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LETTER REGARDING REGULATORY REVIEW OF CONDITIONAL APPROVAL OF FINAL DRAFT FOCUSED REMEDIAL INVESTIGATION FEASIBILITY STUDY FOR OPERABLE UNIT 2 (OU 2) NAS JACKSONVILLE FL
2/23/1994
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Florida Department of
Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Lawton Chiles
Governor

Virginia B. Wetherell
Secretary

February 23, 1994

0103-7559

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Joel Murphy
Code 1853
SOUTHNAVFACENGCOM
2155 Eagle Drive
P.O. Box 190010
North Charleston, South Carolina 29419-9010

Dear Mr. Murphy:

The Department has received and reviewed the **Final Draft Focused Remedial Investigation/Feasibility Study for OU-2 (PSCs 2, 41, and 43)**. With the exception of the comment following this paragraph, which should be addressed as explained in this letter, the document has been determined to be satisfactory for its purpose.

Recent requests from both arms of the Department of Defense regarding State of Florida's Soil Target Cleanup Levels have resulted in the Department producing the attached pages. In all likelihood, the numbers attached will be applicable at all DOD installations where groundwater is shallow (<20 feet) and where removal actions of contaminated soil are deemed necessary. While the numbers presented are conservative, they are based on a target cancer risk of 1x10E-6 and a target hazard of 1 for non-carcinogens for both a residential and occupational scenarios. They have been calculated using FDEP's default parameters by departmental toxicological staff. As suggested to other DOD installations that have ongoing removal actions via a FFS, the Department herein suggests to SOUTHDIV that the attached pages be incorporated into the Final FRI/FFS with an explanation page indicating that such cleanup goals have been developed by the State of Florida and will be adhered when actual removal starts. Likewise, the Interim Record Of Decision (IROD) for the Operable Unit should also reflect these cleanup numbers.

If you have any questions regarding the above paragraph, I propose the Base Cleanup Team considers them as part of the Agenda for the next partnering meeting scheduled in March. Once the above issue is addressed, the Document will be considered Final unless you or the EPA have any changes to incorporate. In the interim, I can be reached at 904/488-0190.

Sincerely,

Jorge R. Caspary, P.G.
Remedial Project Manager
Base Cleanup Team

Enclosure

cc: James Hudson, EPA-Atlanta
Kevin Gartland, NAS Jacksonville
Peter Redfern, ABB-Tallahassee

Florida Department of
Environmental Protection

Memorandum

TO: Jorge Caspary, Technical Review Section
Bureau of Waste Cleanup

THROUGH: Jim Crane, Technical Review Section
Bureau of Waste Cleanup JJC

FROM: Ligia Mora-Applegate, Technical Review Section
Bureau of Waste Cleanup

DATE: February 14, 1994

SUBJECT: *Cleanup Goals for the DOD Sites*

Attached, for your information and use, please find the soil cleanup goals. If there is ground water contamination, the leachability-based cleanup goals should be considered and compared with the health-based cleanup goals using the applicable scenario (i.e., residential or industrial). The lowest of the two sets should be the final cleanup goal; if the industrial scenario is applicable, the site must have a deed restriction for residential land uses and the like. In addition, where appropriate, the inorganics should pass TCLP.

Among the health-based levels, if a residential scenario is applicable you need to look under the column designated *aggregate resident* for carcinogens and *child resident* for non-carcinogens and choose the **lowest** of the two sets. If an industrial scenario is applicable, look under the columns designated *general worker*, and choose the **lowest** of the two sets.

If any of the levels are below background or the Method Detection Limit (MDL) any of the latter two will suffice.

If you have any questions, please see me.

