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Sent: Tuesday, January 18, 2022 9:41 AM

To: CityClerk <CityClerk@longbeach.gov>

Subject: Comment in Support of SAFER Appeal- Addendum for LUEP and 7th&Locust Project (Agenda Item 21)

-EXTERNAL-

Dear Mayor Garcia, Vice Mayor Richardson, Honorable Council Members, and Ms. De La Garza:

Please find attached a supplemental comment submitted on behalf of the Supporters Alliance for Environmental Responsibility (“SAFER”) in support of their appeal concerning the Addendum to the Downtown Plan environmental impact report prepared for the Land Use Equivalency Program (“LUEP”) and 7th Avenue and Locust Street Mixed-Use Project to be heard as Agenda Item 21 at tonight's City Council meeting.

Confirmation of receipt of this email would be greatly appreciated.

Thank you,
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VIA E-MAIL

January 18, 2022

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**Re: Comment on 636 Locust Development Project (Council File No. 22-0061)
CITY COUNCIL AGENDA ITEM 21 (Jan. 18, 2022)**

Dear Mayor Garcia, Vice Mayor Richardson, Honorable Council Members, and Ms. De La Garza:

I am writing on behalf of the Supporters Alliance for Environmental Responsibility (“SAFER”) in support of their appeal concerning the Addendum (EIRA 06-20) to the 2012 Downtown Plan Environmental Impact Report (“EIR”) prepared for the new Land Use Equivalency Program (“LUEP”) and 7th Avenue and Locust Street Mixed-Use development (“7th & Locust Project”) to be heard as Agenda Item 21 at the City Council’s meeting on January 18, 2022 (Council File No. 22-0061). This comment letter serves as a supplement to SAFER’s previous comment letter submitted to the Long Beach Planning Commission on September 16, 2021 and submitted to the City Council with SAFER’s appeal.

In addition to the issues raised in SAFER’s September 16 comment to the Planning Commission, SAFER requests the City Council deny this Project due to significant impacts to indoor and outdoor air quality that will result from the development of the 7th & Locus Project, which were not addressed in the Addendum or the Downtown Plan EIR. SAFER’s review of the Project and Addendum has been assisted by indoor air quality expert Francis Offermann, CIH,

and air quality experts Matt Hagemann, P.G., C.Hg., and Paul E. Rosenfeld, Ph.D., of the Soil/Water/Air Protection Enterprise (“SWAPE”). The expert comments of Mr. Offermann and SWAPE are attached as Exhibit A and Exhibit B, respectively. Based on the analysis of these experts, the Addendum is not appropriate and SAFER respectfully requests that the City prepare an EIR instead.

PROJECT DESCRIPTION

The “project” here consists of two parts: (1) the Land Use Equivalency Program (“LUEP”) and (2) the 7th & Locust Mixed-Use Project.

The LUEP is a response to the current exceedance of allowed residential units within the Downtown Plan area as analyzed in the 2012 PEIR. The 2012 Downtown Plan PEIR evaluated impacts for the development of 5,000 residential units, construction, and operation of 480,000 square feet of retail/commercial space, and 1,500,00 square feet of office space. Currently, the Downtown Plan area has 5,252 residential units. The LUEP relies on something called a Downtown Plan Equivalency Calculator (“DPEC”), which purports to create a mechanism by which the City can re-allocate use designations within the Downtown Plan area from office/commercial/hotel uses to residential uses without exceeding the environmental impacts analyzed in the 2012 Downtown Plan PEIR. Under the proposed LUEP, the City would be able to continue to approve residential development within the Downtown Plan by making corresponding reductions in commercial/office/hotel development. Under the LUEP, an additional 3,260 residential units (for a total of 8,260 units) could be approved by reducing office uses by 417,060 square feet, commercial uses by 135,320 square feet, and hotel uses by 177 rooms.

The proposed 7th & Locust Project is a 7-story high rise building on a 0.52-acre site with 108 residential units, 1,188 sf of retail uses, a 687 sf amenity lounge, a fitness room, on the ground floor level, and a courtyard, pool and pool deck, and community room on the third level. The proposed 7th & Locust would provide 5,650 sf of common open space. The proposed building would be approximately 98 feet tall and would include 172,068 sf of floor area with an FAR of 3.6:1.

LEGAL STANDARD

Preparation of an Addendum Under CEQA

Here, the City has prepared an Addendum to the previously certified Downtown Plan EIR. Pursuant to the CEQA Guidelines, an addendum to a previous EIR is proper only where “some changes or additions are necessary but none of the conditions described in Section 15162 calling for preparation of a subsequent EIR have occurred.” (14 CCR § 15164(a).) Looking to Guidelines Section 1512, **an addendum is not appropriate when:**

- (1) Substantial changes are proposed in the project which will require major revisions

- of the previous EIR or negative declaration due to **the involvement of new significant environmental effects or a substantial increase** in the severity of previously identified significant effects;
- (2) Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or Negative Declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or
- (3) **New information of substantial importance**, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete or the negative declaration was adopted, shows any of the following:
- (A) The project will have **one or more significant effects not discussed in the previous EIR or negative declaration**;
 - (B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;
 - (C) Mitigation measures or alternatives previously found not to be feasible would, in fact, be feasible and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or
 - (D) **Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment**, but the project proponents decline to adopt the mitigation measure or alternative.

(14 CCR § 15162(a).)

Tiering Under CEQA

CEQA permits agencies to ‘tier’ CEQA documents, in which general matters and environmental effects are considered in a document “prepared for a policy, plan, program or ordinance followed by narrower or site-specific [environmental review] which incorporate by reference the discussion in any prior [environmental review] and which concentrate on the environmental effects which (a) are capable of being mitigated, or (b) were not analyzed as significant effects on the environment in the prior [EIR].” (Pub. Res. Code (“PRC”) § 21068.5.) “[T]iering is appropriate when it helps a public agency to focus upon the issues ripe for decision at each level of environmental review and in order to exclude duplicative analysis of environmental effects examined in previous [environmental reviews].” (*Id.* § 21093.) CEQA regulations strongly promote tiering of environmental review.

“Later activities in the program must be examined in light of the program [document] to determine whether an additional environmental document must be prepared.” (14 CCR § 15168©.) The first consideration is whether the activity proposed is covered by the program. (*Id.* § 15168©(2).) If a later project is outside the scope of the program, then it is treated as a separate

project and the previous environmental review may not be relied upon in further review. (*See Sierra Club v. County of Sonoma* (1992) 6 Cal.App.4th 1307, 1320–21.) The second consideration is whether the “later activity would have effects that were not examined in the program.” (14 CCR § 15168©(1).) A program environmental review may only serve “to the extent that it contemplates and adequately analyzes the potential environmental impacts of the project” (*Sierra Nevada Conservation v. County of El Dorado* (2012) 202 Cal.App.4th 1156, 1171 [quoting *Citizens for Responsible Equitable Envtl. Dev. V. City of San Diego Redevelopment Agency* (2005) 134 Cal.App.4th 598, 615].) If the program environmental review does not evaluate the environmental impacts of the project, a tiered [CEQA document] must be completed before the project is approved. (*Id.* at 1184.)

For these inquiries, the “fair argument test” applies. (*Sierra Club*, 6 Cal.App.4th at 1318; *see also Sierra Club v. County of San Diego* (2014) 231 Cal.App.4th 1152, 1164 (“when a prior EIR has been prepared and certified for a program or plan, the question for a court reviewing an agency’s decision not to use a tiered EIR for a later project ‘is one of law, i.e., ‘the sufficiency of the evidence to support a fair argument.’” [quoting *Sierra Club*, 6 Cal.App.4th at 1318]).) Under the fair argument test, a new EIR must be prepared “whenever it can be fairly argued on the basis of substantial evidence that the project may have significant environmental impact. (*Sierra Club*, 6 Cal.App.4th at 1316 [quotations and citations omitted].) When applying the fair argument test, “deference to the agency’s determination is not appropriate and its decision not to require an EIR can be upheld only when there is no credible evidence to the contrary.” (*Id.* at 1318.) “[I]f there is substantial evidence in the record that the later project may arguably have a significant adverse effect on the environment which was not examined in the prior program EIR, doubts must be resolved in favor of environmental review and the agency must prepare a new tiered EIR, notwithstanding the existence of contrary evidence.” (*Id.* at 1319.)

DISCUSSION

A. The Project requires an EIR—not an Addendum—because of new significant impacts which were not previously analyzed in the 2012 Downtown Plan EIR.

As a preliminary matter, the City has improperly relied upon CEQA’s subsequent review provisions (PRC § 21166; 14 CCR §§ 15162, 15164). Where a previous EIR has been certified for a project, CEQA’s subsequent review provisions determine when “[a] subsequent EIR shall be prepared for *that* project.” (14 CCR § 15162 [emphasis added].) Here, no specific project has ever been proposed for the Project site. The 2012 Downtown Plan EIR analyzed the full downtown plan area but did not analyze anything as specific as the 7th & Locust Project. Rather, the 2012 Downtown Plan EIR better described as a programmatic EIR (“PEIR”), which is subject to CEQA’s tiering standards rather than subsequent review.

A lead agency may tier EIRs where multiple individual projects or phased (or “tiered”) projects are to be undertaken, and the individual projects are linked geographically, temporally, or in an otherwise logical manner. (14 CCR §§ 15165, 15168.) Here, there is no doubt that the project areas within the Downtown Plan are linked in a “logical manner” and that the 2012

Downtown Plan EIR is a PEIR subject to CEQA Guidelines section 15168. Under Section 15168, “[i]f a later activity would have effects that were not examined in the program EIR, a new initial study would need to be prepared leading to either an EIR or a negative declaration.” (14 CCR § 15168©(1) [emphasis added].) Importantly, in reviewing an agency’s decision whether to prepare a tiered EIR, the “fair argument” test applies. (*Sierra Club v. Cnty. of Sonoma* (1992) 6 Cal.App.4th 1307, 1318.) Under the fair argument test, a new EIR must be prepared “whenever it can be fairly argued on the basis of substantial evidence that the project may have a significant environmental impact.” (*Id.* at 1316; see *Friends of Coll. Of San Mateo Gardens v. San Mateo Cnty. Comm. College Dist.* (2016) 1 Cal.5th 937, 960.) A PEIR may only serve for subsequent actions “to the extent that it **contemplates and adequately analyzes** the potential environmental impacts of the project. . . .” (*Center for Sierra Nevada Conservation v. County of El Dorado* (2012) 202 Cal.App.4th 1156, 1171[emphasis added] [citations omitted].) Here, because the 7th & Locust Project is outside the scope of the Downtown Plan EIR and there is a fair argument that the 7th & Locust Project will result in impacts not analyzed in the 2012 Downtown Plan EIR, an EIR is required.

