



AFRL-SA-WP-CL-2020-0006

Review of Substantial Impact to Human Health and Safety – Aviano AB Sites

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30 March 2021**

Final Report



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14. ABSTRACT On 12 June 2020, the office of the U.S. Air Force Medical Readiness Agency (AFMRA) requested support from the U.S. Air Force School of Aerospace Medicine (USAFSAM) Occupational and Environmental Health Department to provide recommendations for the substantial impact to human health and safety determination of two sites at Aviano Air Base (AB), Italy. Sampling results for the specific locations were provided to USAFSAM on 30 June 2020 and are summarized in Attachment 1. Sample results indicated the sites may have exceeded the threshold limit for Total Petroleum Hydrocarbon (TPH) listed in the Italy Final Governing Standard (FGS-I). USAFSAM recommended follow-up screening at one location, which was conducted by Bioenvironmental Engineering, and provided on 2 December 2020.					
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**DEPARTMENT OF THE AIR FORCE
711TH HUMAN PERFORMANCE WING (AFRL)
WRIGHT-PATTERSON AIR FORCE BASE OHIO**

12 January 2021

MEMORANDUM FOR AFMRA/SG3PB
AFCEC/AFIMSC Det 4/CEIE
AFCEC/CZTQ

FROM: USAFSAM/OE
2510 Fifth Street, Area B
Wright-Patterson AFB OH 45433

SUBJECT: Consultative Letter, AFRL-SA-WP-CL-2020-0006
Review of Substantial Impact to Human Health and Safety – Aviano AB Sites

References: (a) DODI 4715.08, 31 August 2018, Remediation of Environmental Contamination Outside the United States.
(b) AFI 32-7091, 13 November 2019, Environmental Management Outside The United States.
(c) CNREURAFSWA Environmental, June 2015, Environmental Final Governing Standards-Italy, Revision 2.
(d) U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, September 1999, Toxicological Profile For Total Petroleum Hydrocarbons (TPH).
(e) EPA, May 2020, Regional Screening Levels (RSLs) - User's Guide
(f) EPA 510-R-15-001, June 2015, Technical Guide For Addressing Petroleum Vapor Intrusion At Leaking Underground Storage Tank.
(g) Interstate Technology Regulatory Council, November 2018, TPH Risk Evaluation at Petroleum-Contaminated Sites.

1 INTRODUCTION

On 12 June 2020, the office of the U.S. Air Force Medical Readiness Agency (AFMRA) requested support from the U.S. Air Force School of Aerospace Medicine (USAFSAM) Occupational and Environmental Health Department to provide recommendations for the substantial impact to human health and safety determination of two sites at Aviano Air Base (AB), Italy. Sampling results for the specific locations were provided to USAFSAM on 30 June 2020 and are summarized in Attachment 1. Sample results indicated the sites may have exceeded the threshold limit for Total Petroleum Hydrocarbon (TPH) listed in the Italy Final Governing Standard (FGS-I). USAFSAM recommended follow-up screening at one location, which was conducted by Bioenvironmental Engineering, and provided on 2 December 2020.

2 BACKGROUND

Information received from AFMRA and Air Force Civil Engineer Center regarding the sites' histories are summarized in Table 1. A previous determination of "No Substantial Impact to Human Health or Safety" was cited in a 27 March 2019 Memorandum. While USAFSAM did not conduct the 2019 assessment, it appears the determination was based on the fact these areas are unoccupied. The Navy, as the Lead Environmental Component, requested additional documentation regarding the determinations for these two locations.

