW-107 and MW-246)

Primary Contaminants, Remediation Drivers and Affected Media

GroundwaterVOCsCollectiveFGroundwaterVOCsHuman RiskGroundwaterVOCsfor TheseGroundwaterVOCsContaminantsGroundwaterVOCsIsGroundwaterSVOCsHR = 1.5 x 10^{-2}	=loa

Site Characteristics

- · Grassy, open area between a runway and an abandoned taxiway
- Proximities to runway severely restrict land use (and potential remedial actions)
- 20% of MW-107 area covered by runway and taxiway
- 10% of MW-246 area covered by runway and taxiway
- TCE in groundwater 10 mg/L average, 64 mg/L maximum
- Estimated contaminated groundwater surface area = 220,000 ft², volume = 1,000,000 ft³
- Estimated mass of dissolved VOCs equals 180 lb (does not include TPH); LNAPL is present
- Ca, Cr, Cu, Ni, and Ag were measured at concentrations greater than NPDES discharge limits in some monitoring wells
- Depth to groundwater 7 feet
- Depth to bedrock 30 feet
- · Site also studied for sub-surface soil contamination
- Storm sewer system is a potential groundwater/surface water pathway (under investigation)

Selected Interim Remedial Action/Objectives

- Alternative 3: Extraction, Treatment and Discharge (Plume B) - Plume B
- Source Control for Floating Petroleum Product Removal
- Selection deferred for Plume A, area will be included in the Basewide Natural Attenuation Assessment Plan

Feasibility Study Treatment Alternatives and Associated Costs

- Alternative 2: Natural Attenuation/Monitoring: Capital Cost = \$18,600; First Year O & M = \$72,000
- · Alternative 3: Extraction, Treatment and Discharge
- FS Alternative 3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon: Capital Cost = \$2,200,000; First Year O & M = \$177,000
- FS Alternative 5: UV Oxidation, Ion Exchange, Activated Carbon: Capital Cost = \$2,160,000; First Year O & M = \$220,000
- FS Alternative 7: Ion Exchange, Activated Carbon: Capital Cost = \$2,000,000; First Year O & M = \$280,000
- FS Alternative 9: Bioslurping, Recovered Product Recycling, Off-gas Catalytic Oxidation: Capital Cost = \$270,000; First Year O & M = \$17,000
- These costs derived from the FS will be refined during the remedial design phase based on combination of alternatives and site specific variables

Interim Design Assumptions

- Bioslurping/Free Product Removal (Plume B)
- Monitoring Wells (NOTE: Location and number of wells will be determined during remedial design phase)
- Determine groundwater/surface water interactions and design appropriate responses

Maximum Contaminant Reported of Concern Concentration

ating Petroleum Product (LNAPL) NA 5.040 ma/L Benzene TCE 64 mg/L 1,1-DCE 0.36 mg/L **Xylenes** 6,702 mg/L Bis(2-ethylhexyl)phthalate 153 mg/L

• TPH in groundwater — 15,000,000 mg/L average, 29,000,000 mg/L maximum, floating petroleum product is present

Figure A-12. **Site Summary Information** for ST032, Travis AFB

A.11 SITE SD033 (STORM SEWER SYSTEM II/FACILITIES 810 AND 1917, SOUTH GATE AREA, AND WEST BRANCH OF UNION CREEK)

A.11.1 Site Background

Site SD033, which covers a total of approximately 24 acres, is located in the West Industrial Operable Unit (WIOU), encompasses parts of Storm Sewer System II (previously called Storm Sewer System B), Facilities 810 and 1917, the area around the South Gate, and the west branch of Union Creek. Storm Sewer System II, comprised of underground piping, and the West Branch of Union Creek collect runoff from within the WIOU and small portions of the EIOU and West Annexes and Basewide Operable Unit (WABOU). Runoff from Storm Sewer II generally flows south and enters Union Creek south of the WIOU in the EIOU. Dissolved contamination in the groundwater at SD033 migrated from broken or damaged areas of the storm sewer and underground piping.

Facility 810, constructed in 1955, is used for aircraft refurbishing activities. An OWS, sump, and wash rack previously existed at the facility and discharged to Storm Sewer System II. This equipment has been abandoned, and the facility no longer discharges to the storm sewer. Wastes generated at the facility in the past have included PD-680, paints, solvents, lubricants, PCBs, and fuels.

Facility 1917 is located south of Facility 810 just west of the flightline apron and was constructed in 1956 for use as an aircraft washdown area (Radian, 1996b). An OWS and wastewater collection sumps, previously used during washdown activities, remain at the facility but are no longer in use. Wastes generated at the facility during past activities include PD-680, soaps, engine oil, hydraulic fluid, and jet fuel.

The Air Force collected groundwater samples from 32 locations at SD033 during the RI. At Facility 810, 10 CPT HydroPunch[®] samples and 2 monitoring well samples were collected; at Facility 1917, 2 monitoring wells were sampled; along Storm Sewer System II 10

CPT HydroPunch[®] samples and 2 monitoring well samples were collected; and at the South Gate area, 6 CPT HydroPunch[®] samples were collected. Groundwater samples were analyzed for petroleum hydrocarbons, inorganic constituents, pesticides and PCBs, VOCs, and SVOCs (Radian, 1996b). In addition to groundwater sampling, surface water, sediment, and surface soil samples were collected from 10 transect locations in SD033, 16 soil borings were drilled for subsurface investigations, 2 surface flux samples were collected, and video surveying was performed to inspect the quality of the storm sewer. Specific sampling locations, constituents analyzed, and results can be obtained in the WIOU RI (Radian, 1996b).

