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Executive Summary of DTSC's May 2017 Technical Memorandum On the American Jewish University – Brandeis Bardin Institute Campus May 2017

Overview

The Santa Susana Field Laboratory (SSFL) is a former nuclear energy research and rocket engine testing facility, located in the hills above and directly south of the Brandeis Bardin Institute (BBI) campus. The SSFL property will require soil cleanup for chemical and radiological contaminants. This cleanup will proceed in accordance with Administrative Orders on Consent between the State and the US Department of Energy (DOE) and NASA, and with a 2007 Consent Order with Boeing.

A Technical Memorandum

http://www.dtsc.ca.gov/SiteCleanup/Santa_Susana_Field_Lab/upload/SSFL-Technical-Memo-on-the-Brandeis-Bardin-Campus_050217.pdf was developed by the Department of Toxic Substances Control (DTSC) in response to concerns raised regarding the safety of attending or working on the adjacent BBI campus. This Technical Memorandum concludes:

- Levels of radionuclides on the BBI campus appear to be within the natural background range
- Levels of chemicals and radionuclides at the BBI campus do not pose a threat to human health
- Contamination at SSFL does not pose a threat to BBI campus users, and
- The BBI campus is safe for use by campers, visitors, students, faculty, administrators and staff.

DTSC evaluates data using a sound, scientifically defensible approach, based on multiple-lines of evidence. Like the United States Environmental Protection Agency (US EPA), DTSC evaluations consider natural variations in background levels, differences in geology that affect results, radionuclide half-lives, the ability to accurately analyze and report analytical data, the distribution of the analytical results, statistical validity, and other factors.

The portions of the SSFL property located closest to and adjacent to the BBI campus are referred to as Area IV and the Northern Buffer Zone. DTSC staff reviewed and evaluated data from several different SSFL sampling reports and adjacent off-site data from BBI campus. The data include both chemical and radionuclide results.

As part of DTSC's project oversight, DTSC staff routinely review and assess analytical data for potential health threats. If sampling results show an imminent threat to human health, DTSC requires response actions as needed to protect public health and the environment. DTSC has previously required response actions on different parts of SSFL to address the finding of elevated levels of contamination (e.g., covering the mercury-impacted soils in the Sodium Reactor Experiment [SRE] area, excavation and capping of the Former Sodium Disposal Facility [FSDF], treatment of perchlorate soils from Happy Valley, and cleanup of the Northern drainage, etc.) None of the recent data reviewed as part of this evaluation have indicated a need to initiate immediate response actions for the BBI areas or for the Northern Buffer Zone.

Over the last 25 years, multiple sampling efforts have been conducted on both BBI and SSFL properties. After review and analysis of the data from those sampling efforts related to potential impacts to BBI campus, the results are all generally around or within natural background range and there is no indication of a grouping or pattern that would indicate a contaminant release on BBI's current property.

Focus on Radionuclides

Many of the allegations of contamination on the BBI campus concern radionuclides, and more specifically Strontium-90 (Sr-90) and Cesium 137 (Cs-137). In a 2012 radionuclide investigation (Area IV Study), the US EPA collected over 3,487 soil and 55 sediment samples. US EPA initially analyzed for 55 radionuclides. Based on their findings, US EPA identified Cs-137 and Sr-90 as the key radionuclides of concern.

Typically, preliminary remediation goals (PRGs) are risk-based screening values used to identify areas and contaminants that may warrant further investigation or assessment. The US EPA has a tool called the PRG calculator that allows for development of site screening PRGs. The US EPA PRG website (<https://epa-prgs.ornl.gov/radionuclides/faq.html>) includes several frequently asked questions (FAQs) that relate to the use of PRG values.

“Generally, at sites where contaminant concentrations fall below PRGs, no further action or study is warranted under the Superfund program, so long as the exposure assumptions at a site match those taken into account by the PRG calculations. Chemical concentrations above the PRG would not automatically designate a site as "dirty" or trigger a response action. However, exceeding a PRG suggests that further evaluation of the potential risks that may be posed by site contaminants is appropriate. PRGs are also useful tools for identifying initial cleanup goals at a site.

PRGs are not de facto cleanup standards, however, they could be used to establish final cleanup levels for a site after a proper evaluation takes place. In the Superfund program, this evaluation is carried out as part of

the nine criteria for remedy selection outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Once the nine criteria analysis is completed, the PRG may be retained as is, or modified (based on site-specific information) prior to becoming established as a cleanup standard.” (EPA) <https://epa-prgs.ornl.gov/radionuclides/faq.html>

US EPA typically completes a statistical analysis of the sampling data collected from across the site to create a conservative - that is, protective - picture of the extent of contamination, and compares the results of that analysis to the PRG for the site. The statistical analysis is not an average but does account for variability in the sampling results. If a site analysis shows that the contamination is greater than the PRG, a more detailed risk assessment is conducted to determine what steps are needed to protect the public and environment from exposure to the contaminants.

