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Project Chemist

ENCL. NO.	TYPE OF DELIVERABLE	VERSION	DESCRIPTION OF DELIVERABLE	DATE	NUMBER OF PAGES
1.	Technical Memorandum	Draft	PL81 South Limited Field Investigation Dye Tracer Technical Memorandum (CDRL A007)	6/23/05	See Document

REMARKS: Please provide any suggestions you may have on the content of this report.

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SUBJECT: TECHNICAL MEMORANDUM FOR DYE TRACER STUDY AT PL81 SOUTH

Background:

PL81 is a pipeline corridor that contained two fuel pipelines connecting the Port of Anchorage with storage tanks on Elmendorf Air Force Base (EAFB). One pipeline was removed in 1998, at which time soil contamination was encountered. A Remedial Investigation/Feasibility Study was conducted in 1994. Significant groundwater contamination exists at two areas within the corridor; PL81 North and PL81 South.

The activities described herein are limited to the PL81 South site. PL81 South is located east of former landfill LF04. The purpose of this field effort is to conduct a qualitative dye test to determine if the groundwater at PL81 South is in fact contributing to the beach seep located below LF04. One groundwater qualitative dye test will be performed under this task.

Monitoring well OU6MW-63 is a part of the base-wide groundwater monitoring program. Well OU6MW-63 is screened in Aquifer 2 between 33.5 feet and 48.5 feet below ground surface (bgs). Groundwater level at this well has historically been approximately 40 feet bgs, which is equivalent to 103 feet above mean sea level. This elevation is up gradient of the adjacent beach seep; therefore OU6MW-63 will be used for the dye tracer test. Based on the slug test data from the 1994 RI/FS, a groundwater velocity of 1.28 feet per day to LF04-SP02 was calculated. Based on this groundwater velocity, it is estimated that the dye will take approximately 120 days (four months) to reach the beach seep.

Tracer Test Design:

Tracer tests are used to "trace" the path of flowing water. Tracer tests are conducted in pipelines, lakes, rivers and groundwater. The tracer chemical must be dissolved in water at concentrations that do not significantly change the aqueous density. Tracer chemicals must behave conservatively meaning no mass is lost through reaction or partitioning into differing phases (vapor, solids). Thus, the only solute transport processes affecting a conservative tracer are advection and dispersion. Advection is the movement of the solute (dissolved tracer) due to groundwater flowing and moving. The mean pore-water velocity (calculated from Darcy's Law) is used to predict advection. As the pore-water velocities within the groundwater are not uniform (variability around the mean velocity), some solute will move slower than the mean velocity and other solute will move faster than the mean velocity. The resulting dispersion of the solute causes a broadening of the solute plume and a decrease in the concentration. Approximately 50% of the original dye concentration is expected to be observed at the seep.

The most common tracers used in groundwater studies are fluorescent dyes such as fluorescein and

rhodamine. Rhodamine dye will be used for the PL81 South Tracer Test. Rhodamine will not photodegrade like fluorescein and is widely used for drinking water systems for its safety, convenience, and stability. Samples may be stored for an extended period of time before analysis with a fluorometer. Although rhodamine may sorb onto the aquifer solids to some extent, its distinctive ability to absorb green light and emit red light limits possible interferences from other substances.

Dye studies can be done using visual or instrument evaluation. Instrument evaluation is much more sensitive than visual inspection (approximately 100 parts per billion (ppb) compared to 10 parts per trillion (ppt) respectively). To assure dye adequate detection, a fluorometer will be rented for the analysis of all seep samples collected during the monitoring effort. The fluorometer will be configured to shine green light on the groundwater sample and detect red light emitted by the rhodamine dye. The amount of red light emitted is directly proportional to the concentration of dye.

Pre-Mobilization Activities:

The following activities will occur prior to beginning the dye tracer test field activities:

All required materials will be purchased and equipment rental scheduled.

A site walk will be conducted July 7, 2005.

Proposed Field Activities:

A background seep sample will be collected prior to the addition of the dye to the well. Jacobs will post signs at the seep area indicating that a dye test is being conducted. Approximately 23 pounds of dye will be added to OU6MW-63. (See attachment for dye concentration calculations.)

Jacobs will begin weekly monitoring for the dye 30 days prior to the four month target and continue as necessary. Eight beach seep monitoring trips have been estimated to complete this monitoring task (July through November 2005).

Samples will be collected during each monitoring event and stored in amber glass containers at 4 degrees Celsius (°C). At the completion of the monitoring duration, the Turner Designs 10-AU fluorometer will be rented for the analysis of all the seep samples collected.

A standard of known concentration no greater than the linear range of the tracer (for rhodamine dye, approximately 100 ppb) dye will be prepared and used to calibrate the fluorometer. The fluorometer readings of the seep samples collected will be compared to the standard to obtain their concentrations.