Classes of COCs identified in the groundwater at the site during the RI include VOCs and one SVOC. VOCs identified as COCs include TCE, 1,1-DCE, 1,2-DCA, cis-1,2-DCE, and TPH-gasoline (TPH-G). TPH-extractable (TPH-E) was identified as a SVOC COC. Site location, contaminant concentrations, and a conceptual site model are presented in Figure A-13. Contaminants identified in other media at SD033 include: VOCs in the soil gas and sediment; SVOCs in the sediment; and metals in the sediment, surface soil, and surface water.

A.11.2 Feasibility Study

The alternatives evaluated in the FS for SD033 were Alternative 1 (no action), Alternative 2 (natural attenuation and monitoring), Alternative 3 (extraction, air stripper/catalytic oxidation, ion exchange, activated carbon, and discharge), Alternative 5 (extraction, UV-OX, ion exchange, activated carbon, and discharge), and Alternative 7 (extraction, ion exchange, activated carbon, and discharge). As evaluated in the FS, Alternative 1 had the lowest cost, but also the lowest total score. Alternative 2 had a capital cost of \$18,600, a first year O&M cost of \$72,000, and a score of 16. Alternatives 3, 5, and 7 had scores ranging from 27 to 31. Capital and first year O&M costs for these three alternatives were \$2.6 million capital with \$180,000 O&M for Alternative 3; \$2.7 million capital with \$230,000 O&M for Alternative 5; and \$2.3 million capital with \$140,000 O&M for Alternative 7.

A.11.3 Selected Interim Remedial Actions/Objectives

The selected interim action for SD033 is a combination of Alternative 3 for the Storm Sewer area of contamination and Alternative 2, Natural Attenuation with groundwater monitoring, for the remainder of the site. Alternative 3 using migration control is needed for Storm Sewer II because of VOC concentrations (up to 1,000 μ g/L) in the groundwater and possible hydraulic connections with subsurface utilities that could lead to further contaminant migration (see also Figure 3-6).

Selection of an alternative for the South Gate, Facility 1917, and Facility 810 plumes has been deferred until the final Groundwater ROD. This will allow site-specific data to be collected and evaluated to support the use of natural attenuation as a remedial action. Natural attenuation appears to be a viable alternative because contaminant concentrations are relatively low and only appear in small isolated areas near the South Gate and Facilities 810 and 1917. The remainder of the plumes also appear relatively stable. Additional data regarding natural attenuation will be developed for evaluation as part of the Basewide Natural Attenuation Assessment Plan.

The interface between the storm sewer and contaminated groundwater will be investigated during the RD (see Figure 3-6). At locations where the contaminated groundwater is found to be migrating to the storm sewer or creek, an interim remedial action, such as pump and treat, will be used to control significant migration. Where pump and treat is used, the effectiveness of this action will be monitored and if it is found that the pump and treat action is not adequately controlling the migration, a contingency action, such as repair or lining of the storm sewer will be initiated.

A.11.4 Conceptual Site Model

Sources of groundwater contamination at SD033 include the storm sewer pipeline for the storm sewer portion, and the OWS, wash rack, and storm sewer pipeline for Facility 810 plume. Contaminants found in the sediments, surface soils, and surface water at SD033 are not related to contaminants detected in the groundwater. Some VOCs identified in the soil gas were also found in the groundwater, including TCE, cis-1,2-DCE, and TPH-G; however, they are not considered to be a source of groundwater contamination.



SD033 (Storm Sewer System II/Facilities 810 and 1917, South Gate Area, and West Branch of Union Creek)

Primary Contaminants, Remediation Drivers and Affected Media

Medium	Contaminant Type	Remediation Driver	Contaminant of Concern	Maximum Reported Concentration
Groundwater	VOCs	HR = 3.6 x 10⁵	TCE	941 mg/L
Groundwater	VOCs	HR = 1.7 x 10⁵	1,1-DCE	0.42 mg/L
Groundwater	VOCs	Exceeds MCL	1,2-DCA	1.36 mg/L
Groundwater	VOCs	Exceeds MCL	cis-1,2-DCE	199 mg/L
Groundwater	VOCs	Exceeds IRG	TPH-gasoline	1,000 mg/L
Groundwater	SVOCs	Exceeds IRG	TPH-E	1,420 mg/L

Site Characteristics

- Storm sewer system/Facility 810 are both facilities in use
- · Contamination in sediment, surface soil, groundwater, and surface water
- · cis-1,2-DCE in groundwater 20 mg/L average, 199 mg/L maximum
- TCE in groundwater 125 mg/L average, 941 mg/L maximum
- Estimated contaminated groundwater surface area = 160,000 ft², volume = 490,000 ft³
- · Estimated mass of dissolved VOCs equals 5.6 lb; no evidence of DNAPL or LNAPL
- · VOC (chloromethane) detected in ambient air samples
- Flow in Union Creek is derived from surface runoff, and at times from groundwater
- Site also studied for soil contamination

Selected Interim Remedial Action/Objectives

- · Alternative 3: Extraction, Treatment and Discharge (Storm Sewer Plume) - Migration Control for VOCs
- the Basewide Natural Attenuation Assessment Plan

Feasibility Study Treatment Alternatives and Associated Costs

- · Alternative 3: Extraction, Treatment and Discharge
- Capital Cost = \$2,600,000; First Year O & M = \$180,000
- FS Alternative 5: UV Oxidation, Ion Exchange, Activated Carbon: Capital Cost = \$2,700,000; First Year O & M = \$230,000
- FS Alternative 7: Ion Exchange, Activated Carbon: Capital Cost = \$2,300,000; First Year O & M = \$140,000
- These costs derived from FS will be refined during the remedial design phase based on combination of alternatives and site specific variables

Interim Design Assumptions

- 1 horizontal well, 300 feet in screened length
- Extraction rate 15 gpm total
- · 500 feet of discharge piping 3 inch ID, sch 80 PVC
- 100 feet from treatment system to existing power line
- Determine groundwater/surface water interactions and design appropriate responses

