State of Vermont

Department of Fish and Wildlife
Department of Forests, Parks and Recreation
Department of Environmental Conservation
State Geologist
RELAY SERVICE FOR THE HEARING IMPAIRED
1-800-253-0191 TDD>Voice
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AGENCY OF NATURAL RESOURCES
Department of Environmental Conservation
Waste Management Division
103 South Main Street/West Building
Waterbury, VT 05671-0404
Phone: (802) 241-3888
Fax: (802) 241-3296

March 22, 2000

Brian Fitzgerald, Environmental Compliance Engineer
General Dynamics Armament Systems
10 Lakeside Avenue
Burlington, Vermont 05401-4985

Re: Risk Assessment Former Oil House Area General Dynamics Burlington

Dear Brian:

I have reviewed the PCB Risk Assessment for the Former Oil House Area, dated March 9, 2000 and prepared by ENSR for General Dynamics. Thank you for conducting this assessment to evaluate the potential risk to human health from PCB's in the shallow soil at the Former Oil House Area.

We have adopted a predicted carcinogenic risk to humans from chemical exposure of less than 1 X 10-6. In this sense we are more conservative than the EPA target carcinogenic risk range of 1 X 10-6 to 1 X 10-4 for potential risks to humans. The predicted risk to the utility/maintenance and construction worker exposure (your active soil exposure scenario), as calculated by ENSR, meets this criterion of less than 1 X 10-6. However, the on-site worker (your passive exposure scenario) does not meet the criterion. Therefore, there is an unacceptable cancer risk from PCB's to the site worker at the Former Oil House Area. I am using the maximum exposure figure for excess lifetime cancer risk in your Table 5 which is 9.93E-06 in making this determination. Even if this figure is recalculated by assuming a lower soil ingestion rate of 50 mg/day instead of the 100 mg/day used by ENSR and eliminating any dermal contact factor the risk is only reduced to 3.2E-06. This figure still exceeds the less than 1E-06 risk which is acceptable to us.

Consequently, we will require General Dynamics to develop remedial alternative(s) which will reduce the risk at the Former Oil House Area to an acceptable level. If you have any comments or questions please give me a call at 241-3895. Thank you.

Sincerely,

Stanley Corneille
Site Manager

cc: Douglas Seely ENSR
Lynn Metcalf WMD

MAR 13 2000

ENSR

35 Nagog Park
Acton, MA 01720
(978) 635-9500
FAX (978) 635-9180
http://www.ensr.com

March 10, 2000

Ms. Lynn Metcalf
Mr. Stan Corneille
VT Dept. of Environmental Conservation
Management and Prevention Section
Waste Management Division
103 South Main Street
West Building
Waterbury, VT 05671-0404

Subject: Former Oil House Area
General Dynamics, Burlington, VT

Dear Ms. Metcalf and Mr. Corneille:

We understand you still have some concerns about the long-term exposure potential of shallow soil in the Former Oil House Area at General Dynamics Armament Systems (GDAS) Lakeside Avenue facility in Burlington, Vermont. Please find attached a site-specific risk assessment we prepared for General Dynamics that addresses PCBs in shallow soil in this area.

The risk assessment results indicate that no unacceptable risks are posed to future workers by the concentrations of PCBs present in these soils in the event some day the area becomes unpaved. Human receptors considered include future on-site workers, utility/maintenance workers, and construction workers. The risk assessment documents the assumptions upon which the exposure scenarios are based and the potential risk results for both carcinogenic and non-carcinogenic health effects.

Based on these results, GDAS, believes that this area can be closed out without any additional institutional controls beyond those mandated for the site in the Pine Street Canal remedy under CERCLA.

We understand that you wish to complete considerations of this area quickly so that a draft CA Permit can be completed, therefore, we are available within the next few working days to discuss these results. Please call Mr. Brian Fitzgerald of GDAS (802-657-6209) with any questions.

Sincerely,

Douglas E. Seely
Senior Program Manager

Attachment

cc: B. Fitzgerald, GDAS

transltrRASum.doc

ENSR

35 Nagog Park
Acton, MA 01720
(978) 635-9500
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March 9, 2000

Mr. Brian Fitzgerald
General Dynamics Armament Systems
Lakeside Avenue
Burlington, VT 05401-4685

RE: PCB Risk Assessment, Former Oil House Area
ENSR Project Number 3000-012-001

Dear Mr. Fitzgerald:

A site-specific risk assessment was conducted to evaluate the potential risk to human health of polychlorinated biphenyls (PCBs) detected (Aroclor-1254 and Arocolor-1260) in the shallow soil of the Former Oil House Area (FOHA).

