November 9, 2021

ENGINEERING
ENVIRONMENTAL
ECOLOGICAL

Mrs. Laura Ward, Executive Director
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Subject: **Independent Review of Monitoring Well Installation Work Plan**
Lockheed Martin Tallevast Site (Former American Beryllium Company Site)
1600 Tallevast Road
Tallevast, Manatee County, Florida
E Sciences Project Number 1-1440-004

Dear Mrs. Ward and Mrs. Washington:

E Sciences, Incorporated (E Sciences) is pleased to submit this letter outlining the results and opinions derived from our review of a September 2021 document titled *Monitoring Well Installation Work Plan – Lockheed Martin Tallevast Site* prepared by AECOM Technical Services, Inc. and sealed by the engineer of record on September 16, 2021.

BACKGROUND

E Sciences previously provided consulting services related to the review of documents associated with assessment and remediation of contamination caused by the former operation of the former American Beryllium Company facility at the property located at 1600 Tallevast Road (the "Site") to FOCUS. The Site is owned by Lockheed Martin and contamination assessment and remediation are on-going.

After Lockheed Martin had submitted annual Remedial Action Summary Reports (RASRs) from 2014 until 2020, FOCUS requested that we review certain information in these reports and provide opinions about the ongoing remediation progress and reporting. Specifically, we reviewed the plume and capture zone configurations and system modifications for each year of remedial progress. Select additional regulatory documents were reviewed as needed to further our understanding of the information contained in the RASRs. E Sciences documented the results of this review in our letter titled *Independent Review of Remedial Action Summary Reports* dated January 11, 2021.

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E Sciences' January 11, 2021 letter outlined our opinion that impact of the largely unassessed areas and overestimated capture zones presented in the approved Remedial Action Plan (RAP) documents, which were a basis for our administrative challenges to the approved RAP, were confirmed in the RASRs. We expressed our appreciation that FDEP is requiring that Lockheed Martin install monitoring wells to better define and monitor the extent of 1,4-dioxane and wishes to review additional remediation strategies for "hot spots," but we provided some recommendations to demonstrate specific items that were overlooked during the assessment and continue to be overlooked during remediation.

To our knowledge, the current request for monitoring well installation remains the only item of concern being addressed by Lockheed Martin. To address this request, Lockheed Martin prepared a work plan to respond to this FDEP request by issuance of a document titled *Direct Push Technology Groundwater Sampling Plan* dated April 12, 2021 (herein referred to as the "DP Work Plan"). FOCUS requested that E Sciences review this document and provide comments and opinions. E Sciences prepared a document titled *Independent Review of Direct Push Technology Groundwater Sampling Work Plan* dated May 4, 2021.

Again, we identified numerous inadequacies and failures that were not being addressed under the DP Work Plan. Our May 4, 2021 letter presented specific feedback on the DP Work Plan that showed how the limited nature of the scope outlined in the DP Work Plan would result in missed opportunities to more fully address the unassessed areas needed to evaluate the inadequacy of the remediation system.

Since that time, Lockheed Martin has implemented the DP Work Plan. The results of that assessment were not included in an assessment document, rather in a limited document format titled Monitoring Well Installation Work Plan dated September 17, 2021 (herein referred to as the "MW Work Plan"). This letter documents our findings as they relate to our review of the MW Work Plan.

MW WORK PLAN SUMMARY

Lockheed Martin indicates that the MW Work Plan was provided "to the FDEP for the installation of monitoring wells in the upper surficial aquifer system (USAS)" and that the MW Work Plan is based on the following:

- FDEP's request for the installation of monitoring wells to better define the extent of 1,4-dioxane in the USAS in the southeast area of the Site;
- subsequent communications with FDEP through a teleconference;

- written initial plan comments resolution; and
- the results of the implementation of the DP Work Plan.

The MW Work Plan summarizes the results of the groundwater assessment conducted based on the DP Work Plan and outlines the proposed activities and schedule to install monitoring wells to delineate 1,4-dioxane and volatile organic compounds (VOCs) in the southeast area of the Site. Groundwater samples were collected from 24 direct push locations at two to four screen intervals within the USAS in July 2021. The direct push locations were consistent with those proposed in the DP Work Plan. The target depth intervals were reportedly dependent on location-specific lithology, although they followed closely to the predetermined proposed depth intervals outlined in the DP Work Plan. The groundwater samples were submitted to a stationary laboratory for analysis. Data validation reports were provided as an appendix to the MW Work Plan. Based on the data that is reported in the MW Work Plan, the 1,4-dioxane groundwater plume was confirmed to have extended outside of the reported capture zone of the remediation system in the USAS.

