Appendix B

Summary Critique of Deal With Boeing to Weaken SSFL Cleanup Requirements

The secret negotiations between DTSC and Boeing resulted in a 796-page agreement that, at its core, dramatically weakens the cleanup requirements for the parts of the Santa Susana Field Laboratory (SSFL) for which Boeing is responsible.[1] For many contaminants, concentrations a hundred times higher than previously allowed are permitted for some areas of the site, and ~2000 times higher for the rest of the Boeing site.

DTSC tries to claim that this profound weakening of the cleanup is not due to pressure from Boeing but based on "good science," but a review of the record demonstrates the opposite.

1. DTSC Director Meredith Williams Has Admitted that DTSC Has Very Limited Experience with the Technical Issues Involved and Few if Any Personnel with Expertise in the Matter.

The issue DTSC has focused on in weakening the cleanup standard is changing the Resident-with-Garden cleanup standard. A memorandum dated September 1, 2021,[2] begins by conceding: "A residential garden pathway exposure scenario is unique and, of the hundreds of sites that we routinely evaluate, DTSC has only applied it three or four times for cleanup in California. Of the DTSC toxicology staff, few have participated in risk assessments using this scenario."

2. In That Memo, DTSC Claims That USEPA Admitted It Had Made an Error Regarding the Mass Loading Factor (MLF) and Had Corrected It. In Fact, the USEPA Emails Said No Such Thing.

The September 1, 2021, DTSC memo asserts that USEPA had made an error regarding wet-dry conversions, that the supposed error was identified by Bruce Narloch, working for Boeing's contractor, and that he had informed USEPA of the supposed wet-dry conversion error.[3] The memo then asserts that in late 2015 USEPA indicated that others had also identified the

[1] Department of Toxic Substances Control, *Boeing Cleanup Settlement Agreement,* May 9, 2022.

[2] "RBSL variables discussion document CBG NRDC 210901," transmitted by email from DTSC Director Meredith Williams to the Natural Resources Defense Council (NRDC) and the Committee to Bridge the Gap (CBG) on September 1, 2021; In an earlier email, on August 27, 2021, Director Williams indicated that she was herself producing the memorandum which was to explain the basis for the changes DTSC was proposing ("I apologize for the continued delay. I'm still awaiting one source document to complete the calculation input description. I don't want to promise that I'll have what I need on Monday either so I would suggest that I plan to give you an update Wednesday morning if I haven't been able to send you the document by then.")

[3] RBSL variables discussion document, p. 2.

supposed error, that USEPA admitted the error and said it was going to correct the supposed wet-dry conversion error.[4]

When Director Williams was asked to provide a copy of the late 2015 USEPA email that supposedly made these admissions, she provided emails between Stuart Walker of USEPA and Bruce Narloch of Boeing.[5] However, the actual emails demonstrated that Walker had said no such thing– no admission of an error, no statement that EPA would be correcting a purported error by making a wet-dry correction.

Here is all that EPA's Walker actually wrote in response to Narloch (October 2, 2015):

> Yes, very interesting. Thank you for the analysis Bruce.

And on October 29, 2015:

> Hi Bruce, just got back from another trip and trying to play catch up. Without going into a lot of detail on internal deliberations, we had received some comments on the MLF prior to your comments and had been looking at it. We are definitely looking at the information you provided, along with information from other EPA offices and other agencies.

That's all–no admission of error, no statement a wet-dry conversion mistake had been made, no promise to make a wet-dry correction. All that USEPA's Walker had actually done was to politely say thanks for sending this material; we'll look at it.

Upon this misrepresentation of emails from USEPA's Stuart Walker rested the DTSC assertion of a USEPA admission of a wet-dry conversion error and the need to thus dramatically weaken the cleanup standards for Boeing at SSFL.

3. USEPA's Walker Told Dr. Williams Directly That USEPA Had Made No Such Error, and She Admitted She Had Been Wrong.

Prompted by the receipt the prior night of the 2015 Walker-Narloch email chain, CBG's Hirsch asked USEPA's Walker if he could make himself available during the scheduled virtual meeting on September 17, 2021, between DTSC Director Williams and her staff, and CBG's Dan Hirsch and NRDC's Geoff Fettus and Caroline Reiser.[6] During the meeting, Walker explained that

[4] Ibid.

[5] Hirsch email of September 16, 2021, to Williams, and Williams reply of the same date ("Friday Discussion"), including the Narloch email chain with, among others, USEPA's Stuart Walker ("Narloch_Technical Question Regarding the PRG Calculator and MLF") After receiving a request from Hirsch for the supporting emails, Director Williams had to request the emails from staff. She received them only the evening before the scheduled September 17 discussion with CBG and NRDC, suggesting she had approved the memo without reviewing the referenced supposed email assertions.

[6] In an email to Director Williams the morning of the planned September 17 meeting, Hirsch wrote, "I have reached out to Stuart Walker, the EPA subject matter expert in the email exchange with Dr. Narloch.

USEPA had made no error regarding the Mass Loading Factor (MLF) and that USEPA had consciously chosen the most conservative MLF value to compensate for significant non-conservatisms in other parts of the calculation for setting remediation goals, particularly the problem of using soil transfer factors (Bv_{wet}) which had long been known to be highly unreliable.