A. An EIR is required because the Project will have significant impacts on indoor air quality from formaldehyde emissions that were not previously analyzed nor could have been known when the Downtown Plan EIR was certified in 2012.

Certified Industrial Hygienist, Francis Offermann, PE, CIH, has conducted a review of the Project. Mr. Offermann is one of the world’s leading experts on indoor air quality, in particular emissions of formaldehyde, and has published extensively on the topic. As discussed below and set forth in Mr. Offermann’s comments, the 7th & Locust Project’s emissions of formaldehyde to air will result in very significant cancer risks to future residents and employees of the Project. Mr. Offermann’s comment and CV is attached as Exhibit A.

Importantly, Mr. Offermann highlights that the previous 2012 Downtown Plan EIR did not address indoor air quality impacts or formaldehyde emissions. Because these impacts were not previously analyzed at all, the fair argument standard applies and an EIR is required to address and mitigate this impact. Furthermore, Mr. Offermann’s analysis is based on new information that could not have been known in 2012 when the Downtown Plan EIR was certified. (Ex. A, p. 1.) Therefore, even if the City were allowed to proceed under CEQA’s subsequent review provisions, the Addendum is not proper and an EIR is required.

Formaldehyde is a known human carcinogen and listed by the State of California as a Toxic Air Contaminant (“TAC”). The South Coast Air Quality Management District (“SCAQMD”) has established a significance threshold of health risks for carcinogenic TACs of 10 in a million.

Mr. Offermann explains that many composite wood products typically used in home and apartment building construction contain formaldehyde-based glues which off-gas formaldehyde over a very long time period. He states, “The primary source of formaldehyde indoors is

composite wood products manufactured with urea-formaldehyde resins, such as plywood, medium density fiberboard, and particle board. These materials are commonly used in residential, office, and retail building construction for flooring, cabinetry, baseboards, window shades, interior doors, and window and door trims.” (Ex. A, p. 3.)

Mr. Offermann concludes that future employees of the residential spaces of the 7th & Locust Project will be exposed to a cancer risk from formaldehyde of approximately 112 per million and that future employees of the commercial spaces will be exposed to a cancer risk from formaldehyde of approximately 17.7 per million, *even assuming* all materials are compliant with the California Air Resources Board’s formaldehyde airborne toxics control measure. (Ex. A, p.p 4-5.) These figures exceed SCAQMD’s CEQA significance thresholds for airborne cancer risk of 10 per million. Importantly, Mr. Offermann’s conclusions are based on studies conducted in 2019 and therefore were not available at the time when the Downtown Plan EIR was certified in 2012.

Mr. Offermann concludes that these significant environmental impacts must be analyzed and mitigation measures should be imposed to reduce the risk of formaldehyde exposure. (Ex. A, pp. 5, 10-11.) He prescribes a methodology for estimating the Project’s formaldehyde emissions in order to do a more project-specific health risk assessment. (*Id.*, pp. 5-10.). Mr. Offermann also suggests several feasible mitigation measures, such as requiring the use of composite wood products manufactured with CARB approved no-added formaldehyde (NAF) resins, which are readily available. (*Id.*, pp. 11-12.)

When a Project exceeds a duly adopted CEQA significance threshold, as here, this alone establishes substantial evidence that the project will have a significant adverse environmental impact. Indeed, in many instances, such air quality thresholds are the only criteria reviewed and treated as dispositive in evaluating the significance of a project’s air quality impacts. (See, e.g. *Schenck v. County of Sonoma* (2011) 198 Cal.App.4th 949, 960 [County applies Air District’s “published CEQA quantitative criteria” and “threshold level of cumulative significance”]; see also *Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 110-111 [“A ‘threshold of significance’ for a given environmental effect is simply that level at which the lead agency finds the effects of the project to be significant”].)

The California Supreme Court made clear the substantial importance that an air district significance threshold plays in providing substantial evidence of a significant adverse impact. (*Communities for a Better Environment v. South Coast Air Quality Management Dist.* (2010) 48 Cal.4th 310, 327 [“As the [South Coast Air Quality Management] District’s established significance threshold for Nox is 55 pounds per day, these estimates [of Nox emissions of 201 to 456 pounds per day] constitute substantial evidence supporting a fair argument for a significant adverse impact.”].) Since expert evidence demonstrates that the Project will exceed the SDCAPCD’s CEQA significance threshold, there is substantial evidence that an “unstudied, potentially significant environmental effect[.]” exists. (See *Friends of Coll. Of San Mateo Gardens v. San Mateo Cty. Cmty. Coll. Dist.* (2016) 1 Cal.5th 937, 958 [emphasis added].)

The failure to address the Project’s formaldehyde emissions is contrary to the California Supreme Court’s decision in *California Building Industry Ass’n v. Bay Area Air Quality Mgmt. Dist.* (2015) 62 Cal.4th 369, 386 (“CBIA”). In that case, the Supreme Court expressly holds that potential adverse impacts to future users and residents from pollution generated by a proposed project must be addressed under CEQA. At issue in *CBIA* was whether the Air District could enact CEQA guidelines that advised lead agencies that they must analyze the impacts of adjacent environmental conditions on a project. The Supreme Court held that CEQA does not generally require lead agencies to consider the environment’s effects on a project. (*CBIA*, 62 Cal.4th at 800-01.) However, to the extent a project may exacerbate existing environmental conditions at or near a project site, those would still have to be considered pursuant to CEQA. (*Id.* at 801.) In so holding, the Court expressly held that CEQA’s statutory language required lead agencies to disclose and analyze “impacts on a project’s users or residents that arise from the project’s effects on the environment.” (*Id.* at 800.)

The carcinogenic formaldehyde emissions identified by Mr. Offermann are not an existing environmental condition. Those emissions to the air will be from the Project. Once built, the Project will begin to emit formaldehyde at levels that pose significant direct and cumulative health risks to employees of the Project. The Supreme Court in *CBIA* expressly finds that this type of air emission and health impact by the project on the environment and a “project’s users and residents” must be addressed in the CEQA process. The existing TAC sources near the Project site would have to be considered in evaluating the cumulative effect on future residents of both the Project’s TAC emissions as well as those existing off-site emissions.

The Supreme Court’s reasoning is well-grounded in CEQA’s statutory language. CEQA expressly includes a project’s effects on human beings as an effect on the environment that must be addressed in an environmental review. “Section 21083(b)(3)’s express language, for example, requires a finding of a ‘significant effect on the environment’ (§ 21083(b)) whenever the ‘environmental effects of a project will cause substantial adverse effects on human beings, either directly or indirectly.’” (*CBIA*, 62 Cal.4th at 800.) Likewise, “the Legislature has made clear—in declarations accompanying CEQA’s enactment—that public health and safety are of great importance in the statutory scheme.” (*Id.* [citing e.g., §§ 21000(b), (c), (d), (g), 21001(b), (d)].) It goes without saying that the future residents and employees of the Project are human beings and the health and safety of those residents must be subjected to CEQA’s safeguards.

The City has a duty to investigate issues relating to a project’s potential environmental impacts. (See *County Sanitation Dist. No. 2 v. County of Kern* (2005) 127 Cal.App.4th 1544, 1597–98. [“[U]nder CEQA, the lead agency bears a burden to investigate potential environmental impacts.”]) The proposed Project will have significant impacts on air quality and health risks by emitting cancer-causing levels of formaldehyde into the air that will expose future employees to cancer risks potentially in excess of SCAQMD’s threshold of significance for cancer health risks of 10 in a million.

B. An EIR is required because the Project will have significant impacts on human health from diesel particulate matter that were not previously analyzed in the 2012 Downtown Plan EIR.

The environmental consulting firm SWAPE reviewed the Project and Addendum and found that air quality impacts from emissions of diesel particulate matter (“DPM”), a known human carcinogen, would result in significant human health risks. SWAPE’s comment letter is attached as Exhibit B and their findings are summarized below.

Importantly, the 2012 Downtown Plan EIR did not address the impacts of DPM emissions on human health. Because the impact was not previously analyzed at all, the fair argument standard applies and an EIR is required to address and mitigate this impact.

SWAPE prepared a screening-level health risk assessment (“HRA”) to evaluate potential DPM impacts from the construction and operation of the 7th & Locust Project. (Ex. B, pp. 10-13.) SWAPE used AERSCREEN, the leading screening-level air quality dispersion model. (*Id.*, p. 10) SWAPE used a sensitive receptor distance of 25 meters and analyzed impacts to individuals at different stages of life based on OEHHA and SCAQMD guidance. (*Id.*, pp. 11-12.)

SWAPE found that the excess cancer risks for third-trimester pregnancies, infants, children, and adults at the closest sensitive receptor located approximately 25 meters away, over the course of Project construction and operation, are approximately 25.4, 614, 142, and 15.4 in one million, respectively. (Ex. B, pp. 12-13.) Moreover, SWAPE found that the excess cancer risk over the course of a residential lifetime is approximately 798 in one million. (*Id.*) SWAPE concludes, “The 3rd trimester, infant, child, adult, and lifetime cancer risks exceed the SCAQMD threshold of 10 in one million, thus resulting in a potentially significant impact not previously addressed or identified by the Addendum.” (*Id.*, p. 13.)

Because this impact was not disclosed, discussed, or mitigated by the 2012 Downtown Plan EIR or the Addendum, the Addendum is improper and an EIR is required.