The risk assessment follows U.S. EPA guidelines for conducting risk assessments, and complies with appropriate guidance documents, including but not limited to the following:

- Risk Assessment Guidance for Superfund: Volume 1 – Human Health Evaluation Manual (Parts A, B, C) (U.S. EPA, 1989; 1991a; and 1991b).
- Exposure Factors Handbook (U.S. EPA, 1997a).
- U.S. EPA Soil Screening Guidance: Technical Background Document (U.S. EPA, 1996a).
- Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors. (U.S. EPA, 1991c).

The risk assessment evaluates potential health effects for both chronic and subchronic exposure scenarios, and was conducted using the four-step paradigm as identified by the U.S. EPA (U.S. EPA, 1989). The steps are:

- Data Evaluation
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization

Data Evaluation

Six shallow soil samples are available from the FOHA. Aroclor-1254 was detected in five of the six samples at concentrations ranging from 0.012 mg/kg to 16 mg/kg. Aroclor-1260 was detected in one of the six samples at a concentration of 0.015 mg/kg.

A total PCB concentration was developed on a sample-by-sample basis by adding together the individual Aroclors. One-half the sample quantitation limit was used as a proxy concentration for samples reported as "below detection limit." Total PCB concentrations were evaluated statistically for use in the risk assessment. The results of this statistical analysis (summarized in Table 1) were used to select the exposure point concentration (EPC) for evaluation in the risk assessment. In accordance with U.S. EPA guidance the EPC is defined as the 95% upper confidence limit (95% UCL) on the arithmetic mean concentration or the maximum detected concentration, whichever is lower (U.S. EPA, 1992). As can be seen in Table 2, the EPC for Total PCBs in shallow soil from the FOHA is 11.0 mg/kg, which is lower than the maximum detected concentration of 16.95 mg/kg.

Other compounds detected in soil samples collected within the Former Oil House Area were present at concentrations below risk-based screening levels (i.e., U.S. EPA Region III Risk-Based Concentrations (RBCs)) and were not considered in this site-specific risk assessment.[1]

Exposure Assessment

The purpose of the exposure assessment is to provide a quantitative estimate of the magnitude and frequency of potential exposure to site-related compounds by a receptor. Potentially exposed individuals and the pathways through which those individuals may be exposed to site-related compounds are identified based on the physical characteristics of the site, as well as the current and reasonably foreseeable future uses of the site and surrounding area. The extent of a receptor's exposure is estimated by constructing exposure scenarios that describe the potential pathways of exposure to the Site-related compounds and the activities and behaviors of individuals that might lead to contact with the Site-related compounds in the environment.

The FOHA is located on a property with a long history of industrial use, and is currently paved. Currently, there are no potentially complete exposure pathways for shallow soil at the FOHA. However, as a conservative (i.e., health protective) measure, the risk assessment was conducted based on the assumption that the pavement may be removed at some time in the future. In developing the exposure assumptions it was also assumed that that future site use will remain commercial/industrial – no residential exposure scenarios were considered. This assumption is consistent with the institutional controls to be applied to the entire General Dynamics property, as one of the properties within the adjacent Pine Street Canal Superfund Site remedy area[2].

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[1] Soil sampling within the FOHA is documented in the General Dynamics, Burlington, VT, RCRA Corrective Action Program Data Gap Analysis Report, ENSR Document No. 3000-012-002, June 1999, and the Additional Soil Sampling & Analysis Report, Former Oil House Area, General Dynamics, Burlington, Vermont, letter report to Mr. Gary P. Kjelleren, General Dynamics from Douglas E. Seely, ENSR, in a letter dated October 27, 1999.

[2] The deed restrictions to be applied under CERCLA are described in the draft Form of Easement, Exhibit I to the consent decree, in a letter to Ms. Margery Adams, Esq., U. S. Environmental Protection Agency New Englaad Region, from E. Michael Thomas, P.C., McDermott, Will & Emery, dated April 13, 1999.