· Depth to groundwater — 13 to 18 feet, depending on location; depth to bedrock — varies

Selection deferred for South Gate, Facility 1917, and Facility 810 Plumes, these will be included in

Alternative 2: Natural Attenuation/Monitoring: Capital Cost = \$18,600; First Year O & M = \$72,000 - FS Alternative 3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon:

(NOTE: Location and number of wells will be determined during the remedial design phase)

12,650 feet of untreated water piping (from well to treatment system) — 1 inch ID, sch 80 PVC

Monitoring Wells (NOTE: Location and number of wells will be determined during the remedial design phase)

Figure A-13. **Site Summary Information** for SD033, Travis AFB

A.12 SITE SD034 (FACILITY 811)

A.12.1 Site Background

Site SD034 covers approximately 1.1 acre and encompasses Facility 811, located in the northern portion of the WIOU on Ragsdale Street south of Hangar Avenue. The Facility includes an indoor wash rack, installed in 1979, which is used to wash, strip, and pretreat aircraft parts prior to painting. Wastewater from the wash rack flows into an OWS. Flow from the OWS can be directed into either the sanitary sewer or a concrete-lined overflow pond located just west of the facility. A hole was discovered in the OWS during 1994. The defective OWS was removed and replaced with the current OWS. Chemicals used at this facility include acids, solvents, antifreeze, and the Stoddard solvent PD-680.

The Air Force collected groundwater samples from 14 locations in the area of Facility 811 during the RI. Samples were collected from soil borings, monitoring wells, and CPT locations. Samples were analyzed for petroleum hydrocarbons, inorganic constituents, pesticides and PCBs, VOCs, and SVOCs. In addition to groundwater samples, 2 surface soil samples, 23 soil gas samples, and 14 subsurface soil samples were collected at SD034. Sampling locations, constituents analyzed, and results can be obtained in the WIOU RI (Radian, 1996b).

Classes of COCs detected in the groundwater during the RI include VOCs and SVOCs. VOCs identified as COCs include TCE, vinyl chloride, 1,1-DCE, benzene, cis-1,2-DCE, PCE, and TPH-G. TPH-E and bis(2-ethylhexyl)phthalate were identified as SVOC COCs. A floating product layer of PD-680, a light non-aqueous phase liquid (LNAPL), is also present at the site and is considered a COC. Site location, contaminant concentrations, and a conceptual site model are presented in Figure A-14. Additional contaminants detected include TPH-G and TPH-E in the soil, and TCE, PCE, and cis-1,2-DCE in the soil gas (Radian, 1996b).

A.12.2 Feasibility Study

The alternatives evaluated in the FS for SD034 were Alternative 1 (no action), Alternative 2 (natural attenuation and monitoring), Alternative 3 (extraction, air stripper/catalytic oxidation, ion exchange, activated carbon, and discharge), Alternative 5 (extraction, UV-OX, ion exchange, activated carbon, and discharge), Alternative 7 (extraction, ion exchange, activated carbon, and discharge) and Alternative 9 (extraction, bioslurping, recovered product recycling, and off gas catalytic oxidation). As evaluated in the FS, Alternative 1 had the lowest cost, but also the lowest total score. Alternative 2 had a capital cost of \$18,600, a first year O&M cost of \$72,000, and a score of 16. Alternatives 3, 5, and 7 all had scores of 31. Capital and first year O&M costs for these three alternatives were \$490,000 capital with \$86,000 O&M for Alternative 3; \$570,000 capital with \$110,000 O&M for Alternative 5; and \$380,000 capital with \$79,000 O&M for Alternative 7. Alternative 9 had a total score of 25, capital cost of \$270,000, and a first year O&M cost of \$3,900.

A.12.3 Selected Interim Remedial Actions/Objectives

The selected interim action for SD034 is Alternative 3, Extraction, Treatment, and Discharge, with both source and migration control. Source control will involve removal of the floating free product (PD-680) through bioslurping or other free product removal method. Migration control will be achieved by groundwater extraction and will be coordinated with interim actions for SD037.

Alternative 3, using source and migration control, was selected at this site due to the potential for contaminants to migrate to the West Branch of Union Creek (located approximately 150 feet west of SD034). Removal of the free product will eliminate further contamination of the groundwater, and migration control will ensure that contaminants do not migrate further from the site.

A.12.4 Conceptual Site Model

Sources of groundwater contamination include leaks from the OWS and associated piping at Facility 811. Contaminants, particularly chlorinated hydrocarbons, are commingled with groundwater contamination at SD037. Contamination detected in the soils at the site include TPH-G and TPH-E which are also present in the groundwater. Soils contamination could be a source of contaminants found in the groundwater but should naturally attenuate and not impact groundwater once the floating product (PD-680) is removed.

A.12.5 Special Site Considerations

SD034 and SD037 plumes are commingled; interim remedial actions will be coordinated to ensure that the extraction system is optimized, and the most cost effective interim remedial action is design and implemented.