II. Under CEQA’s subsequent review provisions, the Addendum is improper because of new information regarding significant impacts and new available mitigation measures since certification of the 2012 Downtown Plan EIR.

Under CEQA, an addendum is not allowed when “[n]ew information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified” shows that (1) the project will have one or more significant effects not discussed in the previous EIR or (2) mitigation measures considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment. (14 CCR §§15162, 15164.) Under that standard, the Addendum is improper because the indoor air quality impacts from formaldehyde could not have been known when the Downtown Plan EIR was certified in 2012. Furthermore, the Addendum is improper because of new mitigation measures available to mitigate the Project’s indoor and

outdoor air quality impacts.

A. The Project’s significant impacts to human health from indoor emissions of formaldehyde as well as the mitigation measures available to reduce that impact are new information that could not have been known previous to 2019.

As discussed above, the Project will result in a significant impact to human health from indoor emissions of formaldehyde. This potential indoor air quality impact could not have been known until 2019 when the first study was published showing that homes using composite wood products that comply with California Air Resources Board (“CARB”) standards vastly exceed CEQA significance thresholds for cancer risk. Therefore, this impact was not known and could not have been known in 2012 when the Downtown Plan EIR was certified. When scientific information was not available at the time of prior CEQA review, more recent studies showing that a project may have more serious human health or environmental impacts constitute significant new information requiring a subsequent EIR rather than an addendum. (*Security Env’tl Sys. V South Coast Air Quality Mgmt. Dist.* (1991) 229 Cal.App.3d 110, 124; *Meridian Ocean Sys. V. State Lands Com.* (1990) 222 Cal.App.3d 153, 169). As such, the Addendum is improper under CEQA Guidelines sections 15162 and 15164 and an EIR is required. (See 14 CCR §§ 15162(a)(3), 15164(a).)

Additionally, Mr. Offermann suggests mitigating the Project’s indoor air quality impacts by requiring all composite wood products used in construction of the Project to be manufactured with CARB-approved no-added formaldehyde (“NAF”) resins. Because indoor air quality impacts were not analyzed in the 2012 Downtown Plan EIR, the City has not considered NAF composite wood products. Furthermore, such NAF products have only become readily available recently and, thus, could not have been considered in 2012. Because the Addendum does not adopt any measures to reduce indoor formaldehyde emissions, an EIR is required.

B. New mitigation measures exist to reduce the significant air quality impacts identified in the 2012 Downtown Plan EIR.

The 2012 Downtown Plan EIR concluded that it would result in significant and unavoidable impacts to air quality. Although the 2012 Downtown Plan EIR contained mitigation measures that apply to this Project, different mitigation measures exist now, which were not available in 2012, to reduce the Project’s air quality impacts. As one example, the Project could be required to utilize off-road construction equipment that meets the EPA’s “Tier 4 Final” emissions standards to reduce the Project’s impacts, as opposed to the “Tier 4” standard required by the Downtown Plan EIR. Since 1994, the EPA has slowly adopted more stringent standards to lower the emissions from off-road construction equipment since 1994. Since that time, Tier 1, Tier 2, Tier 3, Tier 4 Interim, and Tier 4 Final construction equipment have been phased in over time. Tier 4 Final represents the cleanest burning equipment and therefore has the lowest emissions compared to other tiers. Because Tier 4 Final was not available in 2012, this

mitigation is new information that could not have been known previously. (*See* 14 CCR 15162(3).) Because the Addendum has failed to adopt such mitigation, an EIR is required.

III. The Addendum’s conclusions regarding the Project’s impacts relative to the 2012 Downtown Plan EIR are not supported by substantial evidence.

A. The Addendum failed to provide substantial evidence that the LUEP would not substantially increase significant impacts identified in the 2012 Downtown Plan EIR.

Pursuant to the CEQA Guidelines, an addendum is not proper where changes in a project would result in a substantial increase in the severity of previously identified significant impacts. (CCR § 15162(a)(1).) Although the Addendum identifies several impacts from the 2012 Downtown Plan EIR will remain significant and unavoidable with the implementation of the LUEP, the Addendum fails to adequately discuss the *relative* severity of the impact.

For example, the Addendum concludes that the LUEP’s impact on population and housing, including displacement, will remain significant and unavoidable. However, the Addendum does not explain how the significance of these impacts compares to the severity identified in the 2012 Downtown Plan EIR. By increasing residential uses in the Downtown Plan area, the LUEP’s impacts to population and displacement will certainly be greater than the impacts analyzed in the 2012 EIR. The Addendum must address whether the impacts will be more severe rather than simply claiming that the impacts will remain significant and unavoidable.

B. The Addendum underestimated the emissions related to the construction and operation of the 7th & Locust Project

SWAPE found that the Addendum underestimated the 7th & Locust Project’s emissions and therefore cannot be relied upon to determine the significance of the Project’s air quality impacts. The Addendum relies on emissions calculated from the California Emissions Estimator Model Version CalEEMod.2016.3.2 (“CalEEMod”). (Ex. B, p. 1.) This model, which is used to generate a project’s construction and operational emissions, relies on recommended default values based on site specific information related to a number of factors (*Id.*, pp. 1-2.) CEQA requires that any changes to the default values must be justified by substantial evidence. (*Id.*, p. 2.)

SWAPE reviewed the Addendum’s CalEEMod output files and found that the values input into the model were inconsistent with information provided in the Addendum. (Ex. A, p. 2.) This results in an underestimation of the Project’s emissions. (*Id.*) As a result, the Addendum’s air quality analysis cannot be relied upon as substantial evidence to compare the Project’s impacts to the impacts analyzed in the 2012 Downtown Plan EIR.

Specifically, SWAPE found that the following values used in the Addendum’s air quality

analysis were either inconsistent with information provided in the Addendum or otherwise unjustified:

1. Unsubstantiated Reduction to CO₂ Intensity Factor (Ex. B, pp. 2-3.)
2. Unsubstantiated Changes to Architectural and Area Coating Areas (Ex. B, p. 3.)
3. Unsubstantiated Construction Phase Lengths (Ex. B, pp. 3-6.)
4. Unsubstantiated Reduction to the Hauling Trip Number (Ex. B, p. 6.)
5. Unsubstantiated Changes to the Solid Waste Generation Rate (Ex. B, p. 7.)
6. Unsubstantiated Changes to the Indoor/Outdoor Water Use Rates (Ex. B, pp. 7-8.)

As a result of these errors in the Addendum, the Project's construction and operational emissions are underestimated and cannot be relied upon to determine the significance of the Project's air quality impacts nor relied upon to compare the Project's impacts to the 2012 Downtown Plan EIR.

CONCLUSION

For the foregoing reasons, the SAFER and its members respectfully request that the City Council refrain from approving the LUEP and 7th & Locust Project at this time and refrain from taking any further action on this matter until an EIR has been prepared. Thank you for your attention to these comments.

Sincerely,



Brian B. Flynn
Lozeau Drury LLP

EXHIBIT A



INDOOR ENVIRONMENTAL ENGINEERING



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From: Francis J. Offermann PE CIH

Subject: Indoor Air Quality: 636 Locust Avenue Project, Long Beach, CA
(IEE File Reference: P-4368)

Pages: 16

Indoor Air Quality Impacts

I am writing this letter as there is new information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified (AEOCM, 2010), that shows the Project will have significant effects from formaldehyde emission not discussed in the previous EIR. This new information relates to the recent Chan 2019 study that shows that new residences built with composite wood products that are CARB Phase 2 certified, do not insure indoor formaldehyde concentrations that are below the CEQA cancer risk of 10 per million.

Indoor air quality (IAQ) directly impacts the comfort and health of building occupants, and the achievement of acceptable IAQ in newly constructed and renovated buildings is a well-recognized design objective. For example, IAQ is addressed by major high-performance building rating systems and building codes (California Building Standards Commission, 2014; USGBC, 2014). Indoor air quality in homes is particularly important because occupants, on average, spend approximately ninety percent of their time indoors with the majority of this time spent at home (EPA, 2011). Some segments of the population that are

most susceptible to the effects of poor IAQ, such as the very young and the elderly, occupy their homes almost continuously. Additionally, an increasing number of adults are working from home at least some of the time during the workweek. Indoor air quality also is a serious concern for workers in hotels, offices and other business establishments.

The concentrations of many air pollutants often are elevated in homes and other buildings relative to outdoor air because many of the materials and products used indoors contain and release a variety of pollutants to air (Hodgson et al., 2002; Offermann and Hodgson, 2011). With respect to indoor air contaminants for which inhalation is the primary route of exposure, the critical design and construction parameters are the provision of adequate ventilation and the reduction of indoor sources of the contaminants.

Indoor Formaldehyde Concentrations Impact. In the California New Home Study (CNHS) of 108 new homes in California (Offermann, 2009), 25 air contaminants were measured, and formaldehyde was identified as the indoor air contaminant with the highest cancer risk as determined by the California Proposition 65 Safe Harbor Levels (OEHHA, 2017a), No Significant Risk Levels (NSRL) for carcinogens. The NSRL is the daily intake level calculated to result in one excess case of cancer in an exposed population of 100,000 (i.e., ten in one million cancer risk) and for formaldehyde is 40 µg/day. The NSRL concentration of formaldehyde that represents a daily dose of 40 µg is 2 µg/m³, assuming a continuous 24-hour exposure, a total daily inhaled air volume of 20 m³, and 100% absorption by the respiratory system. All of the CNHS homes exceeded this NSRL concentration of 2 µg/m³. The median indoor formaldehyde concentration was 36 µg/m³, and ranged from 4.8 to 136 µg/m³, which corresponds to a median exceedance of the 2 µg/m³ NSRL concentration of 18 and a range of 2.3 to 68.

Therefore, the cancer risk of a resident living in a California home with the median indoor formaldehyde concentration of 36 µg/m³, is 180 per million as a result of formaldehyde alone. The CEQA significance threshold for airborne cancer risk is 10 per million, as established by the South Coast Air Quality Management District (SCAQMD, 2015).