Walker at length outlined for Williams the changes USEPA had subsequently made: originally it had used only a single value for soil uptake of individual contaminants, and those were, as indicated above, of questionable reliability; now it had higher quality, measured individual soil transfer factors (root uptake into the plant) for an array of different fruits and vegetables, in different climates and soil types. As stated in the USEPA report summarizing the changes, "Previously, BVs [soil-to-plant transfer factors] that applied to produce were generic for all produce types. Now, the BVs encompass 25 individual produce types, 4 climate zones, and 7 soil types."[7] Walker further explained that in the past, USEPA had used a single value for consumption of fruits and consumption of vegetables; it now uses individual values for each type of fruit and vegetable. And now that it had produce-specific soil transfer factors and consumption rates, it was also using produce-specific MLFs. Thus, there was no error regarding the prior MLF – USEPA had previously consciously chosen the most conservative MLF to compensate for the non-conservatism in its prior use of single, non-conservative values for soil transfer factors and consumption rates. Now that it had individual, well-sourced values for different produce types for uptake and intake, it was appropriate to do so for MLFs as well. But if there were poor quality or single-value numbers for uptake and intake, it would be appropriate to still use the most conservative MLF they had used, ~0.25.

Indeed, Walker indicated, the prior use of the conservative MLF had proven appropriate, in that when USEPA obtained produce-specific uptake and intake factors, those changes more than compensated for weakening the MLFs by using individual MLFs instead of the prior conservative value. In other words, even once they relaxed the MLFs by using individual values rather than the prior single conservative value, cleanup standards tightened, because the other changes went in the more protective direction.

In that meeting, Director Williams admitted she was wrong to have claimed USEPA had admitted to an error or had agreed to fix it, she conceded that the emails she had cited actually didn't say that, and she admitted that Walker had made clear in the meeting that there was no error.

Walker has kindly agreed to make himself available for a few minutes during the latter part of our Zoom meeting to answer questions about the exchange and what EPA did and did not do regarding the MLF and other aspects of the PRG calculator."

[7] Biota Modeling in EPA's Preliminary Remediation Goal and Dose Compliance Concentration Calculators for Use in EPA Superfund Risk Assessment: Explanation of Intake Rate Derivation, Transfer Factor Compilation, and Mass Loading Factor Sources, 2021; See also USEPA Preliminary Remediation Goal Calculator for Radionuclides, "PRG What's New: Dec. 2016" – "Formerly, the transfer factors used in this risk assessment tool were specific to element only. Now, the transfer factors are element, climate zone, soil type, and produce specific."

4. DTSC Is Cherry-Picking: There Are Three Key Elements of the Formula Used in Establishing Cleanup Values. DTSC (Erroneously) Weakened One Element While Failing to Strengthen the Other Two.

Setting cleanup levels where there may be consumption of foodstuffs grown in contaminated soil (e.g., agricultural use or backyard gardens) is based largely on three factors: the amount of contaminated food consumed, the amount of contamination in the soil that is transferred via the roots into crops, and the amount of contaminated soil found on the surface of the crops. This relationship is shown in the following formula from the Standardized Risk Assessment Methodology:[8]

$$RBSL_{fv} = \frac{C_{fv}}{Bv_{wet} + MLF}$$

The $RBSL_{fv}$ is the Risk-Based Screening Level for fruits and vegetables, or the concentration of a pollutant in soil (milligrams of pollutant per kilogram of soil) that would result in an "acceptable" risk from consuming fruits and vegetables growing in soil with that level of contamination.[9] It forms the basis for cleanup levels.

C_{fv} is the target concentration of the pollutant in fruits and vegetables. It is a function in large part of the amount of contaminated food one eats.

Bv_{wet} is the soil transfer factor, or root uptake factor – how much of the contamination in the soil is taken up into the crop via the roots. It can be greater than 1 – some plants concentrate chemicals as they are taken up from the soil and into the plant.

MLF is the Mass Loading Factor, or how much contaminated soil is on the surface of the fruit or vegetable.

At its core, the formula for determining cleanup standards associated with eating food grown in contaminated soil is like a three-legged stool: it is affected by: (1) how much contaminated food you eat, (2) how much contamination in the soil is taken up by the plant, and (3) how much contaminated soil is on the surface of the plant.

Altering one leg of the stool without altering the other two can create substantial problems. What DTSC, at Boeing's urging, has tried to do is cherry-pick: weakening the MLF by about a factor of 20 while failing to improve the consumption and uptake factors. This improperly weakens

[8] Final Standardized Risk Assessment Methodology Revision 2 Addendum (SRAM 2), Santa Susana Field Laboratory, Ventura County, California. Prepared for The Boeing Company by MWH. August 2014.

[9] RBSLs are based on a risk of 10^{-6} or one-in-a-million cancer risk and a Hazard Index (HI) of 1 for non-cancer effects.

cleanup standards dramatically, whereas if one addressed the other two factors as well, cleanup standards overall would be strengthened for many contaminants. *If one isn't going to update the other two factors, one must stick with the existing conservative MLF.*

As USEPA's Stuart Walker made clear to DTSC Director Williams in the September 2021 meeting, USEPA originally had used a single value for MLF, the most conservative MLF they could find, in part because they knew that the single values being used for each toxic chemical's soil uptake (Bv_{wet}) were of questionable reliability, and also because they were using single values for consumption of fruit and for vegetables. When USEPA obtained detailed soil uptake factors for individual fruits and vegetables, from reliable measured values, and utilized consumption rates for individual fruit and vegetable types from actual surveys of home-grown produce intake, they then could back off the conservative single MLF they had been using and use individual measured values for MLF as well. But throwing out the conservative single MLF without coming in with reliable individual values for soil uptake and consumption would be inappropriate and could lead to cleanup standards that aren't protective. Yet that is precisely what the Boeing-DTSC deal does.

5. Director Williams Also Admitted She Was Wrong in Claiming There Were No Measured Soil Transfer Factors for Organic Chemicals.

As indicated above, there are three key factors in setting cleanup goals in situations where people could consume contaminated foodstuffs. The first is the MLF, the contamination that gets on the surface of the produce. As previously shown, Director Williams had claimed that the MLF DTSC had been using was based on an erroneous value from USEPA; the USEPA emails she cited did not in fact say that, and USEPA made it clear to her she was wrong and she admitted so.