The report also indicates that lithologic soil borings were completed at three locations. The soil boring locations were located approximately 250 feet south, east, and west of the perimeter groundwater sample locations. The proposed placement of monitoring wells is indicated to be based upon the groundwater analytical results and the lithology.

Lockheed Martin states that mobilization for field activities will occur within 30 days following regulatory approval of the MW Work Plan. They are proposing to install groundwater monitoring wells with ten feet of screen that terminate at the bottom of the USAS, but not to exceed a depth of 43 feet below land surface (BLS). The MW Work Plan states that field staff will conduct lithologic soil sampling during well installation activities to confirm each well is screened in the appropriate lithologic unit. Therefore, the monitoring wells will evaluate groundwater quality in the proposed monitoring well locations from a ten-foot depth interval, but the actual depth to be monitored is not known at this time. It is presumed that the field staff will review the lithologic borings to determine the depth of the USAS at each monitoring well location in the field and that well screen depth intervals representing the bottom ten feet of the USAS will be selected.

Groundwater samples will be collected from the monitoring wells within 30 days of completion of the well installation activities. Samples will be delivered to a stationary laboratory and analyzed for VOCs and 1,4-dioxane using a standard turnaround time frame.

Based on the data that is reported in the MW Work Plan, the 1,4-dioxane groundwater plume was confirmed to have extended outside of the capture zone of the remediation system in the USAS during the direct push groundwater sampling. The MW Work Plan proposes activities and a schedule to install monitoring wells in the USAS to delineate 1,4-dioxane and volatile organic compound (VOC) plume in the southeast area of the Tallevast Site." The monitoring wells are proposed to be placed outside of the areas where direct push groundwater samples did not detect 1,4-dioxane above the GCTL.

GENERAL COMMENTARY ON MW WORK PLAN DOCUMENT

Discrepancy in Number and Location of Monitoring Wells

There is a discrepancy in the number of groundwater monitoring wells being proposed. The text indicates that Lockheed Martin is proposing to install eleven monitoring wells, but Figure 4 of the document depicts only nine proposed monitoring well locations.

Inadequate Information on Lithologic Borings and Groundwater Analyses

Lockheed Martin indicates that proposed monitoring well locations are based on both lithologic borings and the DPT groundwater analyses, however, we note that no soil boring logs or narrative describing the lithologic data was included in the MW Work Plan. Lithologic borings logs are an ordinary attachment to assessment documents. We expect that FDEP will require that soil boring logs be provided, and for Lockheed Martin to show how that information was used to develop a rationale for the proposed monitoring wells so that FDEP could properly assess the information used as criteria for selecting the monitoring well locations and depths. It is also important to make this information readily accessible to the community members who live on, work in and own land within the contaminated properties. Approval of the plan without such information would be premature.

Additionally, while the groundwater analytical results were depicted on figures, no narrative discussion was provided. Narrative discussion of groundwater analytical results is an ordinary expectation of assessment documents. The analytical data were reportedly used to assist in determining the proposed monitoring well locations. We would expect FDEP to require a discussion of the data and how it supports the rationale for monitoring well placement in the MW Work Plan so that they could properly assess the criteria used for selecting the well locations and depth intervals. It is also important to make this information readily accessible to the community

members who live on, work in and own land within the contaminated properties. Approval of the plan without such information would be premature.

For these reasons, our initial review of the limited information provided to justify the monitoring well placement to adequately delineate the 1,4-dioxane plume is that it appears to follow general practice, but we cannot comment on the adequacy of the actual site-specific data since that has not been included nor has its relationship to the proposed rationale been adequately explained.

MW Work Plan Will Not Vertically Delineate the Plume

Although the missing data, as discussed above, is needed to conduct a thorough analysis of the appropriateness of the proposed monitoring wells, we are able to ascertain that their placement is limited to delineating a specific lateral spread and therefore ignoring the lack of deeper plume delineation or other possible considerations such as secondary sources of contamination from the plume discussed below.

As we reviewed some of the historical assessment data to respond to the community's request to review the MW Work Plan, we were reminded that the vertical delineation of the 1,4-dioxane plume has still not been addressed by this assessment despite repeated requests from the community advisors (E Sciences and Environ/Ramboll as the community's technical advisor under Lockheed Martin's Consent Order with the FDEP). For example, the LSAS monitoring well MW-105, screened from 42 to 47 feet BLS, exhibits exceedances of 1,4 dioxane. The AF gravels well MW-248 screened from 103 to 113 feet BLS also exhibits 1,4-dioxane exceedances. The monitoring wells proposed in the MW Work Plan are limited to a maximum depth of 43 feet BLS and will not address the vertical extent of the contaminant plume that has documented exceedances down to depths of 113 feet nor is there evidence that the proposed monitoring well placement takes into consideration the potential for a secondary source of 1,4-dioxane in the less permeable zones.