Besides being a human carcinogen, formaldehyde is also a potent eye and respiratory irritant. In the CNHS, many homes exceeded the non-cancer reference exposure levels

(RELs) prescribed by California Office of Environmental Health Hazard Assessment (OEHHA, 2017b). The percentage of homes exceeding the RELs ranged from 98% for the Chronic REL of $9 \mu\text{g}/\text{m}^3$ to 28% for the Acute REL of $55 \mu\text{g}/\text{m}^3$.

The primary source of formaldehyde indoors is composite wood products manufactured with urea-formaldehyde resins, such as plywood, medium density fiberboard, and particleboard. These materials are commonly used in building construction for flooring, cabinetry, baseboards, window shades, interior doors, and window and door trims.

In January 2009, the California Air Resources Board (CARB) adopted an airborne toxics control measure (ATCM) to reduce formaldehyde emissions from composite wood products, including hardwood plywood, particleboard, medium density fiberboard, and also furniture and other finished products made with these wood products (California Air Resources Board 2009). While this formaldehyde ATCM has resulted in reduced emissions from composite wood products sold in California, they do not preclude that homes built with composite wood products meeting the CARB ATCM will have indoor formaldehyde concentrations that are below cancer and non-cancer exposure guidelines.

A follow up study to the California New Home Study (CNHS) was conducted in 2016-2018 (Chan et. al., 2019), and found that the median indoor formaldehyde in new homes built after 2009 with CARB Phase 2 Formaldehyde ATCM materials had lower indoor formaldehyde concentrations, with a median indoor concentrations of $22.4 \mu\text{g}/\text{m}^3$ (18.2 ppb) as compared to a median of $36 \mu\text{g}/\text{m}^3$ found in the 2007 CNHS.

Thus, while new homes built after the 2009 CARB formaldehyde ATCM have a 38% lower median indoor formaldehyde concentration and cancer risk, the median lifetime cancer risk is still 112 per million for homes built with CARB compliant composite wood products, which is more than 11 times the OEHHA 10 in a million cancer risk threshold (OEHHA, 2017a).

With respect to this Project, the buildings in the 636 Locust Avenue Project, Long Beach, CA consist of a residential buildings and commercial buildings (i.e., offices, hotels,

restaurants, and retail).

The employees of the commercial spaces (i.e., offices, hotels, restaurants, and retail) are expected to experience significant indoor exposures (e.g., 40 hours per week, 50 weeks per year). These exposures for employees are anticipated to result in significant cancer risks resulting from exposures to formaldehyde released by the building materials and furnishing commonly found in offices, warehouses, residences and hotels.

Because these commercial spaces will be constructed with CARB Phase 2 Formaldehyde ATCM materials, and be ventilated with the minimum code required amount of outdoor air, the indoor formaldehyde concentrations are likely similar to those concentrations observed in residences built with CARB Phase 2 Formaldehyde ATCM materials, which is a median of 22.4 $\mu\text{g}/\text{m}^3$ (Chan et. al., 2019)

Assuming that the commercial spaces employees work 8 hours per day and inhale 20 m^3 of air per day, the formaldehyde dose per work-day at the offices is 149 $\mu\text{g}/\text{day}$.

Assuming that these employees work 5 days per week and 50 weeks per year for 45 years (start at age 20 and retire at age 65) the average 70-year lifetime formaldehyde daily dose is 65.8 $\mu\text{g}/\text{day}$.

This is 1.64 times the NSRL (OEHHA, 2017a) of 40 $\mu\text{g}/\text{day}$ and represents a cancer risk of 16.4 per million, which exceeds the CEQA cancer risk of 10 per million. This impact should be analyzed in an environmental impact report (“EIR”), and the agency should impose all feasible mitigation measures to reduce this impact. Several feasible mitigation measures are discussed below and these and other measures should be analyzed in an EIR.

The residential occupants will potentially have continuous exposure (e.g. 24 hours per day, 52 weeks per year). These exposures are anticipated to result in significant cancer risks resulting from exposures to formaldehyde released by the building materials and furnishing commonly found in residential construction.

Because these residences will be constructed with CARB Phase 2 Formaldehyde ATCM materials, and be ventilated with the minimum code required amount of outdoor air, the indoor residential formaldehyde concentrations are likely similar to those concentrations observed in residences built with CARB Phase 2 Formaldehyde ATCM materials, which is a median of 22.4 $\mu\text{g}/\text{m}^3$ (Chan et. al., 2019)

Assuming that the residential occupants inhale 20 m^3 of air per day, the average 70-year lifetime formaldehyde daily dose is 448 $\mu\text{g}/\text{day}$ for continuous exposure in the residences. This exposure represents a cancer risk of 112 per million, which is more than 11 times the CEQA cancer risk of 10 per million. For occupants that do not have continuous exposure, the cancer risk will be proportionally less but still substantially over the CEQA cancer risk of 10 per million (e.g. for 12/hour/day occupancy, more than 5 times the CEQA cancer risk of 10 per million).

Appendix A, Indoor Formaldehyde Concentrations and the CARB Formaldehyde ATCM, provides analyses that show utilization of CARB Phase 2 Formaldehyde ATCM materials will not ensure acceptable cancer risks with respect to formaldehyde emissions from composite wood products.

Even composite wood products manufactured with CARB certified ultra low emitting formaldehyde (ULEF) resins do not insure that the indoor air will have concentrations of formaldehyde that meet the OEHHA cancer risks that substantially exceed 10 per million. The permissible emission rates for ULEF composite wood products are only 11-15% lower than the CARB Phase 2 emission rates. Only use of composite wood products made with no-added formaldehyde resins (NAF), such as resins made from soy, polyvinyl acetate, or methylene diisocyanate can insure that the OEHHA cancer risk of 10 per million is met.

The following describes a method that should be used prior to construction in the environmental review under CEQA, for determining whether the indoor concentrations resulting from the formaldehyde emissions of the specific building materials/furnishings selected for the building exceed cancer and non-cancer guidelines. Such a design analyses can be used to identify those materials/furnishings prior to the completion of the City's

CEQA review and project approval, that have formaldehyde emission rates that contribute to indoor concentrations that exceed cancer and non-cancer guidelines, so that alternative lower emitting materials/furnishings may be selected and/or higher minimum outdoor air ventilation rates can be increased to achieve acceptable indoor concentrations and incorporated as mitigation measures for this project.

Pre-Construction Building Material/Furnishing Formaldehyde Emissions Assessment.

This formaldehyde emissions assessment should be used in the environmental review under CEQA to assess the indoor formaldehyde concentrations from the proposed loading of building materials/furnishings, the area-specific formaldehyde emission rate data for building materials/furnishings, and the design minimum outdoor air ventilation rates. This assessment allows the applicant (and the City) to determine before the conclusion of the environmental review process and the building materials/furnishings are specified, purchased, and installed if the total chemical emissions will exceed cancer and non-cancer guidelines, and if so, allow for changes in the selection of specific material/furnishings and/or the design minimum outdoor air ventilations rates such that cancer and non-cancer guidelines are not exceeded.

1.) Define Indoor Air Quality Zones. Divide the building into separate indoor air quality zones, (IAQ Zones). IAQ Zones are defined as areas of well-mixed air. Thus, each ventilation system with recirculating air is considered a single zone, and each room or group of rooms where air is not recirculated (e.g. 100% outdoor air) is considered a separate zone. For IAQ Zones with the same construction material/furnishings and design minimum outdoor air ventilation rates. (e.g. hotel rooms, apartments, condominiums, etc.) the formaldehyde emission rates need only be assessed for a single IAQ Zone of that type.

2.) Calculate Material/Furnishing Loading. For each IAQ Zone, determine the building material and furnishing loadings (e.g., m² of material/m² floor area, units of furnishings/m² floor area) from an inventory of all potential indoor formaldehyde sources, including flooring, ceiling tiles, furnishings, finishes, insulation, sealants, adhesives, and any products constructed with composite wood products containing urea-formaldehyde resins (e.g., plywood, medium density fiberboard, particleboard).

3.) Calculate the Formaldehyde Emission Rate. For each building material, calculate the formaldehyde emission rate ($\mu\text{g}/\text{h}$) from the product of the area-specific formaldehyde emission rate ($\mu\text{g}/\text{m}^2\text{-h}$) and the area (m^2) of material in the IAQ Zone, and from each furnishing (e.g. chairs, desks, etc.) from the unit-specific formaldehyde emission rate ($\mu\text{g}/\text{unit-h}$) and the number of units in the IAQ Zone.

NOTE: As a result of the high-performance building rating systems and building codes (California Building Standards Commission, 2014; USGBC, 2014), most manufacturers of building materials furnishings sold in the United States conduct chemical emission rate tests using the California Department of Health “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers”, (CDPH, 2017), or other equivalent chemical emission rate testing methods. Most manufacturers of building furnishings sold in the United States conduct chemical emission rate tests using ANSI/BIFMA M7.1 Standard Test Method for Determining VOC Emissions (BIFMA, 2018), or other equivalent chemical emission rate testing methods.

CDPH, BIFMA, and other chemical emission rate testing programs, typically certify that a material or furnishing does not create indoor chemical concentrations in excess of the maximum concentrations permitted by their certification. For instance, the CDPH emission rate testing requires that the measured emission rates when input into an office, school, or residential model do not exceed one-half of the OEHHA Chronic Exposure Guidelines (OEHHA, 2017b) for the 35 specific VOCs, including formaldehyde, listed in Table 4-1 of the CDPH test method (CDPH, 2017). These certifications themselves do not provide the actual area-specific formaldehyde emission rate (i.e., $\mu\text{g}/\text{m}^2\text{-h}$) of the product, but rather provide data that the formaldehyde emission rates do not exceed the maximum rate allowed for the certification. Thus for example, the data for a certification of a specific type of flooring may be used to calculate that the area-specific emission rate of formaldehyde is less than $31 \mu\text{g}/\text{m}^2\text{-h}$, but not the actual measured specific emission rate, which may be 3, 18, or $30 \mu\text{g}/\text{m}^2\text{-h}$. These area-specific emission rates determined from the product certifications of CDPH, BIFA, and other certification programs can be used as an initial estimate of the formaldehyde emission rate.