SD034 (Facility 811)

Primary Contaminants, Remediation Drivers and Affected Media

Medium	Contaminant Type	Remediation Driver	Contaminant of Concern	Maximum Reported Concentration
Groundwater	VOCs	NA	LNAPL (PD-680)	~1 foot thick
Groundwater	VOCs	HR = 3.0 x 10 ⁻⁵	TCE	740 mg/L
Groundwater	VOCs	HR = 3.1 x 10⁵	Vinyl Chloride	2.38 mg/L
Groundwater	VOCs	HR = 1.2 x 10 ⁻⁶	1,1 DCE	0.317 mg/L
Groundwater	VOCs	Exceeds MCL	Benzene	6.8 mg/L
Groundwater	VOCs	Exceeds MCL	cis-1,2-DCE	496 mg/L
Groundwater	VOCs	HR = 1.2 x 10 ⁻⁵	PCE	88 mg/L
Groundwater	VOCs	NA	TPH-gasoline	10,600,000 mg/L
Groundwater	SVOCs	NA	TPH-E	13,000,000 mg/L
Groundwater	SVOCs	HR = 3.3 x 10 ⁻⁴	bis(2-ethylhexyl)phthalate	6,390 mg/L

Site Characteristics

- · Includes an indoor washrack, an oil/water separator, and a concrete-lined overflow pond
- · Approximately 75% of the area is covered with roadbase and asphalt
- cis-1,2-DCE in groundwater 80 mg/L average, 496 mg/L maximum
- TCE in groundwater 120 mg/L average, 740 mg/L maximum
- Estimated contaminated groundwater surface area = 220,000 ft², volume = 670,000 ft³

- Site is adjacent to SD037 groundwater plumes are mixed
- Depth to groundwater 10 to 13 feet, depth to sandstone bedrock 16 feet
- Site also studied for soil contamination

Selected Interim Remedial Action/Objectives

- Alternative 3: Extraction, Treatment and Discharge - Source control for floating product removal (PD-680)
- Migration Control (coordinated with SD037)

Feasibility Study Treatment Alternatives and Associated Costs

- Alternative 3: Extraction, Treatment and Discharge
- Capital Cost = \$490,000; First Year O & M = \$86,000
- FS Alternative 5: UV Oxidation, Ion Exchange, Activated Carbon: Capital Cost = \$570,000; First Year O & M = \$110,000
- FS Alternative 7: Ion Exchange, Activated Carbon:
- Capital Cost = \$380,000; First Year O & M = \$79,000
- FS Alternative 9: Bioslurping, Recovered Product Recycling, Off-gas Catalytic Oxidation: Capital Cost = \$270,000: First Year O & M = \$3,900
- These costs derived from the FS will be refined during the remedial design phase based on combination of alternatives and site specific variables

Interim Design Assumptions

- Bioslurping/Free Product Removal
- Monitoring Wells (NOTE: Location and number of wells will be determined during remedial design phase)

• TPH in groundwater — 5,000,000 mg/L average, 13,000,000 mg/L maximum, floating petroleum product (PD-680) is present Estimated mass of dissolved VOCs equals 9.6 lb (does not include TPH); LNAPL is present Chromium and mercury were measured at concentrations greater than NPDES limits in some monitoring wells

· Alternative 2: Natural Attenuation/Monitoring: Capital Cost = \$18,600; First Year O & M = \$72,000 - FS Alternative 3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon:

Figure A-14. **Site Summary Information** for SD034, Travis AFB

A.13 SITE SS035 (FACILITIES 818/819)

A.13.1 Site Background

Site SS035 covers approximately 5 acres and consists of Facilities 818 and 819, located in the northern part of the WIOU. Facility 818, constructed in 1970, is used to repair, wash, and paint aircraft. Wash water at the facility flows into trench drains and then into an OWS which discharges to the sanitary sewer system. Facility 819 contains an electro-environmental shop, a wheel and tire shop, and a hazardous waste accumulation area. Chemicals used at these facilities include lubricating oil, hydraulic fluids, PD-680, and water solutions of these chemicals.

The Air Force collected 10 HydroPunch[®] groundwater samples from soil borings at SS035 during the RI. Samples were analyzed for petroleum hydrocarbons, inorganic constituents, pesticides and PCBs, VOCs, and SVOCs. In addition to groundwater sampling, 56 soil samples and 20 soil gas samples were collected. Sampling locations, constituents analyzed, and results can be obtained in the WIOU RI (Radian, 1996b).

COCs detected in the groundwater during the RI include one VOC and one SVOC: TCE and TPH-E, respectively. Site location, contaminant concentrations, and a conceptual site model are presented in Figure A-15. Other contaminants detected include PCBs and metals in the surface soil, and TCE and vinyl chloride in the soil gas. A contaminant source could not be determined for the PCBs (Radian, 1996b).

A.13.2 Feasibility Study

The alternatives evaluated in the FS for SS035 were Alternative 1 (no action), Alternative 2 (natural attenuation and monitoring), Alternative 4 (extraction, air stripper/catalytic oxidation, activated carbon, and discharge), Alternative 6 (extraction, UV-OX, activated carbon, and discharge), and Alternative 8 (extraction, activated carbon, and discharge). As evaluated in the FS, Alternative 1 had the lowest cost, but the lowest total score. Alternative 2 had a capital cost of \$18,600, a first year O&M cost of \$72,000, and a total score of 16. Alternatives 4, 6, and 8 all had scores of 33. Capital and first year O&M costs for these three alternatives were \$310,000 capital with \$77,000 O&M for Alternative 4; \$376,000 capital with \$100,000 O&M for Alternative 6; and \$190,000 capital with \$100,000 O&M for Alternative 8.

A.13.3 Selected Interim Remedial Actions/Objectives

Selection of an alternative is deferred for the groundwater at SS035 until the final Groundwater ROD. This will allow site-specific data to be collected and evaluated to support the use of natural attenuation as a remedial action. Natural attenuation appears to be a viable alternative for this site because the area of contamination appears to be stable, TCE concentrations in groundwater are low (average of 5 μ g/L) and the areal extent is limited. In addition, TPH is present for cometabolism and TCE degradation by-products were detected indicating that natural attenuation is occurring. Additional data regarding natural attenuation will be developed for evaluation as part of the Basewide Natural Attenuation Assessment Plan.