The second main factor is Bv_{wet}, the soil uptake factor, how much contamination is taken up into the plant by its roots from the contaminated soil. In her memorandum of September 1, 2021, Williams asserted:

> *There are not, however, measured values for Bv_{wet} for organic contaminants.*
> (emphasis added)

However, in the meeting on September 17, 2021, CBG and NRDC presented Williams with numerous measured values for Bv_{wet} for different organic chemicals and different crops. The examples provided to Williams came from a USEPA report, based on a range of studies in the literature.[10] Williams then admitted she was wrong on this matter as well and that there were indeed measured soil uptake values for various organic chemicals.

[10] "Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs," USEPA, OSWER Directive 9285.7-55, Attachment 4-1, April 2007.

6. In Her September 1, 2021, Memo, Williams Asserted That Because There Purportedly Were No Measured Values for Soil Uptake, a Theoretical Formula Based on the Octanol-Water Partition Coefficient (Log K_{ow}) Should Be Used. But That Formula Has Long Been Known to Be Grossly Unreliable.

After erroneously claiming there were no measured soil uptake (Bv_{wet}) factors for organic chemicals, the memo went on to assert:

> This [lack of any measured values] necessitates the use of modeled Bv_{wet} values based on the log K_{ow} for the majority of organic contaminants.

However, in that September 17, 2021, meeting, CBG and NRDC showed that the log K_{ow} approach used by Boeing and DTSC was from a 1994 paper[11] that merely mentioned it in passing and focused primarily on an altogether different topic. Additionally, this paper clearly indicated that *one should use measured values instead of the proposed formula wherever possible.*

The purpose of this McKone 1994 paper was to use a Monte Carlo analysis to evaluate relative variance observed in exposure estimates, specifically whether this was due primarily to input variability or uncertainties within models. This 15-page paper only briefly touched on soil transfer factors. The paper suggests that where measured values of biotransfer factors are unavailable, a simple formula based on the octanol-water partition coefficient (K_{ow}) might be considered: “The estimation methods described below are for compounds for which bioconcentration and biotransfer factors have not been explicitly measured.”[12]

The paper indicated one should use measured values, but if not available, proposed a single formula for all above-ground plants, $7.7 \times K_{ow}^{-0.58}$ and similarly, a single formula for root crops of $270 \times K_{ow}^{-0.58}$. No matter what above-ground crop, a single transfer factor was produced by the equation; similarly, no matter what root crop, a single value was assumed.[13]

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[11] Thomas E. McKone, "Uncertainty and variability in human exposures to soil contaminants through home-grown food: A Monte Carlo assessment," *Risk Analysis* 14, no. 4 (1994): 449-463.

[12] Ibid., 454; See also Table III, p. 456. Figure 1 in this document.

[13] Intriguingly, Boeing’s 2014 SRAM2 Addendum, approved by DTSC, made matters even worse – utilizing the formula even when measured values were available, and using only the $7.7 \times K_{ow}^{-0.58}$ estimation rather than the $270 \times K_{ow}^{-0.58}$. In other words, they used the weaker of the two formulas, *thus underestimating for some crops soil transfer of contaminants by a factor of 35.* As unreliable as the two K_{ow} formulas are, as discussed below, Boeing and DTSC chose to use the far less protective of the two.