Two types of potential future exposures were identified for shallow soil at the FOHA:

1) Passive soil exposure. For the purposes of this risk assessment, passive soil exposure is defined as potential on-site worker exposure that may occur day-to-day incidental to job requirements. An example of such an exposure is potential incidental exposure of an on-site worker to soil while consuming lunch in a picnic area or courtyard during the summer months. The risk assessment evaluated an on-site worker for chronic passive soil exposure.

2) Active soil exposure. For the purposes of this risk assessment, active soil exposure is defined as that which may occur during periods of active soil excavation. An example of such an exposure scenario is the potential exposure of a utility/maintenance worker to soil while repairing or maintaining underground utilities. The risk assessment evaluated a maintenance/utility worker for chronic active soil exposure, and construction worker for subchronic active soil exposure.

In evaluating both passive and active on-site soil exposures it has been assumed that potential exposure to total PCBs in shallow soil may occur via incidental ingestion, dermal contact, and inhalation of vapors and dust migrating from soil to outdoor air. Exposure point concentrations for soil and air are presented in Table 2.

To provide a range of possible risk estimates for the FOHA, a range of exposure assumptions (minimal, central tendency, and maximal exposures) were identified for both the passive and active shallow soil exposure scenarios. The minimal exposure assumptions are intended to represent a reasonably conservative estimate of the lower end of potential soil exposure at the site. Central tendency exposure assumptions are intended to represent a reasonable estimate of the most likely potential soil exposures to occur on-site. Maximal exposure assumptions are intended to represent estimates of the maximum potential soil exposures that may occur on-site.

The exposure assumptions utilized in the risk assessment and their sources are summarized in the Tables 3 and 4.

Toxicity Assessment

The toxicity assessment evaluates the relationship between the magnitude of exposure (dose) and the potential for occurrence of specific health effects (response) for each site-related compound being evaluated in the risk assessment. Both potential carcinogenic and noncarcinogenic effects are considered. The most current U.S. EPA verified dose-response values were used for evaluating the potential risk associated with exposure to Total PCBs in shallow soil of the FOHA.

Risk Characterization

Risk characterization combines the results of the exposure assessment and the toxicity assessment to derive site-specific estimates of potentially carcinogenic and noncarcinogenic risks resulting from potential human exposures to site-related compounds. The results of the risk characterization are discussed relative to a target risk range of 10^{-6} (1 in 1,000,000) to 10^{-4} (1 in 10,000) for potential carcinogenic effects and a target Hazard Index (HI) of 1 for potential noncarcinogenic effects, as defined by the U.S. EPA (U.S. EPA, 1989).

The risk characterization results are discussed below for both passive (on-site worker), and active (maintenance/utility worker, and construction worker) soil exposure scenarios.

Passive Soil Exposure (on-site worker)

The potential noncarcinogenic and carcinogenic risks for the passive soil exposure scenario (on-site worker exposure) are presented in Table 5. Under the passive soil exposure scenarios an on-site worker is assumed to be exposed to total PCBs in shallow soil of the FOHA via incidental ingestion and dermal contact, and inhalation of soil-derived vapors and dust.

As indicated in Table 5, the predicted HI for potential passive soil exposures ranges from 0.12 (minimal exposure) to 0.69 (maximal exposure). Under all evaluated exposure scenarios, the predicted HI is below the U.S. EPA target HI of 1.0. Based on these predictions, no adverse noncarcinogenic health effects are expect for passive soil exposures under the conditions (continued industrial use and removal of pavement) defined in this risk assessment.

As can be seen in Table 5, the predicted carcinogenic risk for passive soil exposures ranges from 4.6×10^{-7} (minimal exposure) to 9.9×10^{-6} (maximal exposure). Under all evaluated exposure scenarios the predicted cancer risks are below 1×10^{-5} (1 in 100,000), and within the U.S. EPA acceptable risk range of 1×10^{-6} (1 in 1,000,000) to 1×10^{-4} (1 in 10,000).

Active Soil Exposure (utility/maintenance - construction worker)

The potential noncarcinogenic and carcinogenic risks for the active soil exposure scenario (utility/maintenance worker, and construction worker exposure) are presented in Table 6. Under the active soil exposure scenarios an utility/maintenance or construction worker is assumed to be exposed to total PCBs in shallow soil of the FOHA via incidental ingestion and dermal contact, and inhalation of soil-derived vapors and dust during periods of soil excavation.

