



California Regional Water Quality Control Board

Central Valley Region

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Secretary for
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Protection

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CROWS LANDING
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25 July 2002

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QUARTERLY BASEWIDE GROUNDWATER REPORT, VERIFICATION SAMPLING AND ANALYSIS – WINTER 2002 – SIXTH QUARTER, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA) CROWS LANDING FLIGHT FACILITY, STANISLAUS COUNTY

We have reviewed the *Quarterly Basewide Groundwater Report, Verification Sampling and Analysis – Winter 2002 – Sixth Quarter, NASA Crows Landing Flight Facility, Stanislaus County* (Report), dated 28 June 2002. The Report provides the quarterly groundwater sampling results from the 11 February through 22 February 2002 event. The Report provides monitoring data from selected basewide groundwater monitoring wells at the Underground Storage Tanks (USTs) Cluster 2, Installation Restoration Program (IRP) Site 11, and the Administration Area, which includes the IRP Site 17, UST Cluster 1, and UST 117.

Groundwater was analyzed for the following constituents:

- VOCs (EPA Method 8260), including methyl-tert-butyl-ether (MtBE) and ethylene dibromide (EDB);
- Total Petroleum Hydrocarbons (TPH) as gasoline (-g), JP-4 jet fuel (-j), diesel (-d) and motor oil (-mo) by EPA Method 8015B;
- Alkalinity (EPA Method 310.1)
- Anions (EPA Method 9056 for chloride, nitrate, nitrite, sulfate, and phosphate), and
- Total Dissolved Solids (EPA Method 160.1).

A silica gel cleanup for TPH was performed on all groundwater samples, to remove naturally occurring organics not associated with the petroleum hydrocarbons.

The Report concludes that:

- the analytical results are generally similar to previous quarterly rounds of groundwater sampling and analyses, and do not indicate recent significant changes in the nature or extent of impacted groundwater,
- an additional groundwater investigation is necessary to better delineate the upgradient groundwater plume boundary for UST Cluster 1,
- there is a local groundwater depression in the water table, or shallow (S), and mid-shallow (MS) potentiometric surfaces at the Bell Road (eastern site boundary) monitoring wells 17-MW-25(S) and

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17-MW-25 (MS). The Report suggests that pumping from an off-site agricultural supply well, 6S/8E-16M1, may be causing the local groundwater depression. The Report states that confirmation of 6S/8E-16M1 pumping dates and additional groundwater level data points are needed for further evaluation of the groundwater depression, and

- there is no evidence for gradient reversals as previously reported. The regional groundwater flow direction remains towards the northeast.

General Comments

1. We concur with the scope of work for the proposed groundwater investigation, to better delineate the upgradient Administration Area plume boundary at UST Cluster 1. Please provide 72 hours notice before commencing fieldwork
2. February is typically a wet month, with no irrigation pumping from the aquifer(s). Therefore there should not be any depression of the water table or piezometric surface that can be attributed to pumping from well 6S/8E-16M1. Additionally, other wells [17-MW-24 (S) and 17-MW-24 (MS)] screened in the same aquifer zones, and located at the same distance from 6S/8E-16M1, do not show similar effects. Further, a nearby automated groundwater datalogger in monitoring well 109-MW-01 (S), does not show pumping effects from 6S/8E-16M1. Other factors discussed below may be causing the observed local groundwater depression in the vicinity of monitoring wells 17-MW-25(S) and 17-MW-25 (MS).
 - a. Agricultural supply well 6S/8E-16M1 is listed as both active (in the tabular summary) and stamped destroyed (DWR well data sheet) in the *Draft Findings from Record Search Activities and Visual Inspection of Active and Inactive or Destroyed Water Supply Wells, Former NALF Crows Landing*, dated 13 December 2001. The Department of Water Resources (DWR) well data sheet may not be correct. The Navy should verify the status of well 6S/8E-16M1.
 - b. In a 22 July 2002 phone conversation, the Navy stated that there is a "day tank" next to the 6S/8E-16M1 well house, and that a new well may have been drilled at that location. The Navy should verify whether a new well has been installed at that location.
 - c. The groundwater depression may not be the result of a local effect around monitoring wells 17-MW-25(S) and 17-MW-25 (MS), but a trend in the hydrogeology. An incorrect water level (see specific comment 3) was used to generate Figure 3 (Potentiometric Surface Map). Correcting the error creates a sharper "S" curve in the potentiometric surface contour line representing 84 feet of elevation, which better correlates to the "S" curves in upgradient MS zone potentiometric surface contour lines (85 feet and 86 feet).
 - d. An error of one foot (too low) in the top of casing elevations for monitoring wells 17-MW-25(S) and 17-MW-25 (MS) might account for the observed local groundwater depression. The Navy should verify the top of casing elevations for the following monitoring wells: 17-MW-24 (S), 17-MW-24 (MS), 17-MW-25(S), 17-MW-25 (MS), and 109-MW-01 (S).