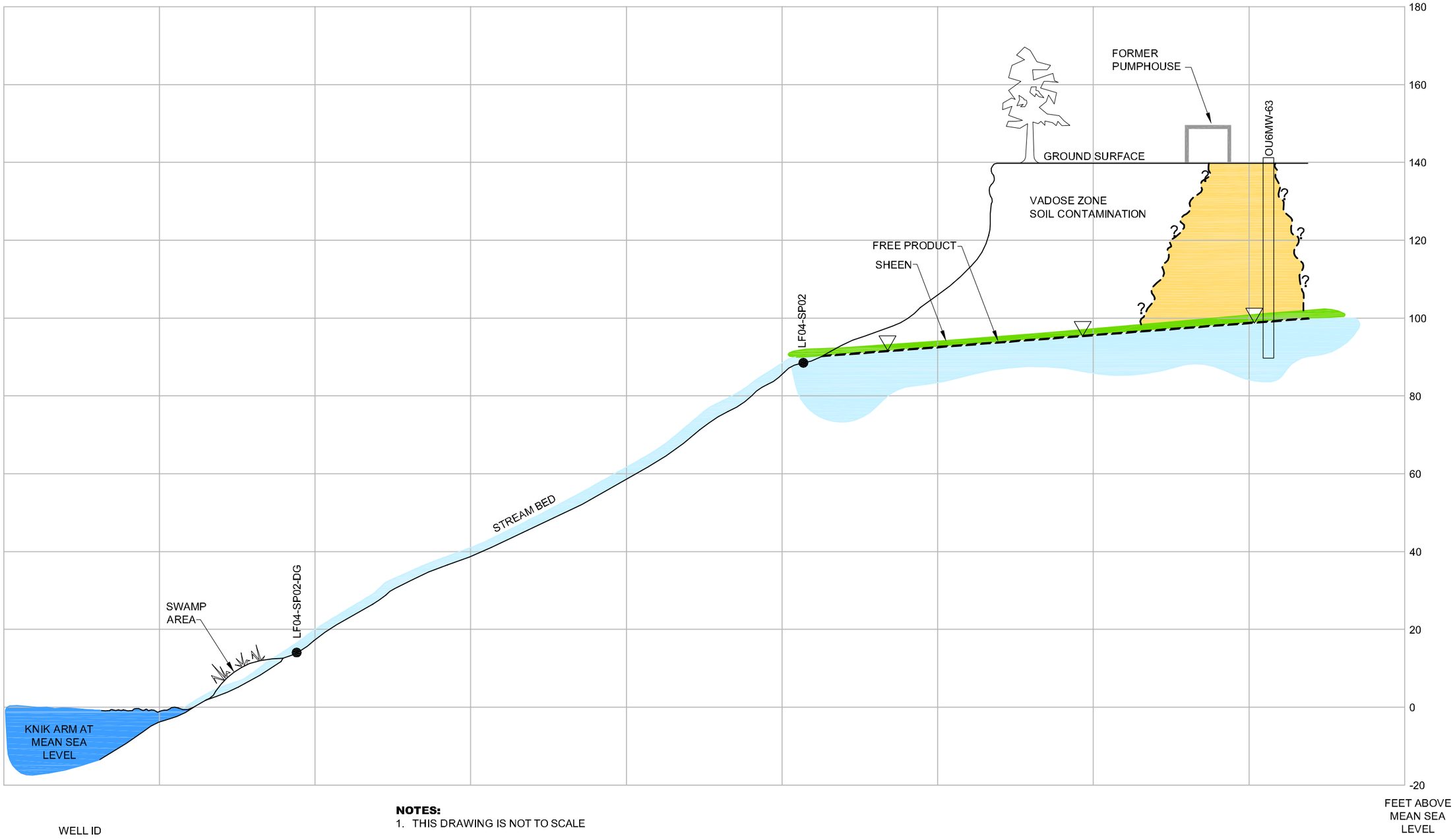
Investigation-Derived Waste: No investigation derived waste other than common trash (i.e. paper waste, containers, ect.) is anticipated for this field effort. At the conclusion of field activities, all waste will be disposed of offsite.

References: Please refer to the 2004 SS83 Removal Action Work Plan for a detailed Health and Safety Plan (HSP) and Quality Assurance Project Plan (QAPP).

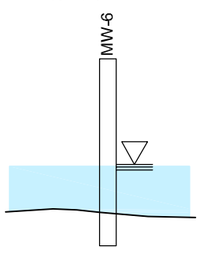
Attachments:

Site figure (Figure 3-16 titled PL81 South Plume Conceptual Site Model from the 2002 Elmendorf Basewide Monitoring report)

Dye concentration calculations



LEGEND:



WELL ID

GROUNDWATER SURFACE LEVEL

GROUNDWATER AQUIFER

GEOLOGIC CONTACT

MONITORING WELL

NOTES:

1. THIS DRAWING IS NOT TO SCALE
2. INFORMATION FOR THIS DRAWING WAS OBTAINED FROM THE ELMENDORF BASEWIDE MONITORING REPORT, FIGURE 3-16, DATED 12-27-02

PL81 SOUTH OU6MW-63 AND
LF04-SP02 SEEPS
CROSS- SECTION
ELMENDORF AFB, ALASKA

PROJECT MANAGER: S. Witzmann	FILE NAME: PL81 South.dwg	DATE: June 23, 05
JE DRAWN BY: AV	LAYOUT TAB: PL81 South	FIGURE NO.: 1-1
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PL81 South Dye Calculations

Parameter	Value	Units	Source
Seepage Velocity (v_s)	**1.28**	**ft/day**	1994 RI/FS
Estimated Average Travel Time	**117**	**days**	1994 RI/FS
Porosity (θ)	0.35		Assumed
Radial distance between between OU6MW63 and Seep 2 (r)	150	feet	Estimated from Figure 4.3-11
Thickness (T)	10	ft/day	Assumed

$$V = \theta \times \pi r^2 \times T$$

Volume (V)	247275	cubic feet
1 cubic foot	= 7.4805195 gallon [US, liquid]	
V	1854562.50	gallons
Dye concentration visibly detected at 100ppb	0.0000001	
	1E-11	
Dye concentration of 10ppt detected using fluorometer		
Density of water	62.4	pounds/cubic foot
Weight of water	115724700	pounds
Amount of dye for 100ppb detection in GW	11.57247	pounds
Amount of dye needed assuming 50% detection at seep	23.14494	pounds