Figure 1

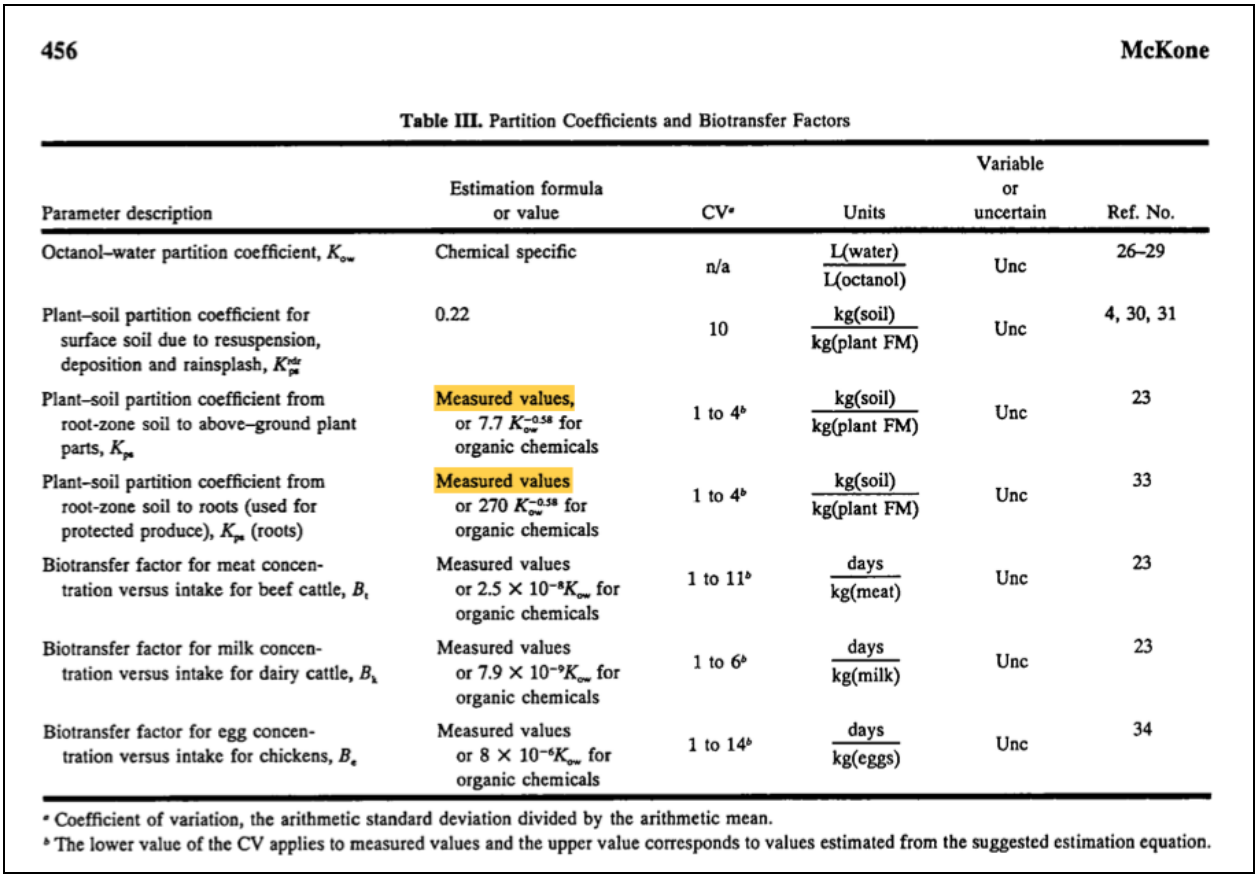

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Table III. Partition Coefficients and Biotransfer Factors

Parameter description	Estimation formula or value	CV[a]	Units	Variable or uncertain	Ref. No.
Octanol–water partition coefficient, K_{ow}	Chemical specific	n/a	L(water)/L(octanol)	Unc	26–29
Plant–soil partition coefficient for surface soil due to resuspension, deposition and rainsplash, K_{ps}^{sdr}	0.22	10	kg(soil)/kg(plant FM)	Unc	4, 30, 31
Plant–soil partition coefficient from root-zone soil to above–ground plant parts, K_{ps}	Measured values, or 7.7 $K_{ow}^{-0.58}$ for organic chemicals	1 to 4[b]	kg(soil)/kg(plant FM)	Unc	23
Plant–soil partition coefficient from root-zone soil to roots (used for protected produce), K_{ps} (roots)	Measured values or 270 $K_{ow}^{-0.58}$ for organic chemicals	1 to 4[b]	kg(soil)/kg(plant FM)	Unc	33
Biotransfer factor for meat concentration versus intake for beef cattle, B_t	Measured values or $2.5 \times 10^{-8} K_{ow}$ for organic chemicals	1 to 11[b]	days/kg(meat)	Unc	23
Biotransfer factor for milk concentration versus intake for dairy cattle, B_k	Measured values or $7.9 \times 10^{-9} K_{ow}$ for organic chemicals	1 to 6[b]	days/kg(milk)	Unc	23
Biotransfer factor for egg concentration versus intake for chickens, B_e	Measured values or $8 \times 10^{-6} K_{ow}$ for organic chemicals	1 to 14[b]	days/kg(eggs)	Unc	34

[a] Coefficient of variation, the arithmetic standard deviation divided by the arithmetic mean.
[b] The lower value of the CV applies to measured values and the upper value corresponds to values estimated from the suggested estimation equation.

Source: Uncertainty and Variability, *supra,* p. 456, highlighting added

The 1994 paper's rough uptake formula based on log K_{ow}, relied upon by DTSC to the present, results in a single presumed uptake factor *regardless of the specific plant, soil, or climate, and has long been viewed as highly unreliable*.

In fact, McKone himself subsequently and repeatedly identified the use of log K_{ow} as unreliable. In a 1997 paper[14] Dowdy and McKone admitted:

> A number of issues *limit the reliability of* K_{ow} as a predictor of [bioconcentration ratio] for vegetation. *Measured* K_{ow} *values vary by as much as several orders of magnitude for the same compound* depending on the method used to obtain them [9]. *This high degree of uncertainty associated with measured values of* K_{ow} *causes reliability problems when* K_{ow} *is used for predicting bioconcentration.*

[14] Deanna L. Dowdy, and Thomas E. McKone, "Predicting plant uptake of organic chemicals from soil or air using octanol/water and octanol/air partition ratios and a molecular connectivity index," *Environmental Toxicology and Chemistry: An International Journal* 16, no. 12 (1997): 2449.

(emphasis added)

He went on to say:

> In addition, K_{ow} values are often obtained without measurement using estimation methods that can also have *low precision and accuracy*. If K_{ow} values are used to obtain bioconcentration information, then any uncertainty inherent to can be carried in the bioconcentration estimates.
>
> (emphasis added)

And again in 2007,[15] McKone and Maddelena stated that:

> Riederer [14], McKone [15], and Dowdy and McKone [13] have all reported the *low reliability of using simple plant/soil partition coefficients to characterize uptake.*
>
> (emphasis added)

And:

> McFarlane et al. [16] have demonstrated experimentally that *chemicals with similar values of K_{ow} can have drastically different long-term partitioning.*
>
> (emphasis added)

In summary, DTSC and Boeing, rather than relying on new and good science, have been using for the soil transfer factor a rough formula that is decades old, has been identified by its author as unreliable, and even the original source said one should use measured values instead wherever possible.

> 7. Director Williams Claimed There Are No Measured Values for Soil Transfer Factors Available, but Now Admits This Isn't True. Actual Measured Values Are Often Far Higher than the Values Used in the SRAM from the Unreliable K_{ow} Formula. Were Measured Values Utilized, RBSLs Would Be Tightened Significantly for a Number of Contaminants, Rather Than Weakened as in the DTSC-Boeing Agreement.

The use of measured values for soil uptake instead of the unreliable K_{ow} formula could result in markedly tightening[16] cleanup requirements for many contaminants. Here are three examples:

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[15] Thomas E. McKone, and Randy L. Maddalena, "Plant uptake of organic pollutants from soil: bioconcentration estimates based on models and experiments," *Environmental Toxicology and Chemistry: An International Journal,* 26, no. 12 (2007): 2494-2504.