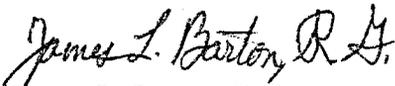
The Navy needs to evaluate all possible causes for the groundwater depression prior to conducting an off-site investigation.

3. The Report was not signed by a California Registered Geologist or Professional Engineer, as required by the California Business Code. Please ensure that future reports are signed by a California Registered Geologist or Professional Engineer.

Specific Comments

1. Section 2.2.3 Groundwater Sampling: The text states that two monitoring wells [117-MW-06 (MD) and 17-MW-10(MS)] were not sampled due to obstructions in the well casings. By **15 September 2002**, please provide a letter Work Plan with the options to rehabilitate, or abandon and replace, the wells.
2. Section 3.2 Groundwater Analytical Results: The text states that general chemistry results presented in the Report will be interpreted in another report. Please provide the name and a proposed release date for the other report, so that we may schedule our review.
3. Figure 3: The potentiometric surface (MS groundwater elevation) value shown for 17-MW-24(MS) (83.34) is incorrect. The correct value for 17-MW-24(MS) from Table 1 is 84.40 feet above mean sea level. Please correct the figure, and issue a replacement page for the Report with the next quarterly report.
4. Figure 6: The Extent of Benzene Impact contour on Figure 6 does not fully represent the extent of petroleum hydrocarbon contamination in groundwater at UST Cluster 2. Contouring TPH-g and TPH-d with benzene would increase the overall petroleum hydrocarbon impacted area to nearly double the area of the benzene plume alone. Please also include TPH impact contours for TPH-g, TPH-d and TPH-j, and TPH-mo detected above water quality objectives (WQOs) for petroleum hydrocarbons in future reports. Please see the attachment for applicable WQOs.
5. Figure 6: While the duplicate sample benzene result for groundwater at monitoring well CL2-MP-02B(S) was 50% higher than the primary sample, only the primary sample was listed in the data box on Figure 6. Also, two UST Cluster 2 detections of TPH-d (510 µg/L and 570 µg/L) were not shown on Figure 6. Please include all TPH (-g, -d, -f, -mo) results and duplicate sample results above WQOs, in the data boxes of similar figures for future reports. If there are no detections for a specific TPH analyte, provide a footnote stating that the specific TPH analyte(s) was not detected at the method detection limit or reporting limit specified in the footnote.
6. Appendix A: Appendix A contains all of the field notes on the Groundwater Monitoring Data Forms. On 12 of the individual well forms over a period of several days, the samplers noted that the "well (was) surging while sampling". Another form states that the well was sampled before purging stability was reached, due to unspecified pump problems. Please explain what the sampler meant by "surging while sampling", what pump problem(s) necessitated sampling before water quality parameters had stabilized in the well, and the effect on the data. For example, was the surging the result of air being entrained into the groundwater discharge (bubbles); was the pump controller defective, or was the pump internally malfunctioning over several days, creating turbulence (uneven discharge) in the groundwater sample discharge? All of these problems can volatilize VOCs, which could affect the data quality of the groundwater analyses.

If you have any questions please contact me at (916) 255-3050 or bartonj@rb5s.swrcb.ca.gov.



James L. Barton, R.G.