Table 1. Spill Site Background

Area/ Closest Building	Golf Course Bldg. 13909	North POL Yard Bldg. 10504
Type	Hydrocarbon Spill	Hydrocarbon Spill
Date Discovered	15 December 2015	8 September 2014
Description of Release	An estimated 100 gallons of fuel was released on a gravel surface from a temporary generator; it produced a stain of soil 3m x 8m in dimension.	Precise source and quantity is unknown, however it was reported as an "extremely modest quantity." An area of dead grass approximately 16.5m x 8m was noted.
Summary of Response Actions	- Excavation of visually affected soil occurred (approximately 30 square meters). - Following the spill response, soil samples were taken. In one area, the samples exceeded the threshold values of the FGS-I Table 18.1 for TPH. - Due to size and location of spill, it was not classified as a remediation site.	- Spill response actions did not address the removal of any contaminated soil due to the presence of an active buried fuel line at the site. - Soil samples exceeded the threshold values of the FGS-I Table 18.1 for TPH. - Due to size and location of spill, it was not classified as a remediation site. Note this location is separate from previous N POL environmental remediation Site #800.

3 DISCUSSION

- A. USAFSAM reviewed soil sampling reports for the Golf Course and North POL Yard sites at Aviano AB. The reports describe sampling results of five zones at the Golf Course spill excavation site, and four different depth locations at the N POL site. At the Golf Course site, one sample, collected near the perimeter fence, exceeded FGS Total Petroleum Hydrocarbon (TPH) threshold limit for commercial and industrial land use. At the N POL site, four samples exceeded the TPH commercial and industrial land use threshold. However, none of

the sample results for specific hydrocarbons and volatile organic compounds tested exceeded their associated commercial and industrial land use thresholds.

1. IAW FGS-I, and DoDI 4715.08, further remediation of environmental contamination is driven by a substantial impact to human health and safety. Substantial impact is defined as, “a level of exposure that is occurring, or is about to occur within the next 3 to 5 years, and exceeds a generally established, published, and applied federal standard in the United States.”
2. A determination of substantial impact may be based on presence or absence of completed exposure pathways (source, media, and receptor). Based on the information provided, the potential exposure pathways are incomplete. Personnel do not work in the immediate vicinity of these locations. Additionally, when assessing receptor risk and building vapor intrusion for petroleum contamination sites, the EPA has established that further investigation is generally unnecessary if the vertical/lateral separation distance between a receptor and source is greater than 6 feet for fully dissolved contamination, or 15 feet for light non-aqueous phase liquid. Furthermore, while no groundwater or air sampling were conducted at these locations, given the spill size and location, substantial impact from ingestion of groundwater/soil ingestion, or inhalation is not anticipated.
3. TPH refers to the total mass of hydrocarbons present without identifying individual compounds. Generally, TPH sampling is used as a screening tool, and there are currently no federal regulations for overarching TPH. Since it is a measured, gross quantity without identification of its constituents, the TPH “value” represents a mixture. Thus, according to the Agency for Toxic Substances and Disease Registry, TPH itself is not a direct indicator of risk to humans or to the environment. The EPA has also noted,

“TPH refers to the total mass of hydrocarbons present without identifying individual compounds... The hazard and health risk assessments that are typically conducted to support risk management decisions at contaminated sites generally require some level of understanding of the hydrocarbon chemical composition present in the contaminated media. Traditional TPH measurement techniques, however, provide no specific information about the detected hydrocarbons. Because TPH is not a consistent entity, the assessment of health effects and development of toxicity values for mixtures of hydrocarbons are problematic. In fact, many risk assessors prefer to analyze and assess the individual chemical constituents rather than rely on TPH data”.
4. Several specific hydrocarbon compounds, carcinogens, and other indicator chemicals were individually tested, and results were determined to be below the FGS-I threshold limits.
5. The US government and EPA have developed guidelines for some of the TPH fractions and for specific hydrocarbon compounds. The EPA has established risk based screening levels based on TPH fractions; when used in the site characterization, these are assessed only for potential noncancer health effects. The EPA has identified six different TPH fraction categories based on size and structure of the hydrocarbon compound present. The EPA TPH fractions and the cut-points used for the Aviano AB sampling ($C \leq 12$ and $C > 12$) do not align, and a direct comparison is not possible. Additionally, lack of information regarding the fuel-type spilled make estimating the Aviano AB TPH fraction

composition or further risk calculations infeasible. Due to the nature of TPH, additional compound-specific or TPH fractional sampling would be required to conduct a more in-depth risk assessment.