Summary of Soil Target Levels

Chemical Name	Soil Target Level (mg/kg) Based on an Excess Cancer Risk of 1E-06			Soil Target Level (mg/kg) Based on a Hazard Index of 1			Soil Target Levels (mg/kg)
	Aggregate Resident	Child Resident	General Worker	Aggregate Resident	Child Resident	General Worker	Based on Leachability
VOCs							
Acetone	ND	ND	ND	7.35E+03	2.70E+03	1.25E+04	6.87E-02
Benzene	2.82E+00	1.02E+01	4.92E+00	ND	ND	ND	2.60E-04
Bromodichloromethane	3.61E+00	6.18E+00	7.57E+00	1.92E+03	6.57E+02	3.35E+03	3.57E-04
2-Butanone	ND	ND	ND	3.30E+04	2.05E+04	4.91E+04	3.60E-02
Ethylbenzene	ND	ND	ND	2.34E+04	6.53E+03	4.43E+04	6.88E-02
Methylene chloride	2.30E+01	6.34E+01	4.22E+01	1.06E+04	3.59E+03	1.85E+04	5.57E-04
Perchloroethylene	1.53E+01	1.61E+01	4.14E+01	3.40E+02	1.44E+02	5.57E+02	2.47E-03
Trichloroethylene	1.34E+01	3.95E+01	2.42E+01	ND	ND	ND	1.04E-03
Xylene (total)	ND	ND	ND	9.43E+04	3.79E+04	1.56E+05	1.15E-02
BNAs							
Acenaphthene	ND	ND	ND	2.02E+04	4.00E+03	4.64E+04	1.86E-01
Acenaphthylene	ND	ND	ND	8.90E+03	2.63E+03	1.63E+04	5.09E-02
Anthracene	ND	ND	ND	8.20E+04	1.83E+04	1.73E+05	5.90E+01
Benzo(a)anthracene	1.51E+00	1.21E+00	5.04E+00	ND	ND	ND	2.76E+01
Benzo(b)fluoranthene	1.50E+00	1.21E+00	5.01E+00	ND	ND	ND	1.10E+01
Benzo(k)fluoranthene	1.50E+00	1.21E+00	4.97E+00	ND	ND	ND	1.10E+01
Benzo(a)pyrene	1.51E-01	1.21E-01	5.04E-01	ND	ND	ND	2.20E+00
Benzo(g,h,i)perylene	ND	ND	ND	1.41E+04	2.26E+03	3.94E+04	3.20E+01
Butylbenzylphthalate	ND	ND	ND	9.35E+04	1.50E+04	2.78E+05	1.11E+00
Carbazole	5.87E+01	4.48E+01	2.24E+02	ND	ND	ND	ND
Chrysene	1.50E+01	1.21E+01	5.03E+01	ND	ND	ND	4.00E+00
Dibenzo(a,h)anthracene	1.51E-01	1.21E-01	5.05E-01	ND	ND	ND	6.60E+01
Dibenzofuran	ND	ND	ND	2.01E+03	3.07E+02	6.40E+03	ND
Fluoranthene	ND	ND	ND	1.82E+04	2.99E+03	4.96E+04	2.13E+01
Fluorene	ND	ND	ND	1.49E+04	2.78E+03	3.60E+04	4.11E+00
n-Hexane	ND	ND	ND	3.02E+04	4.61E+03	9.60E+04	ND
Indeno(1,2,3-c,d)pyrene	1.51E+00	1.21E+00	5.04E+00	ND	ND	ND	3.20E+01
2-Methylnaphthalene	ND	ND	ND	9.00E+02	1.90E+02	2.03E+03	ND
Naphthalene	ND	ND	ND	9.60E+03	2.28E+03	2.00E+04	1.33E-02
Pentachlorophenol	9.68E+00	7.44E+00	3.66E+01	1.49E+04	2.30E+03	4.71E+04	1.06E-01
Phenanthrene	ND	ND	ND	1.47E+04	2.76E+03	3.50E+04	2.81E-01
Pyrene	ND	ND	ND	1.29E+04	2.19E+03	3.38E+04	1.60E+01
Pesticides/Others							
4,4'-DDD	4.78E+00	3.71E+00	1.75E+01	ND	ND	ND	1.54E-01
4,4'-DDE	3.37E+00	2.62E+00	1.24E+01	ND	ND	ND	8.80E-01
DDT	3.23E+00	2.60E+00	1.13E+01	2.31E+02	3.74E+01	6.67E+02	4.86E-02
Chlordane, alpha-	8.80E-01	6.85E-01	3.21E+00	2.93E+01	4.57E+00	8.89E+01	5.60E-01
Chlordane, gamma-	8.80E-01	6.85E-01	3.21E+00	2.93E+01	4.57E+00	8.89E+01	5.60E-01
Dieldrin	7.20E-02	5.59E-02	2.69E-01	2.46E+01	3.82E+00	7.68E+01	3.49E-04
Endrin	ND	ND	ND	1.48E+02	2.29E+01	4.62E+02	6.98E-03
Freon	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	4.85E-02	7.79E-02	1.01E-01	1.19E+00	4.13E-01	2.04E+00	1.07E-04
Toxaphene	4.04E-02	1.67E-01	6.93E-02	ND	ND	ND	6.07E-03
Metals							
Aluminum	ND	ND	ND	ND	ND	ND	ND
Arsenic	7.11E-01	5.20E-01	3.16E+00	1.60E+02	2.34E+01	5.95E+02	ND
Cadmium	6.35E+02	3.18E+03	1.07E+03	2.30E+02	3.75E+01	6.21E+02	ND
Chromium (hexavalent)	9.53E+01	4.77E+02	1.60E+02	1.99E+03	3.59E+02	4.34E+03	ND
Chromium (trivalent)	ND	ND	ND	2.16E+05	5.66E+04	3.06E+05	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND
Copper	ND	ND	ND	1.96E+04	2.88E+03	7.16E+04	ND
Iron	ND	ND	ND	ND	ND	ND	ND
Lead	ND	ND	ND	ND	ND	ND	ND
Manganese	ND	ND	ND	2.15E+03	3.68E+02	5.22E+03	ND
Nickel	1.16E+00	1.01E+00	3.24E+00	8.29E+03	1.45E+03	1.91E+04	ND
Vanadium	ND	ND	ND	2.74E+03	5.00E+02	5.91E+03	ND
Zinc	ND	ND	ND	1.57E+05	2.33E+04	5.51E+05	ND