If the actual area-specific emission rates of a building material or furnishing is needed (i.e. the initial emission rates estimates from the product certifications are higher than desired), then that data can be acquired by requesting from the manufacturer the complete chemical emission rate test report. For instance if the complete CDPH emission test report is requested for a CDHP certified product, that report will provide the actual area-specific emission rates for not only the 35 specific VOCs, including formaldehyde, listed in Table 4-1 of the CDPH test method (CDPH, 2017), but also all of the cancer and reproductive/developmental chemicals listed in the California Proposition 65 Safe Harbor Levels (OEHHA, 2017a), all of the toxic air contaminants (TACs) in the California Air Resources Board Toxic Air Contamination List (CARB, 2011), and the 10 chemicals with the greatest emission rates.

Alternatively, a sample of the building material or furnishing can be submitted to a chemical emission rate testing laboratory, such as Berkeley Analytical Laboratory (<https://berkeleyanalytical.com>), to measure the formaldehyde emission rate.

4.) Calculate the Total Formaldehyde Emission Rate. For each IAQ Zone, calculate the total formaldehyde emission rate (i.e. $\mu\text{g/h}$) from the individual formaldehyde emission rates from each of the building material/furnishings as determined in Step 3.

5.) Calculate the Indoor Formaldehyde Concentration. For each IAQ Zone, calculate the indoor formaldehyde concentration ($\mu\text{g/m}^3$) from Equation 1 by dividing the total formaldehyde emission rates (i.e. $\mu\text{g/h}$) as determined in Step 4, by the design minimum outdoor air ventilation rate (m^3/h) for the IAQ Zone.

$$C_{in} = \frac{E_{total}}{Q_{oa}} \quad (\text{Equation 1})$$

where:

C_{in} = indoor formaldehyde concentration ($\mu\text{g/m}^3$)

E_{total} = total formaldehyde emission rate ($\mu\text{g/h}$) into the IAQ Zone.

Q_{oa} = design minimum outdoor air ventilation rate to the IAQ Zone (m^3/h)

The above Equation 1 is based upon mass balance theory, and is referenced in Section 3.10.2 “Calculation of Estimated Building Concentrations” of the California Department of Health “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers”, (CDPH, 2017).

6.) Calculate the Indoor Exposure Cancer and Non-Cancer Health Risks. For each IAQ Zone, calculate the cancer and non-cancer health risks from the indoor formaldehyde concentrations determined in Step 5 and as described in the OEHHA Air Toxics Hot Spots Program Risk Assessment Guidelines; Guidance Manual for Preparation of Health Risk Assessments (OEHHA, 2015).

7.) Mitigate Indoor Formaldehyde Exposures of exceeding the CEQA Cancer and/or Non-Cancer Health Risks. In each IAQ Zone, provide mitigation for any formaldehyde exposure risk as determined in Step 6, that exceeds the CEQA cancer risk of 10 per million or the CEQA non-cancer Hazard Quotient of 1.0.

Provide the source and/or ventilation mitigation required in all IAQ Zones to reduce the health risks of the chemical exposures below the CEQA cancer and non-cancer health risks.

Source mitigation for formaldehyde may include:

- 1.) reducing the amount materials and/or furnishings that emit formaldehyde
- 2.) substituting a different material with a lower area-specific emission rate of formaldehyde

Ventilation mitigation for formaldehyde emitted from building materials and/or furnishings may include:

- 1.) increasing the design minimum outdoor air ventilation rate to the IAQ Zone.

NOTE: Mitigating the formaldehyde emissions through use of less material/furnishings, or use of lower emitting materials/furnishings, is the preferred mitigation option, as mitigation with increased outdoor air ventilation increases initial and operating costs associated with the heating/cooling systems.

Further, we are not asking that the builder to “speculate” on what and how much composite materials be used, but rather at the design stage to select composite wood materials based on the formaldehyde emission rates that manufacturers routinely conduct using the California Department of Health “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers”, (CDPH, 2017), and use the procedure described earlier (i.e. Pre-Construction Building Material/Furnishing Formaldehyde Emissions Assessment) to insure that the materials selected achieve acceptable cancer risks from material off gassing of formaldehyde.

Indoor Air Quality Impact Mitigation Measures

The following are recommended mitigation measures to minimize the impacts upon indoor quality:

Indoor Formaldehyde Concentrations Mitigation. Use only composite wood materials (e.g. hardwood plywood, medium density fiberboard, particleboard) for all interior finish systems that are made with CARB approved no-added formaldehyde (NAF) resins (CARB, 2009). CARB Phase 2 certified composite wood products, or ultra-low emitting formaldehyde (ULEF) resins, do not insure indoor formaldehyde concentrations that are below the CEQA cancer risk of 10 per million. Only composite wood products manufactured with CARB approved no-added formaldehyde (NAF) resins, such as resins made from soy, polyvinyl acetate, or methylene diisocyanate can insure that the OEHHA cancer risk of 10 per million is met.

Alternatively, conduct the previously described Pre-Construction Building Material/Furnishing Chemical Emissions Assessment, to determine that the combination of formaldehyde emissions from building materials and furnishings do not create indoor formaldehyde concentrations that exceed the CEQA cancer and non-cancer health risks.

It is important to note that we are not asking that the builder to “speculate” on what and how much composite materials be used, but rather at the design stage to select composite wood

materials based on the formaldehyde emission rates that manufacturers routinely conduct using the California Department of Health “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers”, (CDPH, 2017), and use the procedure described earlier (i.e. Pre-Construction Building Material/Furnishing Formaldehyde Emissions Assessment) to insure that the materials selected achieve acceptable cancer risks from material off gassing of formaldehyde.

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APPENDIX A

INDOOR FORMALDEHYDE CONCENTRATIONS AND THE CARB FORMALDEHYDE ATCM

With respect to formaldehyde emissions from composite wood products, the CARB ATCM regulations of formaldehyde emissions from composite wood products, do not assure healthful indoor air quality. The following is the stated purpose of the CARB ATCM regulation - *The purpose of this airborne toxic control measure is to “reduce formaldehyde emissions from composite wood products, and finished goods that contain composite wood products, that are sold, offered for sale, supplied, used, or manufactured for sale in California”*. In other words, the CARB ATCM regulations do not “assure healthful indoor air quality”, but rather “reduce formaldehyde emissions from composite wood products”.

Just how much protection do the CARB ATCM regulations provide building occupants from the formaldehyde emissions generated by composite wood products? Definitely some, but certainly the regulations do not “*assure healthful indoor air quality*” when CARB Phase 2 products are utilized. As shown in the Chan 2019 study of new California homes, the median indoor formaldehyde concentration was of $22.4 \mu\text{g}/\text{m}^3$ (18.2 ppb), which corresponds to a cancer risk of 112 per million for occupants with continuous exposure, which is more than 11 times the CEQA cancer risk of 10 per million.

Another way of looking at how much protection the CARB ATCM regulations provide building occupants from the formaldehyde emissions generated by composite wood products is to calculate the maximum number of square feet of composite wood product that can be in a residence without exceeding the CEQA cancer risk of 10 per million for occupants with continuous occupancy.

For this calculation I utilized the floor area (2,272 ft²), the ceiling height (8.5 ft), and the number of bedrooms (4) as defined in Appendix B (New Single-Family Residence Scenario) of the Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions for Indoor Sources Using Environmental Chambers, Version 1.1, 2017, California Department of Public Health,

For the outdoor air ventilation rate I used the 2019 Title 24 code required mechanical ventilation rate (ASHRAE 62.2) of 106 cfm (180 m³/h) calculated for this model residence. For the composite wood formaldehyde emission rates I used the CARB ATCM Phase 2 rates.

The calculated maximum number of square feet of composite wood product that can be in a residence, without exceeding the CEQA cancer risk of 10 per million for occupants with continuous occupancy are as follows for the different types of regulated composite wood products.

Medium Density Fiberboard (MDF) – 15 ft² (0.7% of the floor area), or
Particle Board – 30 ft² (1.3% of the floor area), or
Hardwood Plywood – 54 ft² (2.4% of the floor area), or
Thin MDF – 46 ft² (2.0 % of the floor area).

For offices and hotels the calculated maximum amount of composite wood product (% of floor area) that can be used without exceeding the CEQA cancer risk of 10 per million for occupants, assuming 8 hours/day occupancy, and the California Mechanical Code minimum outdoor air ventilation rates are as follows for the different types of regulated composite wood products.

Medium Density Fiberboard (MDF) – 3.6 % (offices) and 4.6% (hotel rooms), or
Particle Board – 7.2 % (offices) and 9.4% (hotel rooms), or
Hardwood Plywood – 13 % (offices) and 17% (hotel rooms), or
Thin MDF – 11 % (offices) and 14 % (hotel rooms)

Clearly the CARB ATCM does not regulate the formaldehyde emissions from composite wood products such that the potentially large areas of these products, such as for flooring, baseboards, interior doors, window and door trims, and kitchen and bathroom cabinetry, could be used without causing indoor formaldehyde concentrations that result in CEQA

cancer risks that substantially exceed 10 per million for occupants with continuous occupancy.

Even composite wood products manufactured with CARB certified ultra low emitting formaldehyde (ULEF) resins do not insure that the indoor air will have concentrations of formaldehyde that meet the OEHHA cancer risks that substantially exceed 10 per million. The permissible emission rates for ULEF composite wood products are only 11-15% lower than the CARB Phase 2 emission rates. Only use of composite wood products made with no-added formaldehyde resins (NAF), such as resins made from soy, polyvinyl acetate, or methylene diisocyanate can insure that the OEHHA cancer risk of 10 per million is met.

If CARB Phase 2 compliant or ULEF composite wood products are utilized in construction, then the resulting indoor formaldehyde concentrations should be determined in the design phase using the specific amounts of each type of composite wood product, the specific formaldehyde emission rates, and the volume and outdoor air ventilation rates of the indoor spaces, and all feasible mitigation measures employed to reduce this impact (e.g. use less formaldehyde containing composite wood products and/or incorporate mechanical systems capable of higher outdoor air ventilation rates). See the procedure described earlier (i.e. Pre-Construction Building Material/Furnishing Formaldehyde Emissions Assessment) to insure that the materials selected achieve acceptable cancer risks from material off gassing of formaldehyde.