US EPA does not typically compare individual sample results to the PRG. A sample-by-sample comparison does not represent EPA’s intended use of risk-based screening levels, and doing so would not only be inconsistent, but would also be an overly conservative use of the PRG. However, if all of the sample concentrations measured at a site were below the PRG, US EPA would conclude that no further action was needed.

Although a sample-by-sample comparison is considered overly conservative, DTSC compared the concentrations measured at each sample point to the local background concentrations and a PRG for the BBI campus. DTSC found the concentrations were consistent with local background and were all less than the PRG. The PRG for the BBI campus assumes a person lives on the property for 26 years (six years as a child and 20 years as an adult). The exposure scenario further assumes the individual spends essentially all of their time at the property – that is, stays on the property 24 hours per day 350 days out of the year, only leaving the property for slightly more than one day each month.

BBI Reports/Data Reviewed

Over the past 25 years, sample results from multiple radiological and chemical investigations on what is now BBI property have found results that are similar to local background, and no groupings or patterns have been identified that indicate a release of contamination from SSFL. The levels found pose no unacceptable health risk to people who use the current BBI campus.

In 1991, BBI directed their consultant to perform sampling throughout BBI, and in 1992 and 1994, US EPA oversaw Multi-Media Studies that included sampling on property owned by BBI. Those studies identified that the highest concentrations of Cs-137 and Sr-90 were in two watersheds located within a strip of land that was subsequently acquired by Boeing’s predecessor in 1997. That strip of land is now part of SSFL and is referred to as the Northern Buffer Zone. Given the steep and rugged terrain of these watershed locations, BBI camp users during this period of time would have found these

locations difficult to access, and would have had limited, if any, exposure to these areas, even prior to Boeing's acquisition of the property. The Multi-Media Studies evaluated sampling results using both a statistical and non-statistical approach. Sample results within the SSFL Northern Buffer Zone showed most of the data does not differ from local background conditions (e.g., are naturally occurring). The results on the BBI property also showed no grouping or pattern for the limited number of samples that exceeded local background levels.

In 1995, after review of the Multi-Media Study findings, the US EPA issued a Fact Sheet that stated while the studies on the BBI campus confirmed the presence of radionuclides above local background levels established at the time, the levels were below typical levels found throughout the United States, and did not pose a threat to human health or the environment. In 2012, US EPA conducted further radionuclide sampling that showed sparse, low level exceedances in the Northern Buffer Zone. This is consistent with the Multi-Media Study results on BBI that were within the range of background. Together, results from the BBI and SSFL studies support the conclusion that the overall distribution of radionuclides remains on SSFL and has not migrated offsite onto BBI. Additional, more recent sampling results also confirm this.

BBI's consultant continued sampling various media at Brandeis Bardin, including garden produce, milk from an on-site cow herd, weeds, leaves and vegetation, and soil samples. DTSC reviewed the BBI testing reports, including analytical laboratory reports, for sampling events conducted from 1991 through 2017. In almost all cases the results were within the range of local background, and even including few cases where the results were above background, but still in low concentration levels, no samples showed significant soil or sediment impacts on the BBI property that would pose a threat to students, staff, faculty or visitors. The list of the reports and documents DTSC reviewed and referenced can be found in the Technical Memorandum.

In 2016, American Jewish University retained an independent, third party contractor to evaluate environmental conditions at the BBI campus. Based on review of prior studies, the 2016 Brandeis Study concluded that to date, no study has ever found harmful levels of radiation or chemical contamination on the BBI campus. The 2016 study included a continuous gamma radiation survey and limited soil sampling on the BBI property. Gamma radiation readings in the primary activity areas of the campus were not statistically different from local background levels. In other areas, soil and sediment samples were analyzed for radionuclides and indicator chemicals identified through previous investigations as most likely to represent off-site SSFL impacts. The only result of potential concern was a single, low-level detect of Sr-90. The report infers that the single low-level Sr-90 detection may have been over reported, potentially due to a bias from the presence of other strontium isotopes in the sample. In an abundance of caution, the potential risk to campers and other site users was calculated assuming the camper or site user was exposed to this single Sr-90 detected value (0.18 picocurie/gram - pCi/g).

The length of time a person is exposed and the way a person can be exposed to the contaminant directly influences risk from contamination. To determine the PRG for the BBI property, DTSC considered what contamination concentrations would pose a risk to people living on the property for 26 years (six as a child and 20 additional years after that) 24 hours a day, 350 days out of the year. In other words, DTSC used a health protective residential scenario that provided for much more potential exposure than the limited amount of time that visitors, campers, students, faculty and staff use the facility. Using this scenario and U.S. EPA's PRG Calculator¹, DTSC calculated the PRG for Sr-90 soil to be 3.12 pCi/g. Exposure as described for 26 years to this level of Sr-90 would lead to a one-in-a million additional cancer risk.