[16] Higher values for the uptake factor (Bv_{wet}) will result in a more protective cleanup standard due to this variable being in the denominator of the RBSL equation. Smaller values for MLF, as Boeing and DTSC are using to replace the longstanding value, weaken cleanup standards. A higher Bv_{wet} value would compensate for a lower MLF to varying degrees.

Naphthalene

The Bv_{wet} value for naphthalene that is being used by DTSC & Boeing from the 2014 SRAM 2 Addendum (and apparently still being used in the 2022 DTSC-Boeing Agreement) is 0.0939. However, USEPA's summary of selected *measured* values provides a median soil transfer factor of 2.44 (when converted to wet), which is 26 times higher.[17] The highest measured value is 14 --*150 times higher than the number being used by DTSC and Boeing.*

Thus, reducing the MLF from 0.26 to 0.0135, as DTSC and Boeing want to do, would be more than compensated for by the use of measured values for the soil transfer factor. But DTSC and Boeing are refusing to update the Bv_{wet} values, relying instead on the ancient K_{ow} formula widely known to be unreliable.

In fact, reducing the MLF for naphthalene but updating the soil uptake factor to the median measured value cited above would result, not in a 3.3-fold relaxation of the cleanup standard but a 7-fold tightening. Changing MLF but not changing Bv_{wet} would understate risks ~23-fold; RBSLs would be 23 times too weak.

Pentachlorophenol

The Bv_{wet} value being used by DTSC & Boeing, from the old and unreliable K_{ow} formula, is 0.00826 (wet). USEPA, however, reports the median of measured values as 1.2 (wet)--*145 times higher*.

Even if one were to reduce the MLF from 0.26 to 0.0135, as DTSC and Boeing are now trying, the use of an updated soil uptake factor would make that irrelevant: if both the MLF and Bv_{wet} were changed, the RBSL would need to be *tightened* by a factor of 5, rather than weakened 12 times as proposed. Thus, *changing MLF but not changing Bv_{wet} would understate risks more than 60-fold; RBSLs would be ~60 times too weak.*

Aroclor 1260

The soil uptake factor using the K_{ow} formula is 0.000322 (wet). EPA reports measured values (mean, corn) as 1.04 (wet) – 3,230 times higher.

Even if one were to reduce the MLF from 0.26 to 0.0135, the use of the measured soil uptake factor would make that irrelevant: the RBSL would need to be *tightened* 4-fold compared to the old RBSL, rather than weakened 19-fold as proposed. *Thus changing MLF but not changing Bv_{wet} would understate risks nearly 80-fold; RBSLs would be ~80 times too weak.*

[17] Soil Transfer Factor from Eco-SSL Attachment 4-1, 2007, *supra*, pdf p. 73, then converted to wet; wet-dry conversion factor from SRAM 2, 2014, *supra*, pdf p. 1133, citing McKone 1994, *supra*.

Thus, weakening the MLF nearly 20-fold, as done in the DTSC-Boeing Agreement, but failing to strengthen the Bv_{wet} values, results in dramatically increasing the amount of contamination at SSFL to not be cleaned up. This cherry-picking is at variance rather than consistent with "best science."

US EPA's Office of Land and Emergency Management (OLEM) has recognized that its Regional Screening Level (RSL) calculator for chemicals needs to include the garden pathway, similar to what EPA's Preliminary Remediation Goal (PRG) calculator already does for radionuclides. On March 11, 2022, dozens of environmental and public health organizations wrote to Carlton Waterhouse, OLEM's Deputy Assistant Administrator Carlton Waterhouse, urging USEPA to undertake such an endeavor, with a particular emphasis on assembling measured data for soil uptake and avoidance of reliance on the unreliable estimation based on K_{ow}.[18] We understand such an effort is now underway.

8. DTSC Also *Weakened* the Consumption Rates Rather than Increasing Them to Current EPA Values

The third part of the equation for establishing Risk-Based Screening Levels – the third leg of the stool – is the amount of each type of homegrown fruit and vegetable consumed by a child and by an adult. In the Boeing-DTSC Agreement, the overall consumption rates are significantly *reduced* compared to EPA's current values, which are based on surveys of actual consumption of specific homegrown produce types.

The Boeing-DTSC Agreement assumes only 616.8 grams/day of homegrown produce for an adult and 222.4 for a child.[19] EPA's current figures for consumption of homegrown produce are, however, 1485.5 for an adult and 816.3 for a child – 2.4 times higher for an adult and 3.7 times higher for a child than the values specified in the Boeing-DTSC Agreement.[20] Once again, DTSC and Boeing are cherry-picking, using values that are not based on good science and which markedly weaken cleanup standards.

9. There Are Only Two Scientifically Defensible Approaches to the Three-Legged Stool Conundrum: Fixing All Three Components of the Equation, or Using a Conservative MLF to Compensate for the Unreliable and Non-Protective Uptake and Intake Values. DTSC Chose to Do Neither.

There are thus only two choices: If one is to change the MLF, one must also particularly change the Bv_{wet} values for all toxic chemicals to reliable measured values. However, that would take a

[18] See letter to Carlton Waterhouse, "RE: Food Pathways in Chemical Cleanups."

[19] Boeing Cleanup Settlement Agreement, *supra*, pdf p. 191. Note: The Agreement presumes, for example, that the total weight of homegrown fruit consumed by a child per day is roughly equivalent to 5 strawberries.

[20] EPA, Biota Modeling, *supra,* Table A-1, p. A-10, pdf p. 32.

long time to assemble all the existing studies and supplement them with additional studies.