The interface between the storm sewer and contaminated groundwater will be investigated during the RD (see Figure 3-6). At locations where the contaminated groundwater is found to be migrating to the storm sewer or creek, an interim remedial action, such as pump and treat, will be used to control significant migration. Where pump and treat is used, the effectiveness of this action will be monitored and if it is found that the pump and treat action is not adequately controlling the migration, a contingency action, such as repair or lining of the storm sewer will be initiated.

A.13.4 Conceptual Site Model

The probable source of the groundwater contamination was identified as the OWS associated with Facility 818. Surface soil contamination, including PCBs, was identified at SS035 during the RI. The soil contamination is located near Building 818 and is not related to the groundwater contamination. Remediation of the surface soils is not expected to affect groundwater.





SS035 (Facility 818/819)

Primary Contaminants, Remediation Drivers and Affected Media

Medium	Contaminant Type	Remedia Drive	
Groundwater	VOCs	Exceeds	
Groundwater	SVOCs	Exceeds S	

Site Characteristics

- Asphalt and roadbase covers most of the site
- · Facility 818/819 includes a wash area, oil/water separator and sump, hydraulic lift storage area, and hazardous material accumulation area
- · TCE in groundwater 5 μg/L average, 21 μg/L maximum
- no evidence of DNAPL or LNAPL
- Depth to groundwater 15 feet
- · Low permeability soils (clay and silt) to about 15 feet bgs
- · More permeable material (sand lens) encountered throughout site
- · Site also studied for surface soil contamination

Selected Interim Remedial Action/Objectives

· Deferred: Site will be included in the Basewide Natural Attenuation Assessment Plan

Feasibility Study Treatment Alternatives and Associated Costs

- · Alternative 2: Natural Attenuation/Monitoring: Capital Cost = \$18,600; First Year O & M = \$72,000
- · Alternative 3: Extraction, Treatment and Discharge - FS Alternative 4: Air Stripper/Catalytic Oxidation, Activated Carbon:
- Capital Cost = \$310,000; First Year O & M = \$77,000
- FS Alternative 6: UV Oxidation, Activated Carbon: Capital Cost = \$376,000; First Year O & M = \$100,000
- FS Alternative 8: Activated Carbon:
- Capital Cost = \$190,000; First Year O & M = \$100,000
- These costs derived from the FS will be refined during the remedial design phase based on combination of alternatives and site specific variables

iation Contaminant /er of Concern MCL TCE Standard TPH-E

Maximum Reported Concentration

21 µg/L 160 µg/L

Estimated mass of dissolved VOCs equals 0.007 lb, estimated plume volume equals 12,000 ft³;

Figure A-15. **Site Summary Information** for SS035, Travis AFB

A.14 SITE SD036 (FACILITIES 872/873/876)

A.14.1 Site Background

Site SD036, located in the western portion of the WIOU, covers approximately 6 acres, and is comprised of Facilities 872, 873, and 876. The three facilities were constructed in 1953 as multiple use shops for Civil Engineering (CE). Facility 872 is currently used for maintenance and storage of CE vehicles and landscaping equipment. An OWS previously located at the facility was removed in 1994. Facility 873 contains the CE interior electric, locksmith, and paint shop. Facility 876 is used for paint mixing. An accumulation area for waste paints and thinner is adjacent to the facility. Chemicals used at this site include cleaning solutions, grease, degreasers, hydraulic oils and fluids, PD-680, pesticides, paints, and solvents.

The Air Force sampled groundwater from 25 locations at SD036 during the RI. Samples were collected from soil borings, CPT locations, and groundwater monitoring wells. Groundwater samples were analyzed for petroleum hydrocarbons, inorganic constituents, pesticides and PCBs, VOCs, and SVOCs. In addition to groundwater sampling, 36 soil gas samples and 31 soil samples were collected at SD036. Sampling locations, constituents analyzed, and results can be obtained in the WIOU RI (Radian, 1996b).

Classes of COCs detected in the groundwater at SD036 during the RI include VOCs and one SVOC. VOCs identified as COCs include vinyl chloride, TCE, 1,1-DCE, cis-1,2-DCE, 1,2-DCA, benzene, bromodichloromethane, PCE, and TPH-G. TPH-E was identified as a SVOC COC. Site location, groundwater contaminant concentrations, and a conceptual site model are presented in Figure A-16. Additional contamination detected during the RI includes several VOCs in the soil and soil gas, and SVOCs in the soil gas (Radian, 1996b).

A natural attenuation study will be conducted at SD036 to evaluate the feasibility of natural attenuation of chlorinated solvents using a technical protocol jointly developed by AFCEE and U.S. EPA.

A.14.2 Feasibility Study

The alternatives evaluated in the FS for SD036 were Alternative 1 (no action), Alternative 2 (natural attenuation and monitoring), Alternative 3 (extraction, air stripper/catalytic oxidation, ion exchange, activated carbon, and discharge), Alternative 5 (extraction, UV-OX, ion exchange, activated carbon, and discharge), and Alternative 7 (extraction, ion exchange, activated carbon, and discharge). As evaluated in the FS, Alternative 1 had the lowest cost, but also the lowest total score. Alternative 2 had a capital cost of \$18,600, a first year O&M cost of \$72,000, and a score of 16. Alternatives 3, 5, and 7 had scores ranging from 27 to 31. Capital and first year O&M costs for these three alternatives were \$795,000 capital with \$110,000 O&M for Alternative 3; \$860,000 capital with \$144,000 O&M for Alternative 5; and \$2.3 million capital with \$1.9 million O&M for Alternative 7.

A.14.3 Selected Interim Remedial Actions/Objectives

The selected interim action for groundwater at SD036 is Alternative 3, Extraction, Treatment, and Discharge using source and migration control. Source control is necessary to address cis-1,2-DCE concentrations greater than 3,000 μ g/L. Prior to the design and installation of the extraction system, the site will be evaluated for natural attenuation. Results of this natural attenuation study will be used to assess the need for an active extraction interim action.