The single low-level Sr-90 soil detection (0.18 pCi/g) is below the 3.12 pCi/g residential PRG. Even using the single Sr-90 reading and assuming that the highest strontium level represented all soil on the property, the risk evaluation concluded that the environmental and radiological conditions at the BBI campus pose no unacceptable human health risk to campers, camp counselors, visitors, or residents at the site. These findings are consistent with DTSC's findings from previous SSFL investigations that found Sr-90 levels that exceed the risk-based screening levels are confined to a few locations near former operational areas off the BBI property and within SSFL's Area IV.

The 1992-94 Multi-Media Studies overseen by the US EPA also included analysis for Cs-137. Of 84 samples in the associated BBI property analyzed for Cs-137, three were above the 0.225 pCi/g local background level, with the highest of the three being 0.38 pCi/g. The locations and spacing of the three samples do not indicate a likely source of Cs-137 existed in 1992-1994. Radionuclides naturally decay over time. A sample taken in 1992 with a Cs-137 level at 0.38 pCi/g would be expected to have decayed to 0.219 pCi/g today. This is below the naturally occurring local background level of 0.225 pCi/g, which means we would not expect to find any Cs-137 on the BBI campus today at levels greater than background. Samples collected from 2014 through 2016, and downstream or adjacent to the highest levels found in the Multi-Media Studies, did not detect any Cs-137 levels above background.

SSFL Reports/Data Reviewed

DTSC reviewed studies of the distribution of chemicals and radionuclides on the SSFL property in Area IV and the Northern Buffer Zone to determine if there is evidence of active migration of contaminants from SSFL onto BBI. As discussed above, while this evaluation included radionuclides, DTSC's review considered both potential radionuclide and chemical contamination.

Both chemical and radionuclide samples have been collected on SSFL property in Area IV and the Northern Buffer Zone – the property immediately adjacent to BBI. Samples closest to the former operational areas in Areas IV have higher chemical levels than

¹ Value was calculated using US EPA PRG calculator in January 2017.

those found in the Northern Buffer Zone. While there are sample results in the Northern Buffer Zone that may require cleanup, the majority of the chemical concentrations are sufficiently low that they do not present an unacceptable human health risk. Based on the results provide in Table 4 of the Technical Memorandum, 25 of 40 samples results were less than what can be definitively detected and reported by the laboratory and would not require cleanup. The remaining 15 samples results are below risk-based screening levels.

Based on both monitoring results and analysis of the extensive chemical sampling conducted at BBI, DTSC concludes that the low concentrations of chemicals found in drainage channels on the Brandeis Bardin property, likely represent natural background. These levels are sufficiently low and do not present unacceptable human health risks for staff or students on the Brandeis Bardin property.

In addition, the US EPA Area IV Study concluded that most radionuclide affected soils, or sediment with radionuclides related to SSFL operations are in or near five former operational areas within Area IV. US EPA's data show no significant pattern or grouping of radionuclides in the Northern Buffer Zone. With one low-level Cs-137 exception, the concentrations of Sr-90 and Cs-137 found in the Northern Buffer Zone, do not exceed their respective local background or the laboratories ability to detect the radionuclide and meeting strict quality controls. The US EPA results indicate that SSFL related radionuclide contaminants are not migrating off the SSFL site. US EPA's comprehensive radionuclide study supports DTSC's findings that people at the BBI property are not expected to be at risk from exposure to radionuclides from Area IV.

With regard to chemicals, the soil and sediment sampling results have found some chemical levels in some areas to be above what we would expect under natural conditions (local background). We know that chemically impacted sediments have historically migrated along drainages - such as the Northern Drainage - from SSFL into the Northern Buffer Zone, and into a limited number of steep drainages onto Brandeis Bardin property. Numerous interim measure cleanups at SSFL have been conducted to remove contaminated soils that might potentially migrate via surface water to the Brandeis Bardin property below. Based on analysis of the extensive off-site chemical sampling and monitoring results, DTSC concludes that in almost all cases, the results are within the range of local background. Even in the few cases where the concentrations were above background, the low concentrations of chemical in drainage channels on the Brandeis Bardin property do not present an unacceptable human health risk for staff or students on the Brandeis Bardin property.

Best management practices will continue to be implemented at SSFL contaminated source areas to prevent migration of contaminants off site, and the National Pollutant Discharge Elimination System program will continue to monitor and manage storm water discharges off site. DTSC and the California Regional Water Quality Control Board actively communicate and coordinate on a regular basis, as both agencies have

a mutual interest in ensuring that onsite contaminants are contained, managed, and monitored appropriately.

Conclusions

Based on state and federal standards and screening guidelines, the levels of chemicals and radionuclides found on the BBI campus do not indicate a health threat to the students, faculty, staff, visitors, or campers. While there are some low-levels of chemicals in the more remote and undeveloped areas on the BBI campus, the levels found on the active portions of the BBI campus are within established background levels. The most recently measured levels of Sr-90 and Cs-137 are also within the range of local background. If DTSC becomes aware of data that demonstrates there is a threat to public health, DTSC will take actions to stop that threat.