If one isn't going to do that, one must stick with a conservative MLF to compensate for the potentially significantly non-conservative Bv_{wet} values, as USEPA did for the PRG calculator for radionuclides before it obtained reliable, measured Bv_{wet} factors for different produce types for radioactive materials (and more reliable consumption rates for different produce types). But DTSC did neither–it dramatically weakened the conservatism of the MLF while doing nothing to fix the unreliability and non-protective nature of its Bv_{wet} values, and at the same time used consumption rates two to four times lower than USEPA's current figures.

10. After Repeatedly Promising That There Would Be No Negotiations With Boeing But Rather DTSC Would Strictly Enforce the 2007 Consent Order, DTSC Entered Into Secret Negotiations With Boeing That Resulted in a 796 Page Agreement That Guts the Cleanup Requirements

On May 9, 2022, CalEPA, DTSC, and the LA Regional Water Quality Control Board announced an agreement with Boeing to "supersede" much of the 2007 Consent Order.[21] The news release asserted that the deal would "strengthen" cleanup requirements for soil, groundwater and surface water and impose "strict" standards. Nowhere in the Agreement, however, is there a comparison of the new standards to the previous ones. The claim of "strengthened" standards, however, can be empirically checked by such a comparison, and it demonstrates the claim is markedly false.

The most protective standard contemplated under the new Agreement – and it makes clear that the final standards may be far less protective – is a "suburban residential with garden" standard. But that standard has been dramatically redefined; the great majority of chemical contaminants now have considerably weaker cleanup standards than before.

For the 182 chemical constituents for which there are Risk-Based Screening Levels for the suburban residential garden standard in the prior requirements and in the new Agreement, 147 have been weakened, 34 have been strengthened, and 1 remains the same. Because of an additional 5-fold multiplier for some portions of the property and 100-fold for others (to be discussed later), the actual number weakened are 176 and 6 tightened (with the 5-fold multiplier), and 179 were weakened and 3 tightened (with the 100-fold multiplier). Thus, rather than strengthening the cleanup requirements, for the great majority of contaminants, the standards were in fact weakened.

But that doesn't tell the whole story. It is not just that the great majority of contaminants had their cleanup levels weakened, but they were also weakened by large amounts. The RBSLs for PCBs and dioxins, for example, were weakened by about a factor of 20, and the cleanup levels by factors of 100 and 2000, for the parts of the site for which the 5-fold and 100-fold multipliers respectively are to be applied, as described below in Figure 2.

[21] DTSC Boeing Settlement Agreement, FAQ no.1, accessed July 20, 2022.

Figure 2

Analyte	RBSL Pursuant to 2007 Consent Order[a] (mg/kg)	2022 CalEPA-Boeing Agreement RBSL[b] (mg/kg)	Factor By Which RBSL Has Been Weakened	Factor by Which Cleanup Standard Has Been Weakened in Non-Biological Areas (5x Multiplier)[c]	Factor by Which Cleanup Standard Has Been Weakened in Biological Areas (100x Multiplier)[d]
PCDD/PCDFs					
2,3,7,8-TCDD TEQ	7.51E-09	1.61E-07	**21**	**107**	**2,144**
Polychlorinated Biphenyls (PCBs)					
Aroclor 1016	1.38E-02	2.47E-01	**18**	**89**	**1,790**
Aroclor 1242	4.86E-04	9.93E-03	**20**	**102**	**2,043**
Aroclor 1248	4.86E-04	9.71E-03	**20**	**100**	**1,998**
Aroclor 1254	4.88E-04	1.01E-02	**21**	**103**	**2,070**
Aroclor 1260	4.89E-04	1.09E-02	**22**	**111**	**2,229**
Aroclor 1262[e]	-	1.01E-02	-	-	-
Aroclor 1268[e]	-	1.01E-02	-	-	-
Aroclor 5460	4.86E-04	9.93E-03	**20**	**102**	**2,043**
PCB TEQ	7.50E-09	1.58E-07	**21**	**105**	**2,107**

The Agreement at pdf pages 191-6 states that for some areas of the site for which Boeing is responsible, the cleanup level would be five times the newly weakened suburban residential RBSL. It states that Corrective Measures Study (CMS) areas will be based on a multiplier of five – setting cancer risks at 5 x 10^{-6} and a Hazard Index (HI) for non-cancer risks of 5, rather than the 1 x 10^{-6} and HI of 1 on which the RBSLs are based. This is based on a sum-of-the-fractions approach (if there are multiple contaminants present, one identifies what fraction of the RBSL each represents, sums those fractions, and if that sum is less than 5, one doesn't even include the area in the areas to be studied for corrective measures.)

DTSC has repeatedly claimed that it will not allow risks at SSFL that exceed 1 x 10^{-6} (and an HI of 1).[22] However, the actual Agreement allows a multiplier of 5 above those levels for some portions of the property (those not marked yellow or green in the DTSC map below, Figure 3).

[22] DTSC Santa Susana Field Laboratory Community Meeting video, June 2, 2022.