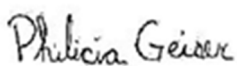
4 ASSESSMENT AND FINDINGS

Based on the information provided, levels that are occurring, or are about to occur within the next 3 to 5 years, are unlikely to exceed a generally established, published, and applied federal standard in the United States. This determination is predominately based on lack of applicable TPH federal standards, the site location from potential receptors, and information on specific compounds tested not indicating presence of substantial impact to human health and safety. However, at the golf course site, the fuel lateral exclusion distance was not fully determined during the initial assessment. Follow-up personnel interviews and site screening were conducted by the Bioenvironmental Engineering Flight in December 2020. The follow-up assessment confirmed the distance of the original spill was greater than 20 feet from Building 13909. Soil screening at the site was commiserate with background levels, and interior air screening found no traces of diesel fuel components.

5 CONCLUSIONS AND RECOMMENDATIONS

- A. Based on the review of the documents that were provided, USAFSAM recommends that the following measures be taken:
1. While no substantial impact to human health or safety was identified, contamination may be present at these sites; any DoD site disturbances or changes in receptor activities should be reviewed by wing health authorities. Should changes in use or activities at the sites occur, which result in an increase in exposures, a new substantial impact determination may be appropriate.
 2. Future sampling of TPH should be analyzed using the methods and fraction cut-points recommended by the EPA and the Interstate Technology Regulatory Council

For further questions regarding this report, please contact the Environmental, Safety, and Occupational Health (ESOH) Service Center at esoh.service.center@us.af.mil or at (937) 938-3764.



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4 Attachments:

1. Aviano AB Sample Summary
2. Excerpt of EPA Regional Screening Level User Guide on TPH Risk Assessment
3. Reports Provided to USAFSAM Related to Golf Course Site
4. Reports Provided to USAFSAM Related to N POL Site

ATTACHMENT 1. AVIANO AB SAMPLE SUMMARY

Aviano AB Sample Result Summary: Golf Course							
Laboratory			Innovazione Chimica s.r.l.				
Sample Report Number			16LA026 34	16LA026 35	16LA026 36	16LA026 37	16LA026 38
Sample Date			3-Oct-16	3-Oct-16	3-Oct-16	3-Oct-16	3-Oct-16
	FGS-I Threshold 1	FGS-I Threshold 2					
pH			8.39	8.38	8.34	8.25	8.28
Residual at 105°C (%)			93.2	92.6	91.2	89	88.7
soil texture: grains >2 mm diameter			64.2	66.5	65.5	64.6	66.7
Metals (mg/kg)							
Antimony	10	30	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic	20	50	1.7	1.9	2.7	3.5	3.1
Beryllium	2	10	0.15	0.15	0.21	0.25	0.25
Cadmium	2	15	0.15	0.16	0.2	0.33	0.27
Cobalt	20	250	<1.0	<1.0	1.4	1.7	1.5
Total chromium	150	800	8	7.3	10	12.1	11.2
Chrome VI	2	15	<0.10	<0.10	<0.10	<0.10	0.1
Mercury	1	5	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	120	500	5	4.3	5.8	7.1	6.5
Lead	100	1000	4.5	4.6	7.2	9.4	9.7
Copper	120	600	2.4	2	5.8	4	3.5
Selenium	3	15	0.17	0.2	0.27	0.33	0.25
Tin			0.66	0.47	0.58	0.68	0.65
Thallium	1	10	<0.5	<0.5	<0.5	<0.5	<0.5
Vanadium	90	250	12.7	11.8	16.4	19.7	17.4
Zinc	150	1500	14.8	13.6	18.1	23.5	24.1
Organic Aromatic Compounds (mg/kg)							
Benzene	0.1	2	<0.010	<0.010	<0.010	<0.010	<0.010
Ethylbenzene	0.5	50	<0.010	<0.010	<0.010	<0.010	<0.010
Styrene	0.5	50	<0.010	<0.010	<0.010	<0.010	<0.010
Toluene	0.5	50	<0.010	<0.010	<0.010	<0.010	<0.010
o-Xylene			<0.010	<0.010	<0.010	<0.010	<0.010
m,p-Xylene			<0.010	<0.010	<0.010	<0.010	<0.010
Xylene	0.5	50	<0.010	<0.010	<0.010	<0.010	<0.010
Total VOC (sum of Aromatic Compounds, excluding Benzene)	1	100	<0.10	<0.10	<0.10	<0.10	<0.10