Alternatively, and perhaps a simpler approach, is to use only composite wood products (e.g. hardwood plywood, medium density fiberboard, particleboard) for all interior finish systems that are made with CARB approved no-added formaldehyde (NAF) resins.

EXHIBIT B



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**Subject: Comments on the Downtown Plan Program EIR Land Use Equivalency Program and 7th
 And Locust Development**

Dear Mr. Flynn,

We have reviewed the August 2021 Downtown Plan EIR Addendum (“Addendum”) for the Downtown Plan Program EIR Land Use Equivalency Program and 7th and Locust Development (“Project”) located in the City of Long Beach (“City”). The Project includes two components: 1) the Land Use Equivalency Program to allow for the reallocation and exchange of permitted land uses within the Certified PEIR; and 2) the 7th and Locust Development. Specifically, the 7th and Locust Development proposes to construct 79,374-SF of residential space with 108 units, 1,188-SF of retail space, and 135 parking spaces on the 0.52-acre site.

Our review concludes that the Addendum fails to adequately evaluate the Project’s air quality and health risk impacts associated with the 7th and Locust Development. As a result, emissions and health risk impacts associated with construction and operation of the proposed Project are underestimated and inadequately addressed. An updated EIR should be prepared to adequately assess and mitigate the potential air quality and health risk impacts that the project may have on the surrounding environment.

Air Quality

Unsubstantiated Input Parameters Used to Estimate Project Emissions

The Addendum’s air quality analysis relies on emissions calculated with CalEEMod.2016.3.2 (p. 63).¹ CalEEMod provides recommended default values based on site-specific information, such as land use

¹ CAPCOA (November 2017) CalEEMod User’s Guide, http://www.aqmd.gov/docs/default-source/caleemod/01_user-39-s-guide2016-3-2_15november2017.pdf?sfvrsn=4.

type, meteorological data, total lot acreage, project type and typical equipment associated with project type. If more specific project information is known, the user can change the default values and input project-specific values, but the California Environmental Quality Act (“CEQA”) requires that such changes be justified by substantial evidence. Once all of the values are inputted into the model, the Project's construction and operational emissions are calculated, and "output files" are generated. These output files disclose to the reader what parameters are utilized in calculating the Project's air pollutant emissions and make known which default values are changed as well as provide justification for the values selected.

When reviewing the Project’s CalEEMod output files, provided in the Air Quality Analysis (“AQA”) and Greenhouse Gas Emissions Calculations (“GHG Report”) as Appendix B and Appendix D to the Addendum, respectively, we found that several model inputs were not consistent with information disclosed in the Addendum. As a result, the Project’s construction and operational emissions are underestimated. As a result, an updated EIR should be prepared to include an updated air quality analysis that adequately evaluates the impacts that construction and operation of the Project will have on local and regional air quality.

Unsubstantiated Reduction to CO₂ Intensity Factor

Review of the CalEEMod output files demonstrates that “The Locust Avenue Multi-Family Residential Building” model includes a reduction to the default CO₂ intensity factor (see excerpt below) (Appendix B, pp. 181, 222, 256; Appendix D, pp. 329).

Table Name	Column Name	Default Value	New Value
tblProjectCharacteristics	CO2IntensityFactor	702.44	502.65

As you can see in the excerpt above, the CO₂ intensity factor was decreased by approximately 28%, from the default value of 702.44- to 502.65-pounds per megawatt hour (“lbs/MWh”). As previously mentioned, the CalEEMod User’s Guide requires any changes to model defaults be justified.² According to the “User Entered Comments & Non-Default Data” table, the justification provided for this change is:

“CO₂ Intensity Factor is based on 2020 forecast in Los Angeles County” (Appendix B, pp. 178, 219, 253; Appendix D; 326).

However, this justification is insufficient for two reasons. First, the “User Entered Comments and Non-Default Data” table fails to provide a verifiable source for the alleged 2020 forecast of Los Angeles County. Second, the Addendum and associated documents fail to mention the CO₂ intensity factor or justify this reduction whatsoever. As such, the revised CO₂ intensity factor is unsupported.

This unsubstantiated reduction presents an issue, as CalEEMod uses the CO₂ intensity factor to calculate the Project’s GHG emissions associated with electricity use.³ Thus, by including an unsubstantiated

² CalEEMod User Guide, available at: <http://www.caleemod.com/>, p. 2, 9

³ “CalEEMod User’s Guide.” CAPCOA, November 2017, available at: <http://www.caleemod.com/>, p. 17.

change to the default CO₂ intensity factor, the model may underestimate the Project’s potential GHG emissions and should not be relied upon to determine Project significance.

Unsubstantiated Changes to Architectural and Area Coating Areas

Review of the CalEEMod output files demonstrates that “The Locust Avenue Multi-Family Residential Building” model includes several changes to the default architectural and area coating areas (see excerpt below) (Appendix B, pp. 179, 220, 254; Appendix D, pp. 327).

Table Name	Column Name	Default Value	New Value
tblArchitecturalCoating	ConstArea_Nonresidential_Exterior	3,344.00	3,273.00
tblArchitecturalCoating	ConstArea_Nonresidential_Interior	10,032.00	9,818.00
tblArchitecturalCoating	ConstArea_Residential_Exterior	112,433.00	70,646.00
tblArchitecturalCoating	ConstArea_Residential_Interior	337,300.00	211,939.00
tblAreaCoating	Area_Nonresidential_Exterior	3344	3273
tblAreaCoating	Area_Nonresidential_Interior	10032	9818
tblAreaCoating	Area_Residential_Exterior	112433	70646
tblAreaCoating	Area_Residential_Interior	337300	211939

As previously mentioned, the CalEEMod User’s Guide requires any changes to model defaults be justified.⁴ However, no justification is provided by the “User Entered Comments and Non-Default Data” table. Furthermore, the Addendum incorporates Mitigation Measure (“MM”) AQ-1(c), which includes the following provision:

“Construct or build with materials that do not require painting” (p. 12).

However, the Addendum fails to specify the exact coating areas or square footage of building materials that would not require paint. As such, we cannot verify the revised architectural and area coating areas.

These unsubstantiated reductions present an issue, as CalEEMod uses the architectural and area coating areas to calculate the Project’s reactive organic gas/volatile organic compound (“ROG”/“VOC”) emissions.⁵ Thus, by including unsubstantiated reductions to the default architectural and area coating areas, the model may underestimate the Project’s construction-related and operational ROG/VOC emissions and should not be relied upon to determine Project significance.

Unsubstantiated Changes to Individual Construction Phase Lengths

Review of the CalEEMod output files demonstrates that “The Locust Avenue Multi-Family Residential Building” model includes several changes to the default individual construction phase lengths (see excerpt below) (Appendix B, pp. 180, 221, 255; Appendix D, pp. 328).

⁴ CalEEMod User Guide, available at: <http://www.caleemod.com/>, p. 2, 9

⁵ CalEEMod User Guide, available at: http://www.aqmd.gov/docs/default-source/caleemod/01_user-39-s-guide2016-3-2_15november2017.pdf?sfvrsn=4, p. 35, 40.

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	10.00	50.00
tblConstructionPhase	NumDays	200.00	440.00
tblConstructionPhase	NumDays	20.00	12.00
tblConstructionPhase	NumDays	4.00	100.00

As a result of these changes, the model includes a construction schedule as follows (see excerpt below) (Appendix B, pp. 186, 228, 262; Appendix D, pp. 334):

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days
1	Demolition	Demolition	9/1/2021	9/16/2021	5	12
2	Grading	Grading	9/17/2021	2/3/2022	5	100
3	Building Construction	Building Construction	2/4/2022	10/12/2023	5	440
4	Paving	Paving	10/13/2023	10/26/2023	5	10
5	Architectural Coating	Architectural Coating	10/27/2023	1/4/2024	5	50

As you can see in the excerpts above, the demolition phase length was decreased by roughly 40%, from the default value of 20 to 12 days; the grading phase length was increased by roughly 2,400%, from the default value of 4 to 100 days; the building construction phase length was increased by roughly 120%, from the default value of 200 to 440 days; and the architectural coating phase length was increased by roughly 400%, from the default value of 10 to 50 days. As previously mentioned, the CalEEMod User’s Guide requires any changes to model defaults be justified.⁶ According to the “User Entered Comments and Non-Default Data” table, the justification provided for these changes is:

“Site preparation phase removed. Additional days added to demolition, grading, building construction, and architectural coating phases. Total construction approximately 28 months” (Appendix B, pp. 178, 219, 253; Appendix D; 326).

Furthermore, regarding the Project’s anticipated construction schedule, the Addendum states:

“The proposed 7th and Locust Development is anticipated to begin construction in the third quarter of 2021 and would last for 28 months with completion in early 2024” (p. 63).

Furthermore, the AQA provides the following tentative construction schedule (see excerpt below) (p. 9-10, Table D):

⁶ CalEEMod User Guide, available at: <http://www.caleemod.com/>, p. 2, 9

Table D: Tentative Project Construction Schedule

Phase Number	Phase Name	Phase Start Date	Phase End Date	Number of Days/Week	Number of Days
1	Demolition	9/1/2021	9/16/2021	5	12
2	Grading	9/17/2021	2/3/2022	5	100
3	Building Construction	2/4/2022	10/12/2023	5	440
4	Paving	10/13/2023	10/26/2023	5	10
5	Architectural Coating	10/27/2023	1/4/2024	5	50

Source: Construction will begin in the third quarter of 2021 and scheduled completion of approximately 28 months (September 2020).

However, the source provided for the tentative construction schedule only reiterates the overall construction schedule indicated by the Addendum. This is insufficient, as according to CalEEMod User’s Guide:

“CalEEMod was also designed to allow the user to change the defaults to reflect site- or project-specific information, when available, provided that the information is supported by substantial evidence as required by CEQA.”⁷

Here, as the Addendum and above-mentioned source only justify a total construction duration of 28 months, the Project fails to provide substantial evidence to support the revised individual construction phase lengths. As such, we cannot verify the changes.