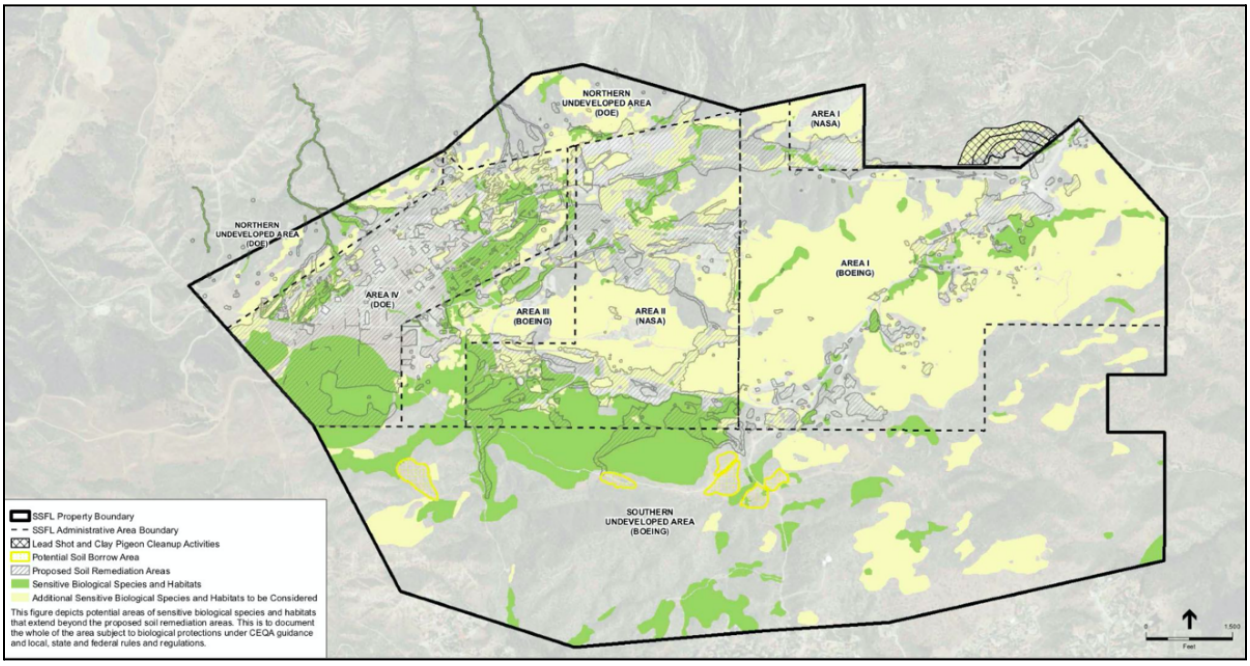
7:58 – CalEPA Secretary Jared Blumenfeld: "Reducing cancer risks to **one in a million** is the standard used by public health experts, and it's precisely what DTSC will use to measure the efficacy of our efforts, and the standard to which we will hold Boeing accountable under the resident with garden cleanup. "(emphasis added).

25:06 – DTSC staff: "It is critical to note that, while the MLF has been updated, the level of protectiveness remains the same. The Risk Assessment Methodology still calls for the same cleanup goal: contamination must be removed until the **risk of cancer is reduced to one in a million, and non-cancer risks are reduced to a hazard index of one**, meaning that risks to those, uh, to non-cancer impacts are negligible." (emphasis added) [Slide states: "MLF updated, but target levels **still one-in-a-million cancer risk**"] (emphasis added).

27:46 – "If standards are not met, Boeing will be required to remove additional soil until they are, and the target for chemical cleanup is a **one-in-a-million cancer risk**." (emphasis added).

1:36:42 – "So, while some factors have changed, you know, that were used in the original SRAM versus the to-be-developed updated SRAM, the important thing to recognize is that cleanup levels will be set to that one-in-a-million cancer risk. Now that's the target cleanup goal so, no matter what changes in the science have happened at the end of the day, the cleanup levels will be based on a risk, target risk, of one.. a chance of **one in a million of contracting cancer**. Okay? So the change in the parameters is actually a little less important than the ultimate risk levels. I mean, the science has advanced, some numbers go up, some numbers go down, but at the end of the day, the level of protectiveness is determined by setting the cleanup levels, which will be set to that target of **one in a million.**" (emphasis added).

Figure 3[23]



For the yellow or green areas in Figure 3, however, which DTSC claims to have moderate or greater biological significance (although heavily scarred with decades of rocket test stands and testing), the Agreement uses a multiplier of 100. If the residential risk is supposedly $<10^{-4}$, they will then "leave in place" the contamination.[24] That risk level is obviously 100 times the promised one-in-a-million level.

So, for some areas of the Boeing site, the Agreement weakens the cleanup standards by five times on top of the weakened RBSLs, and for the majority of the site, by a hundred times the weakened RBSLs. Thus, for many contaminants, the maximum cleanup levels the Agreement would allow would be 100 times weaker than the current limits (20-fold weaker RBSLs times a 5-fold multiplier) in some areas and for the majority of the Boeing areas, 2000 times weaker (i.e., 2000 times higher concentrations allowed). This will result in the great majority of the contaminated soil never getting cleaned up.

On top of all this, the Agreement appears to allow area averaging, so high concentrations in one location are allowed by averaging with lower concentrations in other samples; this violates general USEPA practice of requiring in such exposure scenarios "not to exceed" standards, where any sample that exceeds a cleanup level needs to be cleaned up.

It is important to remember, furthermore, that the Agreement says that the "redefined" suburban residential with garden cleanup standard – weakened hundreds or thousands of times from

[23] California DTSC, Draft Program EIR, September 2017, Figure 1-5, pdf p. 30.

[24] Boeing Cleanup Settlement Agreement, *supra*, Exhibit 11, pdf p. 200.

DTSC's longstanding standard for SSFL – is the maximum cleanup that could be chosen, and that the actual standard may be considerably lower.[25]

11. *Post Hoc* Claims by DTSC to Justify Its Deal With Boeing

The deal was entered into secretly, and despite promises to release it in proposed form for public comment,[26] DTSC and Boeing issued the Agreement in final form without any opportunity for public review and comment, no input from the concerned local governments that had long supported the 2007 and 2010 cleanup agreements, and no environmental review. After the firestorm of public concern that this triggered, DTSC has undertaken a few after-the-fact efforts to provide justification for what it agreed to with Boeing.