Associate Engineering Geologist

Attachment

cc: Ms. Francesca D Onofrio – CALEPA-DTSC, Sacramento
Mr. Mike Sonke – Stanislaus County DER, Modesto
Mr. Donald Chuck – NASA, San Bruno
Ms. Lynn Hornacker – US Navy SWDIV, San Diego



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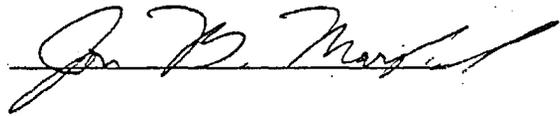
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Gray Davis
Governor

TO: Technical Staff & Other Interested Persons

FROM: Jon B. Marshack, D.Env.
Senior Environmental Specialist
Environmental/Technical Support

DATE: 19 September 2000

SIGNATURE: 

SUBJECT: BENEFICIAL USE-PROTECTIVE WATER QUALITY LIMITS
FOR COMPONENTS OF PETROLEUM-BASED FUELS

In an earlier memorandum, I summarized available water quality limits for petroleum fuel mixtures, constituents and additives. Several of the relevant limits have changed and additional limits have been proposed. The discussion below presents the information contained in my earlier memorandum, along with updated and pending numerical limits in the attached tables.

Discussion:

A significant amount of our work involves the assessment and mitigation of petroleum-based fuel spills into soil and water. Various water quality criteria have been cited by staff in determining whether beneficial uses have been impaired or threatened by such spills. In an effort to achieve uniformity in the use of numerical water quality limits for this purpose and to bring to your attention the wide range of available and relevant criteria, I offer the list on the following pages. These limits are intended to be used to interpret applicable Basin Plan water quality objectives for the protection of existing or potential sources of drinking water. Sources of drinking water are surface and ground waters which have the beneficial use of municipal and domestic supply (MUN), as designated in the applicable *Water Quality Control Plan* (Basin Plan) or the State Water Board "Sources of Drinking Water" Policy, Resolution No. 88-63. Water quality objectives applicable to MUN waters include *Chemical Constituents* (which requires compliance with California drinking water MCLs and generally prohibits adverse effects on beneficial uses), *Toxicity* (which prohibits toxic chemicals in toxic amounts) and *Tastes and Odors* (which prohibits adverse tastes and odors nuisance conditions). Additional objectives and numerical limits may apply to petroleum fuels in surface waters in addition to those contained in this memorandum.

The Basin Plan requires consideration of numerical water quality limits to implement each of these objectives. In most cases, the most stringent of the listed limits for each chemical would implement all three objectives. A discussion of the use of numerical limits to implement narrative water quality objectives is contained in the staff report *A Compilation of Water Quality Goals*, August 2000 edition.

Certain of the recommended limits are lower than applicable analytical detection limits in water. In these cases, the confirmed detection of any amount of these constituents in water indicates that beneficial uses have been impaired.

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In addition, an assessment of existing and potential water quality impacts must take into account State Water Board Resolution Nos. 68-16, *Statement of Policy With Respect to Maintaining High Quality of Waters in California*, and 92-49, *Policies and Procedures for Investigation and Cleanup and Abatement of Discharges Under Water Code Section 13304*. Conformance with these policies in the Central Valley Region is described in the Implementation Chapter of the Basin Plans under the headings, *Antidegradation Implementation Policy*, *Policy for Application of Water Quality Objectives*, and *Policy for Investigation and Cleanup of Contaminated Sites*. Requiring cleanup to technologically and economically achievable levels which are lower than beneficial use-protective limits, would be consistent with these policies for water quality control.

