Lockheed Martin Corporation
6801 Rockledge Drive
MP CCT 246
Bethesda, MD 20817
Telephone (301) 548-2223

LOCKHEED MARTIN

November 15, 2019 **VIA OVERNIGHT CARRIER**

Mr. Brian Dietz
Program Administrator
Land Restoration Program
Land and Materials Administration
Maryland Department of the Environment
1800 Washington Road, Suite 625
Baltimore, Maryland 21230

Re: Transmittal of the Response to Comments for the Frog Mortar Creek Groundwater Discharge Characterization Report
Martin State Airport, 701 Wilson Point Road, Middle River, Maryland

Dear Mr. Dietz:

For your review, please find enclosed two hard copies of the above-referenced document. This document addresses comments received from Maryland Aviation Administration on September 30, 2019.

If you have any questions or require any additional information please contact me by phone at 301-548-2223, or via e-mail at charles.trione@lmco.com.

Sincerely,

Charles Trione
Project Lead, Environmental Remediation
Lockheed Martin Corporation

cc: (via email without enclosure)
Anuradha Mohanty, MDE
Christine Kline, Lockheed Martin
Norm Varney, Lockheed Martin
Michael Martin, Tetra Tech
Peter Shilland, CDM Smith

cc: (via mail with CD enclosure)
Pete Lekas, EA Environmental

cc: (via shipping courier; with enclosures)
Mark Williams, MAA
Al Pollard, Martin State Airport

cc: (via Secure Information Exchange)
Jann Richardson, Lockheed Martin

Tetra Tech Response to Comments for Maryland Aviation Administration Martin State Airport Review Comments

Groundwater Discharge Characterization Report Frog Mortar Creek, Martin State Airport, 701 Wilson Boulevard, Middle River, Maryland, September 2019

1. ***Page 3-4, Section 3.3, first paragraph:*** Please add details regarding approximate screen length of each drive point installed in the FMC sediment for falling head tests. The next paragraph provides details on total depths of the temporary wells, but it is unclear if the screened length is consistent or varied between each location.

    - ***Response:*** The information requested is presented in the first paragraph of Section 3.3 (reproduced below). The screens for both falling head test temporary wells (one set at 2 feet into the sediment and one set at four feet into the sediment) were both six inches in length.

      "Tetra Tech installed two temporary wells within FMC sediment (Figure 3-1) and conducted falling-head testing at each well. The wells consisted of an assembled screen and riser (with drive-point) driven into the sediment, such that the screen was installed entirely within consolidated sediment (below any unconsolidated muddy or organic layer). The wells were constructed of solid two-inch-diameter polyvinyl chloride (PVC) casing with a six-inch PVC slotted-screen. The top of the drive-point device was closed using a threaded end-cap; the bottom of the drive-point device had a conical end-cap that aided drive-point advancement. The same slide hammer driver used to install the SBPFMs was used to install the temporary wells. The wells were filled with water to create excess head, and the water-level drop was recorded using a standard water-level meter.

      The two temporary wells were installed next to each other, with one driven to an approximate depth of two feet, and the other to an approximate depth of four feet. Well locations were surveyed via a handheld global positioning system (GPS) with sub-meter accuracy, using the Maryland State Plane NAD83 system."

2. ***Page 4-4, Section 4.3, second paragraph, first sentence:*** Please clarify if the average hydraulic conductivity, provided in parentheses, is averaging the shallow and deeper estimated sediment conductivities.

    - ***Response:*** Yes, the average hydraulic conductivity, provided in parentheses, was calculated by averaging the shallow and deeper estimated sediment conductivities. The average of 0.3932 ft/day was calculated by averaging 0.3318 feet per day (ft/day) at a depth of two feet, and 0.4545 ft/day at a depth of four feet.

3. ***Page 4-5, Section 4.4.2, first paragraph, first sentence:*** What is the cause of the single high outlying value at SBPFM-71? Please add an explanation or hypothesis as to the cause, since this value differs greatly from all others and strongly influenced the average value for comparison to the 2015 average.

    - ***Response:*** The cause of the single high outlying value at SBPFM-71 is unknown, but as described in the last paragraph of Section 4.4.2:

      "The reasons for the change in flow patterns from 2015 to 2018 are not completely understood, but are assumed to be strongly influenced by the local change of groundwater flow created by the activation of the groundwater extraction wells. The significantly lower net flux measured in 2018 is due to groundwater that now is captured by (i.e., discharges to) the extraction wells rather than to FMC. Some of the observed decrease in net flux may also be due to seasonal variation. The 2015 study was conducted during March and April, a period typically characterized by high groundwater and surface water flow. The 2018 study was conducted during October and November, a period typically characterized by low groundwater and surface water flow."

4. ***Page 4-6, Section 4.4.2, second paragraph:*** Please explain why the studies were conducted in different seasons, if there are known seasonal variations associated with groundwater levels and surface water flow. Would this have affected the overall results of the 2018 study which is compared to the 2015 study under different seasonal conditions? This theory is mentioned in the next section (Section 4.4.3).

    - ***Response:*** The two studies (2015 and 2018) were conducted during two different times of the year in different seasons, however, that was not strategic. The discussion in the last paragraph of Section 4.4.2 as stated above, along with the additional discussion in Section 4.4.3, presents hypothesis on the varied results between the 2018 study as compared to the 2015 study. The possible explanations include: 1) high groundwater and surface flow compared to low groundwater and surface flow; and 2) due to the local change in groundwater flow created by the activation of the groundwater extraction wells.

      While the very significant decrease in magnitude of the VOC mass discharge in 2018 compared to 2015 may be partially attributable to reduced groundwater discharge in fall conditions compared to the spring, any relatively small difference in groundwater discharge is considered unlikely to reduce the VOC mass discharge by the observed extent. Moreover, 2018 was a very wet year with multiple extreme precipitation events throughout the summer. It follows that groundwater discharge would be relatively high over the summer and fall months that year. Even with the extreme weather, groundwater extraction wells were able to maintain control of the groundwater plume, resulting in markedly improved surface water conditions.