As indicated in Table 6, the predicted HI for active soil exposures ranges from 0.0038 (minimal exposure; utility/maintenance worker) to 0.11 (maximal exposure; construction worker). Under all evaluated exposure scenarios, the predicted HI for the active soil exposure scenarios are below the U.S. EPA target HI of 1.0. Based on these predictions, no adverse noncarcinogenic health effects

are expected for active soil exposures under the conditions (utility repair or maintenance, and significant construction activity) defined in this risk assessment.

As can be seen in Table 6, the predicted carcinogenic risk for active soil exposures ranges from 1.4×10^{-6} (minimal exposure; utility/maintenance worker) to 8.7×10^{-6} (central tendency exposure; utility/maintenance worker). Under all evaluated exposure scenarios, the predicted cancer risks are below the U.S. EPA acceptable risk range of 1×10^{-6} (1 in 1,000,000) to 1×10^{-4} (1 In 10,000).

max exp. is lower than the central tendency

Summary

The results of the risk characterization indicate that based on conservative exposure scenarios developed to account for reasonably foreseeable future site conditions, no unacceptable risks to human health would be experienced by an on-site worker, a utility/maintenance worker, or a construction worker as a result of potential exposure to Total PCBs in shallow soil in the Former Oil House Area.

If you have any questions or comments on the risk assessment please contact me at (978) 635-9500. Once we have addressed any of your questions or comments we will finalize a letter report for submittal to the Vermont Agency of Natural Resources.

Sincerely,

Douglas E. Seely
Senior Program Manager

TABLE 1
SUMMARY STATISTICS
FORMER OIL HOUSE AREA
GENERAL DYNAMICS, BURLINGTON, VT

Compound	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Mean Concentration (mg/kg)	95% UCL Concentration (mg/kg)
TOTAL PCB	0.02	16.95	2.94	11.00
Notes:				

TABLE 2
EXPOSURE POINT CONCENTRATIONS
FORMER OIL HOUSE AREA
GENERAL DYNAMICS, BURLINGTON, VT

Compound	Shallow Soil Concentration (mg/kg)	Predicted Ambient Air Fugitive Dust Shallow Soil (mg/m^3)	Predicted Ambient Air Vapor Surface Soil (mg/m^3)	Predicted Excavation Air Fugitive Dust Shallow Soil (mg/m^3)
TOTAL PCB	1.10E+01	1.31E-08	4.32E-08	6.60E-07

Notes:

TABLE 3
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS
PASSIVE SOIL EXPOSURE SCENARIOS
FORMER OIL HOUSE AREA
GENERAL DYNAMICS, BURLINGTON, VT

Parameter	On-Site Worker					
	Minimal Exposure		Central Tendency Exposure		Maximal Exposure	
	Value	Reference	Value	Reference	Value	Reference
Parameters Used in the On-Site Surface Soil Pathway						
Exposure Frequency (days/365 days)	65	(a)	150	(c)	250	(h)
Exposure Duration (yr)	6.6	(b)	8	(i)	25	(c)
Soil Ingestion Rate (mg/day)	50	(c,d)	50	(c,d)	100	(c,d)
Skin Contacting Medium (cm^2)	2300	(e)	2300	(e)	2300	(e)
Soil on Skin (mg/cm^2)	0.5	(f)	0.5	(f)	0.5	(f)
Body Weight (kg)	70	(g)	70	(g)	70	(g)
Inhalation Rate for Dust and Volatiles (m^3/day)	20	(h)	20	(h)	20	(h)

Notes:
NA - Not Applicable; this receptor is not assumed to be exposed via this pathway or in this area.
(a) - Best professional judgement. Exposure frequency is equivalent to 5 days per week for the three months of summer.
(b) - U.S. EPA, 1997. Exposure Factors Handbook, Volume I. Recommended value for occupational tenure, Table 1-2.
(c) - U.S. EPA, 1994. U.S. EPA Region I Risk Update. August 1994.
(d) - U.S. EPA 1989. Risk Assessment Guidance for Superfund, Volume 1. Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, DC. EPA 540/1-89/002.
(e) - U.S. EPA, 1989. Exposure Factors Handbook. Office of Health and Environmental Assessment, Washington, DC. EPA 600/8-89/043. Assumed exposure to hands, forearms, lower legs and feet.
(f) - U. S. EPA, 1992. Dermal Exposure Assessment: Principles and Applications. Interim Report. EPA/600/8-91/011B.
(g) - U.S. EPA, 1989. Exposure Factors Handbook. Office of Health and Environmental Assessment, Washington, DC. EPA 600/8-89/043.
(h) - U.S. EPA, 1991. Standard Default Exposure Factors.
(i) - Bureau of Labor Statistics. 1991.