Continued - Aviano AB Sample Result Summary: Golf Course							
Analyte	FGS-I Threshold 1	FGS-I Threshold 2	16LA026 34	16LA026 35	16LA026 36	16LA026 37	16LA026 38
Polycyclic Aromatic Compounds (mg/kg)							
benzo(a)anthracene	0.5	10	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(a)pyrene	0.1	10	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(b)fluoranthene	0.5	10	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(k)fluoranthene	0.5	10	<0.010	<0.010	<0.010	<0.010	<0.010
benzo(g,h,i)perylene	0.1	10	<0.010	<0.010	<0.010	<0.010	<0.010
chrysene	5	50	<0.010	<0.010	<0.010	<0.010	<0.010
dibenzo(a,e)pyrene	0.1	10	<0.010	<0.010	<0.010	<0.010	<0.010
dibenzo(a,l)pyrene	0.1	10	<0.010	<0.010	<0.010	<0.010	<0.010
dibenzo(a,i)pyrene	0.1	10	<0.010	<0.010	<0.010	<0.010	<0.010
dibenzo(a,h)pyrene	0.1	10	<0.010	<0.010	<0.010	<0.010	<0.010
dibenzo(a,h)anthracene	0.1	10	<0.010	<0.010	<0.010	<0.010	<0.010
indenopyrene	0.1	5	<0.010	<0.010	<0.010	<0.010	<0.010
pyrene	5	50	0.132	<0.010	0.023	0.036	0.061
Total Polycyclic Aromatic (sum of first 10 compounds above)	10	100	<0.50	<0.50	<0.50	<0.50	<0.50
Hydrocarbons (mg/kg)							
C≤12	10	250	15.2	<1.0	<1.0	<1.0	1.6
C>12	50	750	<u>1570</u>	42	142	278	514
Notes: FGS-I Threshold 1: public, private, residential green use threshold limit. Bold text indicates exceedance FGS-I Threshold 2: commercial, industrial use threshold limit. <u>Underlined text</u> indicates exceedance							

Aviano AB Sample Result Summary: N POL Site						
Laboratory			Leochimica S.r.l.			
Sample Report			3407975-001	3407975-002	3407975-003	3407975-004
Sample Date			16-Sept-14	16-Sept-14	16-Sept-14	16-Sept-14
Sample Depth			10cm	20cm	30cm	60cm
	FGS-I Threshold 1	FGS-I Threshold 2				
soil texture: grains >2 mm diameter	N/A	N/A	70.1	64.6	51.6	65.3
pH	N/A	N/A	8.4	8.3	8.3	8.4
Metals (mg/kg)						
Antimony	10	30	<1.0	<1.0	<1.0	<1.0
Arsenic	20	50	5.2	6.2	3.9	3
Beryllium	2	10	<0.8	<0.8	<0.8	<0.8
Cadmium	2	15	<0.4	<0.4	<0.4	<0.4
Cobalt	20	250	2.2	2.7	2.6	1.9
Total chromium	150	800	24.7	32.9	45.6	22.9
Chrome VI	2	15	<0.1	<0.1	<0.1	<0.1
Mercury	1	5	<0.1	<0.1	<0.1	<0.1
Nickel	120	500	9.01	12.6	20	10.6
Lead	100	1000	12.8	26.6	9	7
Copper	120	600	7.4	37.4	10.7	9.1
Selenium	3	15	0.5	0.5	0.5	0.6
Tin	1	350	0.7	0.7	0.6	0.6
Thallium	1	10	0.2	0.3	0.2	0.2
Vanadium	90	250	23.6	28.6	17.1	16.5
Zinc	150	1500	26.0	29.5	22	17
Organic Aromatic Compounds (mg/kg)						
Benzene	0.1	2	<0.003	<0.003	<0.003	<0.003
Ethylbenzene	0.5	50	<0.003	<0.003	0.011 (±0.003)	0.008 (±0.002)
Styrene	0.5	50	0.251 (±0.075)	0.152 (±0.045)	0.150 (±0.045)	0.090 (±0.027)
Toluene	0.5	50	0.006 (±0.002)	0.004 (±0.001)	<0.003	0.005 (±0.002)
Xylene	0.5	50	4.395 (±1.318)	2.926 (±0.878)	2.775 (±0.832)	1.852 (±0.556)
Total VOC (sum of Aromatic Compounds, excluding Benzene)	1	100	4.65 (± 1.40)	3.08 (±0.92)	2.94 (±0.88)	1.96 (±0.59)
Carcinogenic Aliphatic Halogenated Compounds (mg/kg)						
Tribromomethane (bromoform)	0.5	10	<0.02	<0.02	<0.02	<0.02
1,2 Dibromoethane	0.01	0.1	<0.007	<0.007	<0.007	<0.007
dibromochloromethane	0.5	10	<0.003	<0.003	<0.003	<0.003
bromodichloromethane	0.5	10	<0.01	<0.01	0.04	0.02