Attachment

J:\Jon HD 1\Documents\W. Q. Goals\Memos\Goals for Fuels 9/2000

Water Quality Numerical Limits for Petroleum Fuel Mixtures, Constituents and Additives

Constituent	Water Quality Objective (a)	Numerical Limit Interpreting Water Quality Objective		
		Source	Limit	Units
Aromatic Hydrocarbons:				
Benzene	Chemical Constituents	California Primary MCL (b)	1.0	ug/L
	Toxicity Tastes and Odors	California Public Health Goal (OEHHA) Amoore and Hautala, <i>J. Applied Tox.</i> , Vol.3, No.6, 1983	0.15 170	ug/L ug/L
n-Butylbenzene	Chemical Constituents	California Drinking Water Action Level (DHS)	70	ug/L
	Toxicity Tastes and Odors			
Ethylbenzene	Chemical Constituents	California Primary MCL (b)	700	ug/L
	Chemical Constituents	Proposed California Primary MCL (d)	300	ug/L
	Toxicity	California Public Health Goal (OEHHA)	300	ug/L
	Tastes and Odors	Federal Register, Vol. 54, No. 97, pp. 22138,22139	29	ug/L
Isopropyl benzene	Chemical Constituents			
	Toxicity Tastes and Odors	USEPA IRIS Reference Dose (i) Amoore and Hautala, <i>J. Applied Tox.</i> , Vol.3, No.6, 1983	700 0.8	ug/L ug/L
Toluene	Chemical Constituents	California Primary MCL (b)	150	ug/L
	Toxicity	California Public Health Goal (OEHHA)	150	ug/L
	Tastes and Odors	Federal Register, Vol. 54, No. 97, pp. 22138,22139	42	ug/L
1,3,5-Trimethylbenzene	Chemical Constituents			
	Toxicity Tastes and Odors	USEPA Health Advisory (g) Amoore and Hautala, <i>J. Applied Tox.</i> , Vol.3, No.6, 1983	100 15	ug/L ug/L
Xylenes (sum of isomers)	Chemical Constituents	California Primary MCL (b)	1750	ug/L
	Toxicity	California Public Health Goal (OEHHA)	1800	ug/L
	Tastes and Odors	Federal Register, Vol. 54, No. 97, pp. 22138,22139	17	ug/L
Aliphatic Hydrocarbons:				
n-Hexane	Chemical Constituents			
	Toxicity Tastes and Odors	USEPA Health Advisory (e) Amoore and Hautala, <i>J. Applied Tox.</i> , Vol.3, No.6, 1983	400 6.4	ug/L ug/L
Hydrocarbon Mixtures:				
Diesel or Kerosene	Chemical Constituents			
	Toxicity Tastes and Odors	USEPA Superfund Provisional Reference Dose (i) Taste 7 odor threshold from USEPA Health Advisory	56-140 100	ug/L ug/L
Gasoline	Chemical Constituents			
	Toxicity Tastes and Odors	USEPA Superfund Provisional Cancer Slope Factor (c) McKee & Wolf, <i>Water Quality Criteria</i> , SWRCB, p. 230	21 5	ug/L ug/L
Additives:				
Lead	Chemical Constituents	California Primary MCL (b)	15	ug/L
	Toxicity (h) Tastes and Odors	California Public Health Goal (OEHHA)	2	ug/L
Ethylene dibromide (EDB)	Chemical Constituents	California Primary MCL (b)	0.05	ug/L
	Toxicity Tastes and Odors	Cal/EPA Cancer Potency (c)	0.0097	ug/L
Ethylene dichloride (1,2-Dichloroethane)	Chemical Constituents	California Primary MCL (b)	0.5	ug/L
	Toxicity	California Public Health Goal (OEHHA)	0.4	ug/L
	Tastes and Odors	Amoore and Hautala, <i>J. Applied Tox.</i> , Vol.3, No.6, 1983	7000	ug/L
Methyl t-butyl ether (MtBE)	Chemical Constituents	California Primary MCL (b)	13	ug/L
	Chemical Constituents	California Secondary MCL (f)	5	ug/L
	Toxicity	California Public Health Goal (OEHHA)	13	ug/L
	Tastes and Odors	California Secondary MCL	5	ug/L
Di-isopropyl ether (DIPE)	Chemical Constituents			
	Toxicity Tastes and Odors	Amoore and Hautala, <i>J. Applied Tox.</i> , Vol.3, No.6, 1983	0.8	ug/L
t-Butyl alcohol (TBA)	Chemical Constituents			
	Toxicity Tastes and Odors	California Drinking Water Action Level (DHS) Amoore and Hautala, <i>J. Applied Tox.</i> , Vol.3, No.6, 1983	12 290,000	ug/L ug/L
Ethanol †	Chemical Constituents			
	Toxicity Tastes and Odors	Amoore and Hautala, <i>J. Applied Tox.</i> , Vol.3, No.6, 1983	760,000	ug/L
Methanol	Chemical Constituents			
	Toxicity Tastes and Odors	USEPA IRIS Reference Dose (i) Amoore and Hautala, <i>J. Applied Tox.</i> , Vol.3, No.6, 1983	3500 740,000	ug/L ug/L