In letters to Members of Congress and local elected officials who had expressed concern about the secret negotiations and efforts to weaken the SRAM, DTSC Director Williams pledged that the SRAM revisions and DTSC's methodology would be reviewed by USEPA.[27] DTSC apparently revived its discredited claim that USEPA had made an error with the MLF and had corrected it. In a memorandum from USEPA to DTSC, USEPA made clear once again that it had made no mistake; it also made clear it was not reviewing nor endorsing DTSC's methodology.[28] The memorandum indicated that USEPA utilized a conservative MLF in the past, and when it updated the radiation remediation goal calculator to include an array of consumption rates and soil-to-plant transfer factors for individual produce types, it did the same thing for MLF. As we have pointed out above, DTSC, contrary to USEPA's changes, reduced the conservatism for the MLF while not including measured transfer factors and consumption rates for individual produce types.

DTSC posted on its website a supposed "independent, third party" peer review by the Office of Environmental Health Hazard Assessment (OEHHA). But OEHHA is not an independent third party; it is simply another division of CalEPA, along with DTSC. The OEHHA letter is but a few,

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[25] "California Holds Boeing Accountable for Cleanup at Toxic Santa Susana Field Laboratory," California Department of Toxic Substances Control, May 9, 2022.

[26] DTSC Press Statement on SSFL Mediation, February 12, 2021. "Any **proposal** coming from a settlement will not only comply with California's strong public health and environmental laws, but it **will also include opportunities for public input to allow for robust community engagement**." (emphasis added).

[27] Meredith Williams, "Response to Elected Local Government Representatives of Communities Surrounding the Former Santa Susana Field Laboratory regarding Cleanup of the Former Santa Susana Field Laboratory," February 17, 2022. "[W]e will work with our partners at the United States Environmental Protection Agency and the California Office of Environmental Health Hazard Assessment on any revisions to ensure the SRAM reflects the best available science."; Meredith Williams, "Response to Members of the United States Congress regarding Cleanup of the Former Santa Susana Field Laboratory." January 26, 2022. "I commit that DTSC will use a rigorous scientific process to finalize the SRAM and will work with our partners at the United States Environmental Protection Agency and the California Office of Environmental Health Hazard Assessment on any revisions to ensure the SRAM reflects the best available science."

[28] Larry Douchand, "Email to Dr. Gettmann," July 8, 2022.

general, conclusory sentences, in no way a peer review. There is no evidence that OEHHA was provided with any of the information summarized above about what was wrong with what DTSC was doing with the MLF.

DTSC also posted on its website a brief, conclusory letter from Tom McKone, who had come up with the log K_{ow} approximation discussed earlier in this analysis. McKone in his letter does not mention that he had himself subsequently published articles indicating the formula to be highly unreliable. He simply says the Risk Assessment Information System (RAIS) that DTSC was relying upon for Bv_{wet} values is relied upon by others; he doesn't mention that RAIS is merely citing to his own 1994 paper with the formula whose reliability he had subsequently indicated was very poor.

None of these is a genuine independent peer review; none reviews DTSC's overall methodology; none was by an entity that was provided information about the criticism of what DTSC has done in the deal with Boeing; none was done before entering into the deal.

DTSC now tries to rely upon RAIS, without disclosing that it is sponsored by the Department of Energy's Office of Environmental Management,[29] which is one of the three Responsible Parties at SSFL, and that the MLF Boeing and DTSC are now using from there was in fact requested by Bruce Narloch, Boeing's consultant.[30] It was thus a case of one RP asking for help from another RP in weakening its cleanup obligations.

RAIS doesn't even have a suburban residential garden exposure scenario in its chemical calculator.[31] It does have one for agriculture, and that shows the most conservative MLF to be 0.25.[32]

[29] Homepage of RAIS website, "About the RAIS," accessed July 20, 2022.

[30] Narloch_Technical Question, *supra*, pdf. pp. 1-2.

[31] See RAIS Chemical PRG Calculator User's Guide for Residential, Table 3.

[32] See RAIS Chemical PRG Calculator User's Guide for Farmer, Table 20.

Figure 3.[33] Cows grazing near the contaminated nuclear area of SSFL

DTSC's position is that SSFL needs to be cleaned up to all uses allowed by Ventura County's zoning and General Plan for the area and its surroundings. But nowhere in the Agreement is there any consideration of cleanup standards for agricultural/rural residential use. There is no question that the most conservative MLF for agricultural scenarios is 0.25. But DTSC ignores that entirely, and instead now tries to use an MLF of 0.0135 for lettuce.

Conclusion

CalEPA and DTSC repeatedly promised there would be no negotiations with Boeing but instead the 2007 Consent Order would be strictly enforced Instead, DTSC went into a secret negotiation with Boeing to "supersede" the 2007 Order, and released an Agreement on May 9, 2022, that gutted the cleanup. Despite assertions that the deal "strengthened" the cleanup requirements, for the great majority of toxic chemicals at the site, the cleanup standards were weakened. For many of the chemicals, the new standards are hundreds or thousands of times less protective than required previously. And that is the best alternative–the Agreement makes clear that the final cleanup levels may be even considerably weaker.

[33] Source: Bill Bowling.

DTSC claimed that USEPA had made a wet-dry weight conversion error with the Mass Loading Factor that had been pointed out to it by Boeing and supposedly admitted to by USEPA – all of which turned out to be false. The USEPA subject matter expert explained that the soil uptake factor previously used was of very poor scientific quality and so they compensated, appropriately, by using a conservative MLF. When high-quality individual measured uptake and intake factors for different kinds of produce were obtained for radionuclides, they then shifted to using individual MLFs for different kinds of produce for radionuclides. If one weren't going to do the same for chemicals, one needed to continue to use the conservative MLF. But despite its prior claims being demonstrated to be false, DTSC has nonetheless just doubled down on weakening the cleanup standards.

Rather than following "good science," DTSC is doing the opposite. Essentially, it cut a deal with a major polluter to allow it to breach a legally binding cleanup agreement and instead leave the great majority of its contaminated soil not cleaned up. If not reversed, substantial continued harm to public health and the environment can result.

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