Consideration of 1,4-Dioxane Behavior in MW Work Plan

The Interstate Technology Regulatory Council (ITRC) is a state-led coalition that provides a clearinghouse of information to broaden and deepen technical knowledge and expedite quality decision making while protecting human health and the environment. There is an ITRC online document designed for state and federal environmental staff, project managers, and other stakeholders to gain knowledge of 1,4-dioxane history and potential sources, regulatory framework, environmental fate and transport, investigation strategies, sampling and analysis, toxicity and risk

assessment, and remediation and treatment technologies. The document was developed by a team of over 200 environmental practitioners drawn from state and federal government, academia, industry, environmental consulting, and public interest groups. The organization presents innovative environmental technologies and approaches so that compliance costs are reduced, and cleanup efficacy is maximized.

The ITRC document provides a useful overview on considerations for developing or refining a Conceptual Site Model for assessment of 1,4-dioxane in groundwater plumes. This document discusses the fate and transport processes in the context of its physical and chemical properties. Useful information from that document is summarized below:

- 1,4-dioxane is fully very soluble in water and migrates at a rate similar to groundwater. It is hydrophilic so it has a low tendency to attach (sorb) to solids. As a result, 1,4-dioxane has the potential for rapid plume expansion in groundwater with higher flow velocities.
- Matrix diffusion describes the movement of contaminants into and out of an aquifer's lower-permeability zones (e.g., clays, silts, bedrock). This is a much slower process than the contaminant migration through flow in groundwater. Diffusion is of particular interest for 1,4-dioxane in aquifers where soils of highly contrasting permeabilities are in close contact such as the situation between the USAS and the Lower Surficial Aquifer System (LSAS) are in close contact. The ITRC document states the following:

  Matrix diffusion has the potential to increase persistence of 1,4-dioxane in the subsurface for several reasons. First, the high effective solubility of 1,4-dioxane creates an initial concentration gradient that can drive large amounts of mass into lower-permeability zones. Second, 1,4-dioxane sorbs poorly, meaning that significant penetration into a low-permeability layer can occur because there is less resistance to diffusion-driven transport. Conceptually, it is expected that 1,4-dioxane will move rapidly through highly transmissive portions of the aquifer, but it will invade less permeable materials by diffusion. Back-diffusion of 1,4-dioxane mass from these less permeable zones might serve as a dominant long-term secondary source.

This means that 1,4-dioxane can move into the less permeable aquifer, such as the LSAS, and then redissolve into the USAS. ITRC states that further delineation of areas where diffusion-based "secondary sources" are suspected may also be necessary for this reason. Knowing the location and understanding the sources of contamination are critical in determining remedial actions. The ITRC document showcases the complexity of assessment of 1,4-dioxane plumes as sites such as this one

and how a simple delineation at the base of the USAS may be insufficient to identifying a possible secondary contributing source.

GENERAL COMMENTARY ON THE IMPACT TO THE COMMUNITY

It is unknown how long the plume has been migrating beyond the capture zone due to the lack of delineation monitoring wells ever being installed in this area. Unfortunately, after a decade of involvement with this site, it has been our experience that the lack of narrative and backup information is consistent with the historical documentation prepared by Lockheed Martin. This has created a great challenge to identify potential deficiencies in the assessment and remediation planning and is an ongoing concern of the community that has not been addressed. The lack of critical analysis of the plume and the capture zone has resulted in documented plume movement and the recent acknowledgement by Lockheed Martin that the plume was not only not delineated in this area but that it extends outside of the capture zone.

The community has incurred considerable cost to have experts independently review volumes of appendices of previous assessment documents to evaluate if the assessment was complete or if the containment system was adequate. We concluded that the plume was not properly defined when the SAR was approved. The plume was still not defined when the RAP was approved. The inadequacy of plume delineation was raised by the community during each of these stages of this project. Our concerns that the location of the contamination must be defined to be contained and remediated were expressed multiple times. However, Lockheed Martin was not required to address these concerns and the plume likely continued to expand and likely continues to expand. We can only conclude that the complexity of the plume and lack of clarity being presented in these regulatory documents precluded the critical independent regulatory review that was needed to challenge the conclusions that were not always by the data or to request sufficient data to evaluate the assessment and remediation.