Water Quality Numerical Limits for Petroleum Fuel Mixtures, Constituents and Additives

Constituent	Water Quality Objective (a)	Numerical Limit Interpreting Water Quality Objective		
		Source	Limit	Units
<i>Polynuclear Aromatic Hydrocarbons (PAHs or PHAs):</i>				
Carcinogenic PAHs -- sum as benzo(a)pyrene equivalents (j)	Chemical Constituents Toxicity Tastes and Odors	Cal/EPA Cancer Potency (c)	0.0029	ug/L
Acenaphthene	Chemical Constituents Toxicity Tastes and Odors	USEPA IRIS Reference Dose (i) USEPA National Ambient Water Quality Criteria	420 20	ug/L ug/L
Anthracene	Chemical Constituents Toxicity Tastes and Odors	USEPA IRIS Reference Dose (i)	2100	ug/L
Benz(a)anthracene	Chemical Constituents Toxicity Tastes and Odors	Proposed USEPA Primary MCL (d) see "Carcinogenic PAHs" above	0.1	ug/L
Benzo(a)pyrene	Chemical Constituents Toxicity Tastes and Odors	California Primary MCL (b) see "Carcinogenic PAHs" above	0.2	ug/L
Dibenz(a,h)anthracene	Chemical Constituents Toxicity Tastes and Odors	Cal/EPA Cancer Potency (c)	0.0085	ug/L
7,12-Dimethylbenz(a)anthracene	Chemical Constituents Toxicity Tastes and Odors	Cal/EPA Cancer Potency (c)	0.00014	ug/L
Fluoranthene	Chemical Constituents Toxicity Tastes and Odors	USEPA IRIS Reference Dose (i)	280	ug/L
Fluorene	Chemical Constituents Toxicity Tastes and Odors	USEPA IRIS Reference Dose (i)	280	ug/L
Naphthalene	Chemical Constituents Toxicity Tastes and Odors	USEPA IRIS Reference Dose (i) Amoore and Hautala, <i>J. Applied Tox.</i> , Vol.3, No.6, 1983	14 21	ug/L ug/L
Pyrene	Chemical Constituents Toxicity Tastes and Odors	USEPA IRIS Reference Dose (i)	210	ug/L

Notes:

- (a) Water Quality Objectives for groundwater from the *Water Quality Control Plan (Basin Plan) for the Sacramento River Basin and the San Joaquin River Basin*, Fourth Edition (1998):

Chemical Constituents

Ground waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.

At a minimum, ground waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs) specified in the following provisions of Title 22 of the California Code of Regulations, which are incorporated by reference into this plan: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Tables 64449-A (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits) and 64449-B (Secondary Maximum Contaminant Levels-Ranges) of Section 64449. This incorporation-by-reference is prospective, including future changes to the incorporated provisions as the changes take effect. At a minimum, water designated for use as domestic or municipal supply (MUN) shall not contain lead in excess of 0.015 mg/l. To protect all beneficial uses, the Regional Water Board may apply limits more stringent than MCLs.

Toxicity

Ground waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life associated with designated beneficial use(s). This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances.

Tastes and Odors

Ground waters shall not contain taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

- (b) Primary MCLs are human health based, but also may reflect other factors relating to technologic and economic feasibility of attainment and monitoring in a water distribution system and at the tap. These factors may not be relevant for the water resource.
- (c) 1-in-a-million cancer risk estimate derived from published oral cancer slope factor by assuming 2 liters/day water consumption and 70 kg body weight.
- (d) If adopted as proposed, this limit would become the numerical limit used to interpret this objective.