These unsubstantiated changes present an issue, as the construction emissions are improperly spread out over a longer period of time for some phases, but not for others. According to the CalEEMod User’s Guide, each construction phase is associated with different emissions activities (see excerpt below).⁸

Demolition involves removing buildings or structures.

Site Preparation involves clearing vegetation (grubbing and tree/stump removal) and removing stones and other unwanted material or debris prior to grading.

Grading involves the cut and fill of land to ensure that the proper base and slope is created for the foundation.

Building Construction involves the construction of the foundation, structures and buildings.

Architectural Coating involves the application of coatings to both the interior and exterior of buildings or structures, the painting of parking lot or parking garage striping, associated signage and curbs, and the painting of the walls or other components such as stair railings inside parking structures.

Paving involves the laying of concrete or asphalt such as in parking lots, roads, driveways, or sidewalks.

As such, by disproportionately altering the individual construction phase lengths without proper justification, the model’s calculations are altered and may underestimate emissions. Thus, by including unsubstantiated changes to the default individual construction phase lengths, the model may

⁷ CalEEMod User Guide, available at: <http://www.caleemod.com/>, p. 12.

⁸ “CalEEMod User’s Guide.” CAPCOA, November 2017, available at: http://www.aqmd.gov/docs/default-source/caleemod/01_user-39-s-guide2016-3-2_15november2017.pdf?sfvrsn=4, p. 31.

underestimate the Project’s construction-related emissions and should not be relied upon to determine Project significance.

Unsubstantiated Reduction to the Hauling Trip Number

Review of the CalEEMod output files demonstrates that “The Locust Avenue Multi-Family Residential Building” model includes a reduction to the grading hauling trip number (see excerpt below) (Appendix B, pp. 181, 222, 256, 329).

Table Name	Column Name	Default Value	New Value
tblTripsAndVMT	HaulingTripNumber	2,475.00	1,958.00

As previously mentioned, the CalEEMod User’s Guide requires any changes to model defaults be justified.⁹ According to the “User Entered Comments and Non-Default Data” table, the justification provided for this change is:

“Demolition truck haul trips. Export of soil 15 times daily during "mass excavation" grading phase” (Appendix B, pp. 178, 219, 253; Appendix D, pp. 326).

Furthermore, regarding the number of hauling trips associated with the grading phase, the Addendum states:

“It is assumed that exporting the soil would require 1,958 total truck trips during the 100-day grading period” (p. 63).

However, these justifications are insufficient, as the Addendum cannot simply assume the Project’s anticipated number of hauling trips. According to the CalEEMod User’s Guide:

“CalEEMod was also designed to allow the user to change the defaults to reflect site- or project-specific information, when available, provided that the information is supported by substantial evidence as required by CEQA.”¹⁰

Here, as the Addendum and associated documents fail to provide substantial evidence to support the revised hauling trip number, we cannot verify the reduction.

This unsubstantiated reduction presents an issue, as CalEEMod uses the number of hauling trips to estimate the construction-related emissions associated with on-road vehicles.¹¹ By including an unsubstantiated reduction to the default hauling trip number, the model may underestimate the Project’s construction-related emissions and should not be relied upon to determine Project significance.

⁹ CalEEMod User Guide, available at: <http://www.caleemod.com/>, p. 2, 9

¹⁰ CalEEMod Model 2013.2.2 User’s Guide, available at: <http://www.aqmd.gov/docs/default-source/caleemod/usersguideSept2016.pdf?sfvrsn=6>, p. 12.

¹¹ CalEEMod User Guide, available at: <http://www.caleemod.com/>, p. 34.

Unsubstantiated Changes to the Solid Waste Generation Rate

Review of the CalEEMod output files demonstrates that “The Locust Avenue Multi-Family Residential Building” model includes a reduction to the default solid waste generation rate (see excerpt below) (Appendix B, pp. 181, 222, 256, 329).

Table Name	Column Name	Default Value	New Value
tblSolidWaste	SolidWasteGenerationRate	1.09	0.95

As previously mentioned, the CalEEMod User’s Guide requires any changes to model defaults be justified.¹² However, no justification was provided “User Entered Comments and Non-Default Data” table. Furthermore, the Addendum and associated documents fail to mention the specific waste generation rates for the 7th and Locust Development or justify this change whatsoever. As such, we cannot verify the revised solid waste generation rate.

This unsubstantiated reduction presents an issue, as CalEEMod uses the solid waste generation rate to calculate the Project’s operation GHG emissions associated with the disposal of solid waste into landfills.¹³ Thus, by including an unsubstantiated reduction to the default solid waste generation rate, the model may underestimate the Project’s operational GHG emissions and should not be relied upon to determine Project significance.

Unsubstantiated Changes to the Indoor and Outdoor Water Use Rates

Review of the CalEEMod output files demonstrates that the “The Locust Avenue Multi-Family Residential Building” model includes reductions to the default indoor and outdoor water use rates (see excerpt below) (Appendix B, pp. 181-182, 222-223, 256-257, 329-330).

Table Name	Column Name	Default Value	New Value
tblWater	IndoorWaterUseRate	361,205.12	315,675.06
tblWater	OutdoorWaterUseRate	23,055.65	20,149.47

As previously mentioned, the CalEEMod User’s Guide requires any changes to model defaults be justified.¹⁴ However, no justification was provided “User Entered Comments & Non-Default Data” table. Furthermore, the Addendum and associated documents fail to mention the specific indoor and outdoor water use rates for the 7th and Locust Development or justify these changes whatsoever. As such, we cannot verify the revised indoor and outdoor water use rates.

These unsubstantiated reductions present an issue, as CalEEMod uses indoor and outdoor water use rates to estimate the amount of wastewater, which has direct emissions of GHGs.¹⁵ By including unsubstantiated reductions to the default indoor and outdoor water use rates, the model

¹² CalEEMod User Guide, available at: <http://www.caleemod.com/>, p. 2, 9

¹³ CalEEMod User Guide, available at: <http://www.caleemod.com/>, p. 46.

¹⁴ CalEEMod User Guide, available at: <http://www.caleemod.com/>, p. 2, 9

¹⁵ CalEEMod User Guide, available at: <http://www.caleemod.com/>, p. 44, 45.

underestimates the Project's water-related operational emissions and should not be relied upon to determine Project significance.

Diesel Particulate Matter Health Risk Emissions Inadequately Evaluated

The Addendum concludes that the 7th and Locust Development would have a less-than-significant health risk impact without conducting a quantified construction or operational health risk analysis ("HRA") (p. 70-71). Specifically, regarding potential health risk impacts associated with construction of the 7th and Locust Development, the Addendum states:

"Project construction activities would result in the generation of DPM emissions from the use of off-road diesel equipment required for demolition, site grading and excavation, building construction, paving, and architectural coating. As stated in the Certified PEIR, because the use of off-road heavy-duty diesel equipment during construction of the project would be temporary, that DPM is highly dispersive (Zhu et al. 2002), and that USEPA and CARB regulations that minimize exhaust emissions are mandated to be implemented by construction contractors, construction-related TAC emissions would not expose sensitive receptors to substantial emissions of TACs. Furthermore, as discussed above, project construction would be required to implement Certified PEIR Mitigation Measure AQ-1(a), which includes enhanced exhaust control practices on off-road vehicle and off-road construction equipment. As shown previously in Table 3 and Table 5, project construction emissions, including exhaust PM10 and PM2.5, would be below the SCAQMD regional and localized significance thresholds and within the construction emissions identified in the Certified PEIR. As a result, the 7th and Locust Development, and the Equivalency Program, would not result in new significant construction TAC impacts and would not result in a substantial increase in the severity of impacts identified in the Certified PEIR" (p. 70).

As demonstrated above, the Addendum concludes that the Project would result in a less-than-significant construction-related health risk impact because the limited use of heavy-duty diesel equipment, highly dispersive properties of diesel particulate matter, and implementation of USEPA and CARB regulations would not result in substantial toxic air contaminant ("TAC") emissions. Furthermore, regarding potential health risk impacts associated with Project operation, the Addendum states:

"The 7th and Locust Development's commercial land uses would consist of retail uses. Even if such uses would include dry cleaning facilities, the use of perchloroethylene would be prohibited per SCAQMD Rule 1421.10. Additionally, the project's retail uses would be neighborhood serving and would not generate substantial truck trips of more than 100 trucks per day, or 40 trucks equipped with Transport Refrigeration Units (TRUs). While minor incidental TAC emissions from sources such as the use of cleaning products and solvents could result from the project, these TAC emissions sources would not result in substantial exposures to on- or off-site sensitive receptors that would result in an exceedance of health risk standards" (p. 70).

As demonstrated above, the Addendum concludes that the Project would result in a less-than-significant operational health risk impact because the proposed land uses would not include dry cleaning services

or generate substantial truck trips. However, the Addendum's evaluation of the potential health risk impacts associated with the 7th and Locust Development, as well as the subsequent less-than-significant impact conclusion, is incorrect for three reasons.

First, the Addendum fails to quantitatively evaluate the construction-related and operational TACs associated with the 7th and Locust Development or make a reasonable effort to connect these emissions to potential health risk impacts posed to nearby existing sensitive receptors. This is incorrect, as construction of the proposed Project will produce emissions of diesel particulate matter ("DPM") through the exhaust stacks of construction equipment over a potential construction duration of 28 months (p. 63). Furthermore, the Addendum indicates that the proposed land uses are expected to generate approximately 534 average daily vehicle trips, which will generate additional exhaust emissions and continue to expose nearby sensitive receptors to DPM emissions (p. 65). However, the Addendum fails to evaluate the potential Project-generated TACs or indicate the concentrations at which such pollutants would trigger adverse health effects. Thus, without making a reasonable effort to connect the Project's construction-related and operational TAC emissions to the potential health risks posed to nearby receptors, the Addendum is inconsistent with CEQA's requirement to correlate the increase in emissions generated by the 7th and Locust Development with the potential adverse impacts on human health.