Continued - Aviano AB Sample Result Summary: N POL Site							
Analyte	FGS-I Threshold 1	FGS-I Threshold 2	3407975- 001	3407975- 002	3407975- 003	3407975- 004	3407975- 001
Carcinogenic Aliphatic Chlorinated Compounds (mg/kg)							
Chloromethane	0.1	5	<0.06	<0.06	<0.06	<0.06	<0.06
Dichloromethane	0.1	5	<0.003	<0.003	<0.003	<0.003	<0.003
trichloromethane	0.1	5	<0.03	<0.03	<0.03	<0.03	<0.03
Vinyl chloride	0.01	0.1	<0.01	<0.01	<0.01	<0.01	<0.01
1,2 Dichloroethane	0.2	5	<0.02	<0.02	<0.02	<0.02	<0.02
1,1 Dichloroethylene	0.1	1	<0.01	<0.01	<0.01	<0.01	<0.01
Trichloroethylene	1	10	<0.01	<0.01	<0.01	<0.01	<0.01
Tetrachloroethylene (PCE)	0.5	20	<0.003	<0.003	<0.003	<0.003	<0.003
Non-Carcinogenic Aliphatic Chlorinated Compounds (mg/kg)							
1,1 Dichloroethane	0.5	30	<0.01	<0.01	<0.01	<0.01	<0.01
1,2 Dichloroethylene	0.3	15	<0.01	<0.01	<0.01	<0.01	<0.01
1,1,1-Trichloroethane	0.5	50	<0.01	<0.01	<0.01	<0.01	<0.01
1,2 Dichloropropane	0.3	5	<0.01	<0.01	<0.01	<0.01	<0.01
1,1,2 Trichloroethane	0.5	15	<0.007	<0.007	<0.007	<0.007	<0.007
1,2,3 Trichloropropane	0.1	1	<0.01	<0.01	<0.01	<0.01	<0.01
1,1,2,2 Tetrachloroethane	0.5	10	<0.006	<0.006	<0.006	<0.006	<0.006
Hydrocarbons (mg/kg)							
C _≤ 12	10	250	<u>726.0</u> (±167.7)	<u>1201.0</u> (±227.4)	<u>2933.0</u> (±677.5)	<u>1072.0</u> (±247.6)	
C _{>} 12	50	750	447 (±82)	<u>960</u> (±177)	<u>1166</u> (±215)	416 (±77)	
Notes: FGS-I Threshold 1: public, private, residential green use threshold limit. Bold text indicates exceedance FGS-I Threshold 2: commercial, industrial use threshold limit. <u>Underlined text</u> indicates exceedance							