Water Quality Numerical Limits for Petroleum Fuel Mixtures, Constituents and Additives

Notes (continued):

- (e) Health advisory = 4000 ug/L for 10 day exposure or less. No lifetime exposure advisory has been developed. However, lifetime health advisories are normally at least ten-fold lower than 10-day advisories. Therefore, a level of 400 ug/L would be a reasonable estimate of a lifetime protective level.
- (f) Secondary MCLs are human welfare based, but also may reflect other factors relating to technologic and economic feasibility of attainment and monitoring in a water distribution system and at the tap. These factors may not be relevant for the water resource.
- (g) Health advisory = 10,000 ug/L for 1 day exposure or less. No lifetime exposure advisory has been developed. However, lifetime health advisories are normally at least 100-fold lower than 1-day advisories. Therefore, a level of 100 ug/L would be a reasonable estimate of a lifetime protective level.
- (h) Liability under Proposition 65 may also exist for responsible parties where levels in water exceed 0.25 ug/L.
- (i) Listed value assumes 2 liters/day water consumption, 70 kg body weight, and 20% relative source contribution from drinking water.
- (j) Concentrations of individual PAHs are adjusted by dividing the concentrations by the potency equivalency factors (PEFs) in the table on the following page. The limit applies to the sum of these adjusted concentrations.

Office of Environmental Health Hazard Assessment (OEHHA)
 Weighting Scheme for Polyaromatic Hydrocarbons (PAH's)

<u>PAH or derivative</u>	<u>CAS number</u>	<u>Suggested PEF</u>
benzo[a]pyrene	50-32-8	1.0 (index compound)
benz[a]anthracene	56-55-3	0.1
benzo[b]fluoranthene	205-99-2	0.1
benzo[j]fluoranthene	205-82-3	0.1
benzo[k]fluoranthene	207-08-9	0.1
dibenz[a,j]acridine	224-42-0	0.1
dibenz[a,h]acridine	226-36-8	0.1
7H-dibenzo[c,g]carbazole	194-59-2	1.0
dibenzo[a,e]pyrene	192-65-4	1.0
dibenzo[a,h]pyrene	189-64-0	10
dibenzo[a,i]pyrene	189-55-9	10
dibenzo[a,l]pyrene	191-30-0	10
indeno[1,2,3-c,d]pyrene	193-39-5	0.1
5-methylchrysene	3697-24-3	1.0
1-nitropyrene	5522-43-0	0.1
4-nitropyrene	57835-92-4	0.1
1,6-dinitropyrene	42397-64-8	10
1,8-dinitropyrene	42397-65-9	1.0
6-nitrocrysene	7496-02-8	10
2-nitrofluorene	607-57-8	0.01
chrysene	218-01-9	0.01

This weighting scheme for PAH's was developed by the Air Toxicology and Epidemiology Section (ATES) of the Office of Environmental Health Hazard Assessment (OEHHA) in the document entitled Health Effects of Benzo[a]pyrene. The nitro PAHs are those listed as IARC class 2B. Although chrysene is an IARC class 3 carcinogen, USEPA classifies it as B2. The justification for each PEF is detailed in Appendix A of the document entitled the Health Effects of Benzo[a]pyrene.

These PEF's may be used for both inhalation and oral exposure pathways, although data used for their development was prioritized so inhalation exposure was given higher priority than other routes of exposure. When a specific potency value is developed for a chemical it should be used in place of the PEF.

Transmittal

Date: 31 July 2002

From: Lynn Marie Hornecker *LMH*
Code 06CC.LMH

To: Diane Silva
Code ~~01LS.DS~~ 05G.DS
Administrative Record Manager

Subj: CERCLA ADMINISTRATIVE RECORD MATERIALS
NALF Crows Landing

Installation: NALF Crows Landing

UIC Number: N60211

Document ^{Subject} Title: Quarterly Basewide Groundwater Report

Author: James Barton RWR/CB

Recipient: Marianna Potacka Navy

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