29-Feb-00

TABLE 4
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS
ACTIVE SOIL EXPOSURE SCENARIOS
FORMER OIL HOUSE AREA
GENERAL DYNAMICS, BURLINGTON, VT

Parameter	Maintenance/Utility Worker				Construction Worker	
	Minimal Exposure		Central Tendency Exposure		Maximal Exposure	
	Value	Reference	Value	Reference	Value	Reference
Parameters Used in the On-Site Surface Soil Pathway						
Exposure Frequency (days/365 days)	2	(a)	10	(i)	40	(k)
Exposure Duration (yr)	6.6	(b)	8	(j)	1	(l)
Soil Ingestion Rate (mg/day)	50	(c,d)	50	(c,d)	100	(c,d)
Skin Contacting Medium (cm^2)	2300	(e)	2300	(e)	2300	(e)
Soil on Skin (mg/cm^2)	0.5	(f)	0.5	(f)	0.5	(f)
Body Weight (kg)	70	(g)	70	(g)	70	(g)
Inhalation Rate for Dust and Volatiles (m^3/day)	20	(h)	20	(h)	20	(h)

Notes:
NA - Not Applicable; this receptor is not assumed to be exposed via this pathway or in this area.
(a) - Best professional judgement, 2 days per year of maintenance/utility repair activities requiring excavation.
(b) - U.S. EPA, 1997. Exposure Factors Handbook, Volume I. Recommended value for occupational tenure, Table 1-2.
(c) - U.S. EPA, 1994. U.S. EPA Region I Risk Update. August 1994.
(d) - U.S. EPA 1989. Risk Assessment Guidance for Superfund, Volume 1. Human Health Evaluation Manual (Part A). Office of Emergency and Remedial Response, Washington, DC. EPA 540/1-89/002.
(e) - U.S. EPA, 1989. Exposure Factors Handbook. Office of Health and Environmental Assessment, Washington, DC. EPA 600/8-89/043. Assumed exposure to hands, forearms, lower legs and feet.
(f) - U. S. EPA, 1992. Dermal Exposure Assessment: Principles and Applications. Interim Report. EPA/600/8-91/011B.
(g) - U.S. EPA, 1989. Exposure Factors Handbook. Office of Health and Environmental Assessment, Washington, DC. EPA 600/8-89/043.
(h) - U.S. EPA, 1991. Standard Default Exposure Factors.
(i) - Best professional judgement, 5 days/week, 2 weeks/year during which repair/maintenance activities require excavation.
(j) - Bureau of Labor Statistics. 1991.
(k) - Best professional judgement. Excavation in support of construction activities equivalent to 5 days/week for 2 months.
(l) - Best professional judgement. Significant construction activities represent a one time event.

29-Feb-00

TABLE 5
SUMMARY OF POTENTIAL RISKS - PASSIVE SOIL EXPOSURE SCENARIOS
FORMER OIL HOUSE AREA
GENERAL DYNAMICS, BURLINGTON, VT

Compound	Hazard Index			Excess Lifetime Cancer Risk		
	Minimal Exposure	Central Tendency Exposure	Maximum Exposure	Minimal Exposure	Central Tendency Exposure	Maximum Exposure
TOTAL PCB	1.22E-01	2.83E-01	6.94E-01	4.62E-07	1.29E-06	9.93E-06

Notes:
NC - Not Caluculated.

TABLE 6
TOTAL POTENTIAL RISKS - ACTIVE SOIL EXPOSURE SCENARIOS
FORMER OIL HOUSE AREA
GENERAL DYNAMICS, BURLINGTON, VT

Compound	Hazard Index			Excess Lifetime Cancer Risk		
	Minimal Exposure	Central Tendency Exposure	Maximum Exposure	Minimal Exposure	Central Tendency Exposure	Maximum Exposure
TOTAL PCB	3.77E-03	1.88E-02	1.11E-01	1.44E-08	8.74E-08	6.41E-08
Notes:						