A.14.4 Conceptual Site Model

Sources of groundwater contamination at Facilities 872, 873, and 876 include the OWS and wash rack at Facility 872 as well as the hazardous waste storage area at Facilities 873 and 876 (Radian, 1996b). Contaminants in the soil gas at SD036 includes TCE, vinyl chloride, 1,1-DCE, cis-1,2-DCE, benzene, PCE, and TPH-G, and were used to determine soil and groundwater sampling locations for the RI. Contaminants in the soil include TPH-G and TPH-E. Because these contaminants are also present in the groundwater, they may contribute to

contamination in the soil. Any activities conducted to remediate the groundwater could have an effect on the soil.

A.14.5 Special Site Considerations

At SD036 a natural attenuation study is being performed by AFCEE. This study will evaluate the site using natural attenuation protocol developed by U.S. EPA and AFCEE. The migration and source control actions selected for this site will be deferred until results of the study are reviewed, estimated to be late 1998. Based on the results, the migration control and source control actions will be implemented or reevaluated.





SD036 (Facilities 872/873/876)

Primary Contaminants, Remediation Drivers and Affected Media

Medium	Contaminant Type	Remediation Driver	Contaminant of Concern	Maximum Reported Concentration
Groundwater	VOCs	HR = 2.1 x 10 ⁻³	Vinyl Chloride	198 mg/L
Groundwater	VOCs	HR = 2.4 x 10⁵	TCE	308 mg/L
Groundwater	VOCs	HR = 2.2 x 10 ^{-₅}	1,1-DCE	3.71 mg/L
Groundwater	VOCs	HI = 6.2	cis-1,2-DCE	3,870 mg/L
Groundwater	VOCs	Exceeds MCL	1,2-DCA	1.36 mg/L
Groundwater	VOCs	HR = 1.2 x 10 ⁻⁶	Benzene	3.87 mg/L
Groundwater	VOCs	HR = 1.0 x 10 ⁻⁶	Bromodichloromethane	2.26 mg/L
Groundwater	VOCs	HR = 1.6 x 10 ⁻⁴	PCE	382 mg/L
Groundwater	VOCs	NA	TPH-gasoline	4,380 mg/L
Groundwater	SVOCs	NA	TPH-E	480 mg/L

Site Characteristics

- The site is paved with two to four feet of asphalt and road base material and is surrounded by buildings
- The site is active
- · Site is adjacent to SD037 groundwater plumes are mixed
- TCE and cis-1,2-DCE in groundwater 2,900 mg/L average TCE and DCE, 3,870 mg/L maximum cis-1,2-DCE
- Estimated contaminated groundwater surface area = 153,000 ft², volume = 610,000 ft³
- · Estimated mass of dissolved VOCs equals 140 lb; DNAPL may be present
- · Cu and Hg were measured at concentrations greater than NPDES discharge limits in some monitoring wells
- Depth to groundwater 10 feet; depth to bedrock >30 feet
- · Low permeability alluvium (clay) from 4 to 9.5 feet bgs, and moderate permeability alluvium (clayey sand) from 8 to 18 feet bgs
- · Thick, discontinuous sand units
- · Site also studied for soil contamination

Selected Interim Remedial Action/Objectives

- Alternative 2: Natural Attenuation/Monitoring
- Based on completed Natural Attenuation Study
- Migration Control (TCE) depending on results of Natural Attenuation Study
- Alternative 3: Extraction, Treatment and Discharge
- Source Control (DCE) depending on results of Natural Attenuation Study

Feasibility Study Treatment Alternatives and Associated Costs

- Alternative 2: Natural Attenuation/Monitoring: Capital Cost = \$18,600; First Year O & M = \$72,000
- · Alternative 3: Extraction, Treatment and Discharge
- FS Alternative 3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon: Capital Cost = \$795,000; First Year O & M = \$110,000
- FS Alternative 5: UV Oxidation, Ion Exchange, Activated Carbon: Capital Cost = \$860,000; First Year O & M = \$144,000
- FS Alternative 7: Ion Exchange, Activated Carbon:
- Capital Cost = \$2,300,000; First Year O & M = \$1,900,000 These costs derived from FS will be refined during the remedial design phase
- based on combination of alternatives and site specific variables

Interim Design Assumptions

- · 2 horizontal wells, 300 feet in screened length each (NOTE: Location and number of wells will be determined during the remedial design phase)
- Extraction rate 30 gpm total, 15 gpm from each well
- 550 feet of untreated water piping
- (from well to treatment system) 1 inch ID, sch 80 PVC
- 70 feet of discharge piping (to west branch of Union Creek) 2 inch ID, sch 80 PVC
- 70 feet from treatment system to existing power line

Figure A-16. **Site Summary Information** for SD036, Travis AFB

A.15 SITE SD037 (SANITARY SEWER SYSTEM, FACILITIES 837, 838, 919, 977, AND 981, AREA G RAMP, AND RAGSDALE/V AREA)

A.15.1 Site Background

Site SD037 covers approximately 90 acres and encompasses a large portion of the WIOU including the Sanitary Sewer System, Facilities 837, 838, 919, 977, and 981, the Area G Ramp, and the Ragsdale/V Area. The portion of the Sanitary Sewer System encompassed by this site includes approximately 22,000 feet of underground piping, which is used to deliver domestic and industrial wastewater from facilities within the WIOU, to the Fairfield-Suisun publicly-owned treatment works. Dissolved contamination in the groundwater at SD037 migrated from broken or damaged areas of the sanitary sewer system.