SOIL CLEAN-UP LEVEL CALCULATIONS & ASSUMPTIONS

Using Inhalation Slope Factor, Cs =

$$\frac{\text{Risk} * \text{BW} * \text{AT}}{\text{EF}*\text{ED}*\text{FI}*[(\text{SF}_o * \text{IR} * \text{1E-06 kg/mg}) + (\text{SFd} * \text{SA} * \text{AF} * \text{ABS} * \text{1E-06 kg/mg}) + (\text{SFi} * \text{InhR} * (1/\text{VF}+1/\text{PEF}))]}$$

Using Inhalation Unit Risk, Cs =

$$\frac{\text{Risk} * \text{BW} * \text{AT}}{\text{EF}*\text{ED}*\text{FI}*[(\text{SF}_o * \text{IR} * \text{1E-06 kg/mg}) + (\text{SFd} * \text{SA} * \text{AF} * \text{ABS} * \text{1E-06 kg/mg}) + (\text{IUR} * \text{BW} * 1000\ \mu\text{g/mg} * (1/\text{VF}+1/\text{PEF}))]}$$

Using Inhalation Reference Dose, Cs =

$$\frac{\text{Hazard} * \text{BW} * \text{AT}}{\text{EF}*\text{ED}*\text{FI}*[((1/\text{RfDo}) * \text{IR} * \text{1E-06 kg/mg})) + ((1/\text{RfDd}) * \text{SA} * \text{AF} * \text{ABS} * \text{1E-06 kg/mg}) + ((1/\text{RfDi}) * \text{InhR} * (1/\text{VF}+1/\text{PEF}))]}$$

Using Inhalation Reference Concentration, Cs =

$$\frac{\text{Hazard} * \text{BW} * \text{AT}}{\text{EF}*\text{ED}*\text{FI}*[((1/\text{RfDo}) * \text{IR} * \text{1E-06 kg/mg})) + ((1/\text{RfDd}) * \text{SA} * \text{AF} * \text{ABS} * \text{1E-06 kg/mg}) + ((1/\text{RfCi}) * \text{BW} * (1/\text{VF}+1/\text{PEF}))]}$$

ASSUMPTIONS

Dermal Contact with Chemicals in Soil (Average)

Assumption	Value	Code	Reference
Chemical Concentration (ppm)	chemical specific	CS	
Surface Area - worker (cm2/day)	2300	SAw	FDEP Default
Surface Area - aggregate resident (cm2/day)	4280	SAa	FDEP Default
Surface Area - child resident (cm2/day)	1800	SAc	FDEP Default
Conversion Factor (kg/mg)	1.00E-06	CFkg/mg	
Conversion Factor (µg/mg)	1.00E+03	CFµg/mg	
Soil to Skin Adherence Factor-resident (mg/cm2)	0.2	AFr	FDEP Default
Soil to Skin Adherence Factor-worker (mg/cm2)	0.6	AFw	FDEP Default
Absorption Factor - organic (unitless)	0.01	ABSo	FDEP Default
Absorption Factor - inorganic (unitless)	0.001	ABSin	FDEP Default
Soil Ingestion Rate - worker (mg/day)	50	IRw	FDEP Default
Soil Ingestion Rate - aggregate resident (mg/day)	120	IRa	FDEP Default
Soil Ingestion Rate - child resident (mg/day)	200	IRc	FDEP Default
Fraction Ingested (unitless)	1	FI	FDEP Default
Inhalation Rate - worker (m3/day)	20	InhRw	FDEP Default
Inhalation Rate - aggregate resident (m3/day)	20	InhRa	FDEP Default
Inhalation Rate - child resident (m3/day)	10	InhRc	
Exposure Frequency - worker (day/yr)	250	EFw	FDEP Default
Exposure Frequency - residents	350	EFr	FDEP Default
Exposure Duration - worker (yr)	25	EDw	FDEP Default
Exposure Duration - aggregate resident (yr)	30	EDa	FDEP Default
Exposure Duration - child resident (yr)	6	EDc	FDEP Default
Body Weight - worker (kg)	70	BWw	FDEP Default
Body Weight - aggregate resident (kg)	62	BWa	FDEP Default
Body Weight - child resident (kg)	15	BWc	FDEP Default
Averaging Time - worker, NC (days)	9125	ATwnc	FDEP Default
Averaging Time - aggregate resident (NC) (days)	10950	ATanc	FDEP Default
Averaging Time - child resident (NC) (days)	2190	ATcnc	FDEP Default
Averaging Time - Cancer (days)	25550	ATc	FDEP Default