One such example was clearly illustrated in 2016. In 2016 E Sciences was requested to review the issuance of *a Temporary Point of Compliance (TPOC) Status Update Notice*. At that time, we prepared a review letter dated February 18, 2016, provided to FDEP. In that letter we stated the following:

> "The 1,4-Dioxane concentrations historically documented in groundwater samples collected from monitoring well MW-114 were reported to be above the GCTL in 2011, 2012, 2014 and 2015. However, this monitoring well location was not included within the

> boundary of the TPOC depicted in the 2009 RAPA or the February 2011 TPOC notification. The community is depending on the responsible party to provide accurate information and the FDEP to consistently review historical and current project data to ensure that the contamination and TPOC delineations are accurate, the plume is not migrating and the information is effectively conveyed to the affected community."

Now, in 2021 the "new" plume boundary depicted in the MW Work Plan is over 1,000 feet downgradient of monitoring well MW-114. We also noted in our 2016 review of the TPOC that there were some private property owners that were not included in the notification for the five-year status update of the TPOC. Despite the above comments, Lockheed Martin chose not to complete the horizontal delineation of the plume until FDEP's delineation request in the November 24, 2020 review letter. Further, as far as we are aware, affected private property owners were not noticed.

We understand that the community appreciates FDEP's current request for additional assessment but remains concerned about how much time has passed due to Lockheed Martin's lack of acknowledgement of the actual groundwater conditions or urgency to address the leading edge (both vertically and horizontally) of the plume.

Our understanding is that Lockheed is unwilling to engage directly with the community any longer and so the community's sole access to information is through copies of final reports that are sent to FOCUS or downloaded from the FDEP OCULUS database. As stated in the 2016 E Sciences document referenced above, the community has had to engage independent technical advisors to review information as it becomes available. It should be an expectation that the assessment documents available provide complete information and present a rationale for recommendations so that the community can be informed and so that FDEP can have sufficient information to evaluate the data and recommendations adequately.

Once again, we spent considerable time referring to historical documents to refresh our understanding of the lithology in the area downgradient of the Site to understand the information provided in the MW Work Plan, to evaluate the depth of the USAS and if the screened intervals being proposed are appropriate. We would not expect FDEP or the community to have to search historical records for the Site to understand the current proposed strategy, rather Lockheed Martin should provide the information in a comprehensive document that includes the findings of the assessment and a narrative discussion explaining the rationale for the recommendations. Lockheed Martin's pattern of providing inadequate and incomplete information has evaded accountability

and continues to cost the community, the environment and the FDEP (thereby the taxpayers of the State).

REQUEST FOR ADDITIONAL ACTIVITIES

Based upon the information discussed above, it is our opinion that Lockheed Martin should be required to conduct the following activities:

- Clarify if the plan is to install nine or eleven monitoring wells.
- Provide narrative rationale for monitoring well depths and placement.
- Provide lithologic boring logs and the results of the plume stability analysis that was referenced in the DP Work Plan.
- Delineate the vertical extent of the 1,4-dioxane plume as part of this MW Work Plan.
- Address the possibility of a secondary source of 1,4-dioxane.
- Prepare an updated TPOC notification and ensure that all affected property owners are notified.
- Expedite the additional assessment. It has been one year since FDEP requested delineation of the 1,4-dioxane plume. Lockheed Martin has indicated that they will mobilize within 30 days of work plan approval and sample the newly installed wells within 30 days of installation. It is noted that it took four months from sample collection for Lockheed Martin to submit the MW Work Plan to FDEP. It is conceivable based upon this, that the report of results will not be available for six months from FDEP approval of the MW Work Plan. The results of this assessment impact off-site property owners and is being used as a basis for modifying the remediation system to capture the plume. These on-going delays do not show urgency on the part of the responsible party to remedy the situation that is impacting third parties.
- Expedite the remediation. It has been apparent for years that the contaminant plume has not been contained. Again, there should be some urgency applied to the remediation activities because this contamination plume affects several private properties and may be continuing to spread.

Due to the social and economic detriment suffered by the community by the widespread migration of the contamination plume, we suggest that there be a higher degree of diligence of review and urgency to ensure that the rights of the affected parties and the public are met and protected.

We appreciate the opportunity to offer our professional services to you. If you have any questions concerning our evaluation, please contact us at 954-484-8500.

Sincerely,
E SCIENCES, INCORPORATED

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