Facilities 837 and 838 were constructed in 1954 and used for aircraft maintenance. They are currently used as office buildings. Both facilities contain a sump that has been abandoned in place and a transformer that formerly contained PCBs. Facility 919, constructed in 1984, is used to maintain heavy equipment and contains an OWS which discharges to the sanitary sewer. A wash rack and hazardous waste accumulation area are located east of the facility. Facility 977, constructed in 1972, is used as an air terminal where personnel use hydraulic equipment to load and unload cargo. In the past, leaks were reported from the hydraulic rams (Radian, 1996b). These rams have since been replaced and are now periodically checked for leaks. Facility 981, located northeast of Facility 977, was constructed in 1975. A waste accumulation area was located northeast of the facility, and a vehicle wash area was located east of the facility.

The Area G Ramp, located just south of Facility 977, contains a hydrant system used for fueling aircraft. The hydrant system consists of a pressurized fuel pipeline and aircraft fueling spots, each with a riser pipe which can be attached to a pump truck. The Ragsdale/V Area encompasses an open grassy area at the intersection of Ragsdale and V streets which contains a jet fuel distribution piping system. Chemicals used and handled in these areas include wastewater, oils, hydraulic fluids, fuels, transformer fluids, and chlorinated solvents.

During the RI, groundwater samples were collected from 128 locations at SD037:

- 6 HydroPunch[®] samples were collected from the Area G Ramp;
- 6 HydroPunch[®] samples and 1 monitoring well sample were collected from the vicinity of Facility 981;
- 4 groundwater samples were collected from the vicinity of Facility 977; and
- 111 groundwater samples (87 HydroPunch[®] samples and 24 monitoring well samples) were collected along the Sanitary Sewer System, which includes the Ragsdale/V area and the vicinity of Facilities 837, 838, and 919. Groundwater samples were analyzed for petroleum products, inorganic constituents, pesticides and PCBs, VOCs, and SVOCs (Radian, 1996b).

In addition to groundwater samples, subsurface soil, surface water, surface emission flux, sediment, and surface soil samples were collected at SD037:

- At Facility 977, 4 soil samples were collected;
- At Facility 981, 1 surface water sample, 1 sediment sample, 7 surface soil samples, 12 soil gas samples, and 12 subsurface soil samples were collected;
- At the Area G Ramp, 5 soil samples and 12 soil gas samples were collected; and
- Along the Sanitary Sewer System (including Facilities 919, 837, and 838), 63 soil samples and 7 surface emission flux samples were collected.

Sampling locations, constituents analyzed, and results can be obtained in the WIOU RI (Radian, 1996b).

Classes of COCs detected in the groundwater at SD037 during the RI include VOCs and SVOCs. VOCs identified as COCs include 1,1-DCE, 1,2-DCA, benzene, bromodichloromethane, carbon tetrachloride, chloromethane, PCE, TCE, vinyl chloride, cis-1,2-DCE, and TPH-G. SVOCs identified as COCs include bis(2-ethylhexyl)phthalate, naphthalene, and TPH-E. Site location, contaminant concentrations, and a conceptual site model are presented in Figure A-17.

Contaminants of concern detected in the subsurface soils include VOCs, petroleum hydrocarbons, and SVOCs. Metals were identified at isolated locations in the surface soil.

A.15.2 Feasibility Study

The alternatives evaluated in the FS for SD037 were Alternative 1 (no action), Alternative 2 (natural attenuation and monitoring), Alternative 3 (extraction, air stripper/catalytic oxidation, ion exchange, activated carbon, and discharge), Alternative 5 (extraction, UV-OX, ion exchange, activated carbon, and discharge), and Alternative 7 (extraction, ion exchange, activated carbon, and discharge). As evaluated in the FS, Alternative 3 had the lowest cost, but also the lowest total score. Alternative 2 has a capital cost of \$18,600, a first year O&M cost of \$72,000, and a score of 16. Alternatives 3, 5, and 7 had similar scores ranging from 27 to 29. Capital and first year O&M costs for these three alternatives were \$2.6 million capital with \$210,000 O&M for Alternative 3; \$2.7 million capital with \$260,000 O&M for Alternative 5; and \$3.2 million capital with \$1.3 million O&M for Alternative 7.

A.15.3 Selected Interim Remedial Actions/Objectives

The selected interim action for groundwater at SD037 includes a combination of Alternative 3, Extraction, Treatment, and Discharge using source and migration control, and Alternative 2, Natural Attenuation with groundwater monitoring. Source control will be done in one area near Facilities 837 and 838, and migration control will be done in four areas north and south of these facilities. Natural attenuation will be used in other areas of the site with low contaminant concentrations, and the plume appears to be stable.

Source control is selected in areas where a DNAPL is suspected because TCE concentrations are greater than or equal to $3,000 \ \mu g/L$. Migration control is required in areas where contaminants have the greatest potential to discharge to the West Branch of Union Creek.

Selection of an alternative is deferred for the remainder of the plume until the final Groundwater ROD. This will allow site-specific data to be collected and evaluated in support of using natural attenuation as a remedial action. Natural attenuation appears to be a viable alternative because concentrations are low, and the area is paved, limiting the infiltration of water which could mobilize contaminants and present an impervious barrier to potential human and ecological receptors. Additional data regarding natural attenuation will be developed for evaluation as part of the Basewide Natural Attenuation Assessment Plan.

The interface between the storm sewer and contaminated groundwater will be investigated during the RD (see Figure 3-6). At locations where the contaminated groundwater is found to be migrating to the storm sewer or creek, an interim remedial action, such as pump and treat, will be used to control significant migration. Where pump and treat is used, the effectiveness of this action will be monitored and if it is found that the pump and treat action is not adequately controlling the migration, a contingency action, such as repair or lining of the storm sewer will be initiated.