SOIL CLEAN-UP LEVEL CALCULATIONS & ASSUMPTIONS

VOLATILIZATION MODEL*

Soil-to-air Volatilization Factor (VF)

Assumption	Exposure	Abbr
Inverse Mean Conc. at Center (g/m2-s per kg/m3)	101.8	Q-C95%UCL
Conversion Factor (m2/cm2)	0.0001	CFm2/cm2
Diffusivity in air (cm2/sec)	chemical specific	Di
Soil moisture content (cm3 water/gm soil)	10%	theta
Soil bulk density (gm/cm3)	1.5	beta
True soil density or particle density (gm/cm3)	2.65	rho
Total soil porosity (unitless)	0.434	Pt
Air filled soil porosity (unitless)	0.284	Pa
Effective diffusivity (cm2/sec)	chemical specific	Dei
Organic carbon partition coefficient (cm3/g)	chemical specific	Koc
Organic carbon content of soil (fraction)	2%	OC
Soil-water partition coefficient (cm3/g)	chemical specific	Kd
Soil-air partition coeff. (g soil/cm3 air)	chemical specific	Kas
Exposure interval (seconds)	7.90E+08	T
alpha (cm2/sec)	chemical specific	alpha
Soil-to-air Volatilization Factor (m3/kg)	chemical specific	VF

$$Dei\ (cm2/sec) = Di * [Pa^{(10/3)}/Pt^2]$$

$$Pa\ (unitless) = Pt - (theta * beta)$$

$$Pt\ (unitless) = 1 - (beta/rho)$$

$$Kas\ (g\ soil/cm3\ air) = Hprime/Kd$$

$$Kd\ (cm3/kg) = Koc*OC$$

$$alpha\ (cm2/sec) = (Dei*Pa)/[Pa+(rho*((1-Pa)/Kas))]$$

$$VF\ (m3/kg) = \frac{Q\text{-}C95\%UCL*CFm2/cm2*[(3.14*alpha*T)^{0.5}]}{(2*Dei*Pa*Kas)}$$

Soil Saturation Concentration (Csat)

UL of soil free moisture (mg/L water)	chemical specific	Cw
Soil Moisture content (kg water/kg soil)	10%	Thetam
Water Solubility (mg/L water)	chemical specific	Schem
Water filled soil porosity (unitless)	0.15	Pw
Henry's Law Constant (atm-m3/mol)	chemical specific	Hchem
Henry's Constant Unitless (unitless)	chemical specific	Hprime
Soil Saturation Concentration (mg/kg)	chemical specific	Csat

$$Cw\ (mg/L\ water) = Schem*Thetam$$

$$Pw\ (unitless) = Pt - Pa$$

$$Hprime\ (unitless) = Hchem*41$$

$$Csat\ (mg/kg) = \frac{[(Kd*Cw*beta)+(Cw*Pw)+(Cw*Hprime*Pa)]}{beta}$$

Particulate Emission Factor (PEF)

Respirable fraction (g/m2-hr)	0.036	Rf2
Frac. vegetative cover (unitless)	0	Gchem
Mean annual wind speed (m/sec)	4.5	Um
Equiv. threshold value of wind speed at10m (m/sec)	12.8	Ut
Func. dep. on Um/Ut (unitless)	0.0497	F(x)
Particulate Emission Factor (m3/kg)	chemical specific	PEF

$$PEF\ (m3/kg) = \frac{Q\text{-}C95\%UCL*3600\ sec/hr}{[Rf*(1-Gchem)*(Um/Ut)^3*F(x)]}$$

Soil Screening Level Partitioning Equation for Migration to Groundwater

Cw - acceptable concentration in water (mg/l)	chemical specific	ACW
Koc - organic carbon partitioning coefficient (L/kg)	chemical specific	Koc
Foc - fraction of organic carbon in soil (unitless)	2.00E-03	Foc
theta - soil porosity (Lporosity/Lsoil)	5.00E-01	theta2
S - fraction water content (Lwater/Lporo)	3.00E-01	S
SD - soil bulk density (kg/Lsoil)	1.60E+00	SD

$$Screening\ Level\ in\ Soil\ (mg/kg) = ACW * [(Koc * Foc) + (theta2 * (S/SD))]$$