A.15.4 Conceptual Site Model

The vehicle wash area at Facility 981 was a source of groundwater contamination. Hazardous waste and surface spill areas where oily rags, waste oil, and vehicle wash wastewater are potentially released contributed to contamination. The jet fuel distribution pipeline at the Area G Ramp was a source of groundwater contamination. Hydraulic equipment at Facility 977, which may have released hydraulic fluids and oils, contributed to groundwater contamination at SD037. The Sanitary Sewer System and OWSs and wash racks connected to it was a source of groundwater contamination. Antifreeze, contaminated gasoline and diesel, transmission fluid, and waste oil were potentially released from heavy equipment maintenance operations at Facility 919. Transformer fluid was potentially released from OWSs and sumps, USTs, hazardous waste storage, and surface spill areas near Facilities 837 and 838.

Surface soil and subsurface soil contamination have also been identified in several locations within SD037. The soil contamination includes VOCs, SVOCs, and metals. The surface soil contaminants have not impacted groundwater, and any soil cleanup action would probably not affect groundwater. There are several locations of TPH contamination in the soil, some of which may be related to groundwater contamination (that is, groundwater directly underneath the contaminated soil has similar contamination). Soil contamination in these areas will be addressed using natural attenuation.

A.15.5 Special Site Considerations

The SD034 plume and a portion of the SD037 plume are commingled; interim remedial actions will be coordinated to ensure that the extraction system is optimized, and the most cost effective interim remedial action is design and implemented.





SD037 (Sanitary Sewer System, Facilities 837, 838, 919, 977 and 981, Area G Ramp and Ragsdale/V Area)

Primary Contaminants, Remediation Drivers and Affected Media				
Medium	Contaminant Type	Remediation Driver	Contaminant of Concern	Maximum Reported Concentration
Groundwater	VOCs	HR = 1.1 x 10 ⁻⁶	1,1-DCE	0.598 mg/L
Groundwater	VOCs	Exceeds MCL	1,2-DCA	0.597 mg/L
Groundwater	VOCs	HR = 1.9 x 10 ⁻⁷	Benzene	14 mg/L
Groundwater	VOCs	Exceeds MCL	Bromodichloromethane	0.69 mg/L
Groundwater	VOCs	Exceeds MCL	Carbon Tetrachloride	60.7 mg/L
Groundwater	VOCs	HR = 1.3 x 10 ⁻⁸	Chloromethane	1.03 mg/L
Groundwater	VOCs	HR = 4.6 x 10 ⁻⁵	PCE	407 mg/L
Groundwater	VOCs	HR = 5.4 x 10 ⁻⁵	TCE	6,990 mg/L
Groundwater	VOCs	HR = 6.0 x 10 ⁻⁵	Vinyl Chloride	60.2 mg/L
Groundwater	VOCs	Exceeds MCL	cis-1,2-DCE	340 mg/L
Groundwater	VOCs	NA	TPH-Gasoline	4,160 mg/L
Groundwater	SVOCs	HR = 1.4 x 10 ⁻⁶	bis(2-ethylhexyl)phthalate	139 mg/L
Groundwater	SVOCs	Exceeds MCL	Napthalene	115 mg/L
Groundwater	SVOCs	NA	ΤΡΗ-Ε	2,660,000 mg/L

Site Characteristics

- oil water separators, sumps, and wash racks
- TCE in groundwater 1,220 mg/L average, 6,990 mg/L maximum
- Estimated contaminated groundwater surface area = 1,100,000 ft², volume = 4,500,000 ft³
- Estimated mass of dissolved VOCs equals 390 lb, estimated plume volume equals 4,500,000 ft³; DNAPL may be present
- · Copper and silver were measured at concentrations greater than NPDES levels in some monitoring wells
- Depth to groundwater 10 feet, depth to bedrock 30 feet
- · Subsurface geology beneath the sanitary sewer system varies
- · In general, low permeability alluvium underlies the area with discontinuous permeable layers
- Weathered sandstone and shale interbed to form bedrock layer beneath the alluvium
- · Site also studied for surface and sub-surface soil contamination
- · Storm sewer is a potential groundwater/surface water pathway

Selected Interim Remedial Action/Objectives

- Alternative 3: Extraction, Treatment and Discharge
- Source Control (Facility 837/838 and Ragsdale/V Areas) - Migration Control
- Selection is deferred for remainder of site (southern end), area will be included in the **Basewide Natural Attenuation Assessment Plan**

Feasibility Study Treatment Alternatives and Associated Costs

- Alternative 2: Natural Attenuation/Monitoring: Capital Cost = \$18,600; First Year O & M = \$72,000
- · Alternative 3: Extraction, Treatment and Discharge
- FS Alternative 3: Air Stripper/Catalytic Oxidation, Ion Exchange, Activated Carbon: Capital Cost = \$2,600,000; First Year O & M = \$210,000
- FS Alternative 5: UV Oxidation, Ion Exchange, Activated Carbon: Capital Cost = \$2,700,000; First Year O & M = \$260,000
- FS Alternative 7: Ion Exchange, Activated Carbon
- Capital Cost = \$3,200,000; First Year O & M = \$1,300,000

Interim Design Assumptions

- · 5 horizontal wells, 300 feet in screened length (NOTE: Location and number of wells will be determined during remedial design phase)
- Extraction rate 75 gpm total, 15 gpm from each well 4,000 feet of untreated water piping
- (from well to treatment system) 1 inch ID, sch 80 PVC 50 feet of discharge piping
- (to west branch of Union Creek) 3 inch ID, sch 80 PVC
- · 100 feet from treatment system to existing power line
- Determine groundwater/surface water interactions, and design appropriate response

· The sanitary sewer system includes approximately 22,000 feet of piping, as well as associated

These costs derived from the FS will be refined during the remedial design phase based on combination of alternatives

Figure A-17. **Site Summary Information** for SD037, Travis AFB