Second, the Addendum's conclusion is inconsistent with guidance from the Office of Environmental Health Hazard Assessment ("OEHHA"), the organization responsible for providing guidance on conducting HRAs in California, as well as local air district guidelines. OEHHA released its most recent *Risk Assessment Guidelines: Guidance Manual for Preparation of Health Risk Assessments* in February 2015. This guidance document describes the types of projects that warrant the preparation of an HRA. The OEHHA document recommends that all short-term projects lasting at least two months be evaluated for cancer risks to nearby sensitive receptors. As the Project's construction duration vastly exceeds the 2-month requirement set forth by OEHHA, it is clear that the Project meets the threshold warranting a quantified HRA under OEHHA guidance. Furthermore, the OEHHA document recommends that exposure from projects lasting more than 6 months be evaluated for the duration of the project and recommends that an exposure duration of 30 years be used to estimate individual cancer risk for the maximally exposed individual resident ("MEIR"). Even though we were not provided with the expected lifetime of the Project, we can reasonably assume that the Project will operate for at least 30 years, if not more. Therefore, we recommend that health risk impacts from Project operation also be evaluated, as a 30-year exposure duration vastly exceeds the 6-month requirement set forth by OEHHA. These recommendations reflect the most recent state health risk policies, and as such, we recommend that an analysis of health risk impacts posed to nearby sensitive receptors from Project-generated DPM emissions be included in an updated EIR for the Project.

Third, by claiming a less-than-significant impact without conducting a quantified construction or operational HRA for nearby, existing sensitive receptors, the Addendum fails to compare the Project's cumulative excess cancer risk to the applicable SCAQMD numeric threshold of 10 in one million, and lacks evidence to support its conclusion that the health risk would be under the threshold (p. 22, Table

9).¹⁶ Thus, pursuant to CEQA and SCAQMD guidance, an analysis of the health risk posed to nearby, existing receptors from construction and operation of the 7th and Locust Development should have been conducted.

Screening-Level Analysis Indicates a Potentially Significant Health Risk Impact

In order to conduct our screening-level risk analysis we relied upon AERSCREEN, which is a screening level air quality dispersion model.¹⁷ The model replaced SCREEN3, and AERSCREEN is included in the OEHHA¹⁸ and the California Air Pollution Control Officers Associated (“CAPCOA”)¹⁹ guidance as the appropriate air dispersion model for Level 2 health risk screening analyses (“HRSA”). A Level 2 HRSA utilizes a limited amount of site-specific information to generate maximum reasonable downwind concentrations of air contaminants to which nearby sensitive receptors may be exposed. If an unacceptable air quality hazard is determined to be possible using AERSCREEN, a more refined modeling approach is required prior to approval of the Project.

In order to estimate the health risk impacts posed to residential sensitive receptors as a result of the Project’s construction-related and operational TAC emissions, we prepared a preliminary HRA using the annual PM₁₀ exhaust estimates from the Addendum’s CalEEMod output files. Consistent with recommendations set forth by OEHHA, we assumed residential exposure begins during the third trimester stage of life. The CalEEMod model indicates that construction activities will generate approximately 404 pounds of DPM over the 852-day construction period.²⁰ The AERSCREEN model relies on a continuous average emission rate to simulate maximum downward concentrations from point, area, and volume emission sources. To account for the variability in equipment usage and truck trips over Project construction, we calculated an average DPM emission rate by the following equation:

$$\text{Emission Rate} \left(\frac{\text{grams}}{\text{second}} \right) = \frac{404.3 \text{ lbs}}{852 \text{ days}} \times \frac{453.6 \text{ grams}}{\text{lbs}} \times \frac{1 \text{ day}}{24 \text{ hours}} \times \frac{1 \text{ hour}}{3,600 \text{ seconds}} = \mathbf{0.00249 \text{ g/s}}$$

Using this equation, we estimated a construction emission rate of 0.00249 grams per second (“g/s”). Subtracting the 852-day construction period from the total residential duration of 30 years, we assumed that after Project construction, the sensitive receptor would be exposed to the Project’s operational DPM for an additional 27.67 years, approximately. The operational CalEEMod emissions indicate that operational activities will generate approximately 36 pounds of DPM per year throughout operation. Applying the same equation used to estimate the construction DPM rate, we estimated the following emission rate for Project operation:

¹⁶ “South Coast AQMD Air Quality Significance Thresholds.” SCAQMD, April 2019, *available at*: <http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf>.

¹⁷ U.S. EPA (April 2011) AERSCREEN Released as the EPA Recommended Screening Model, http://www.epa.gov/ttn/scram/guidance/clarification/20110411_AERSCREEN_Release_Memo.pdf

¹⁸ “Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments.” OEHHA, February 2015, *available at*: http://oehha.ca.gov/air/hot_spots/2015/2015GuidanceManual.pdf

¹⁹ CAPCOA (July 2009) Health Risk Assessments for Proposed Land Use Projects, http://www.capcoa.org/wp-content/uploads/2012/03/CAPCOA_HRA_LU_Guidelines_8-6-09.pdf.

²⁰ See Attachment A for calculations.

$$\text{Emission Rate} \left(\frac{\text{grams}}{\text{second}} \right) = \frac{35.8 \text{ lbs}}{365 \text{ days}} \times \frac{453.6 \text{ grams}}{\text{lbs}} \times \frac{1 \text{ day}}{24 \text{ hours}} \times \frac{1 \text{ hour}}{3,600 \text{ seconds}} = \mathbf{0.000515 \text{ g/s}}$$

Using this equation, we estimated an operational emission rate of 0.000515 g/s. Construction and operational activity was simulated as a 0.52-acre rectangular area source in AERSCREEN with dimensions of 64.87- by 32.44-meters. A release height of three meters was selected to represent the height of exhaust stacks on operational equipment and other heavy-duty vehicles, and an initial vertical dimension of one and a half meters was used to simulate instantaneous plume dispersion upon release. An urban meteorological setting was selected with model-default inputs for wind speed and direction distribution.

The AERSCREEN model generates maximum reasonable estimates of single-hour DPM concentrations from the Project site. EPA guidance suggests that in screening procedures, the annualized average concentration of an air pollutant be estimated by multiplying the single-hour concentration by 10%.²¹ Regarding the nearest sensitive receptors, the Addendum states that “[t]he proposed 7th and Locust Development is located within 25 meters of residential uses” (p. 67). Thus, the single-hour concentration estimated by AERSCREEN for Project construction is approximately 18.70 µg/m³ DPM at approximately 25 meters downwind. Multiplying this single-hour concentration by 10%, we get an annualized average concentration of 1.870 µg/m³ for Project construction at the MEIR. For Project operation, the single-hour concentration estimated by AERSCREEN is 3.843 µg/m³ DPM at approximately 25 meters downwind. Multiplying this single-hour concentration by 10%, we get an annualized average concentration of 0.3843 µg/m³ for Project operation at the MEIR.

We calculated the excess cancer risk to the MEIR using applicable HRA methodologies prescribed by OEHHA. Consistent with the 852-day construction schedule included in the Project’s CalEEMod output files, the annualized average concentration for Project construction was used for the entire third trimester of pregnancy (0.25 years), infantile stage of life (0 – 2 years), and 0.08 years of the child stage of life (2 – 16 years); and the annualized averaged concentration for operation was used for the remainder of the 30-year exposure period, which makes up the remaining child stage of life and the entire adult stage of life (16 – 30 years).

Consistent with OEHHA guidance and recommended by the SCAQMD, BAAQMD, and SJVAPCD guidance, we used Age Sensitivity Factors (“ASF”) to account for the heightened susceptibility of young children to

²¹ “Screening Procedures for Estimating the Air Quality Impact of Stationary Sources Revised.” EPA, 1992, *available at*: http://www.epa.gov/ttn/scram/guidance/guide/EPA-454R-92-019_OCR.pdf; *see also* “Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments.” OEHHA, February 2015, *available at*: <https://oehha.ca.gov/media/downloads/cnrn/2015guidancemanual.pdf> p. 4-36.

the carcinogenic toxicity of air pollution.^{22, 23, 24} According to this guidance, the quantified cancer risk should be multiplied by a factor of ten during the third trimester of pregnancy and during the first two years of life (infant), as well as multiplied by a factor of three during the child stage of life (2 – 16 years). We also included the quantified cancer risk without adjusting for the heightened susceptibility of young children to the carcinogenic toxicity of air pollution in accordance with older OEHHA guidance from 2003. This guidance utilizes a less health protective scenario than what is currently recommended by SCAQMD, the air quality district with jurisdiction over the City, and several other air districts in the state. Furthermore, in accordance with the guidance set forth by OEHHA, we used the 95th percentile breathing rates for infants.²⁵ Finally, according to SCAQMD guidance, we used a Fraction of Time At Home (“FAH”) Value of 1 for the 3rd trimester and infant receptors.²⁶ We used a cancer potency factor of 1.1 (mg/kg-day)⁻¹ and an averaging time of 25,550 days. The results of our calculations are shown below.

The Maximally Exposed Individual at an Existing Residential Receptor							
Age Group	Emissions Source	Duration (years)	Concentration (ug/m3)	Breathing Rate (L/kg-day)	Cancer Risk (without ASFs*)	ASF	Cancer Risk (with ASFs*)
3rd Trimester	Construction	0.25	1.87	361	2.54E-06	10	2.54E-05
Infant (Age 0 - 2)	Construction	2	1.87	1090	6.14E-05	10	6.14E-04
Child (Age 2 - 16)	Construction	0.08	1.87	572	1.36E-06	3	1.42E-04
	Operation	13.92	0.3843	572	4.61E-05		
	Total	14			4.75E-05		

²² “Draft Environmental Impact Report (DEIR) for the Proposed The Exchange (SCH No. 2018071058).” SCAQMD, March 2019, available at: <http://www.aqmd.gov/docs/default-source/ceqa/comment-letters/2019/march/RVC190115-03.pdf?sfvrsn=8>, p. 4.

²³ “California Environmental Quality Act Air Quality Guidelines.” BAAQMD, May 2017, available at: http://www.baaqmd.gov/~media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, p. 56; see also “Recommended Methods for Screening and Modeling Local Risks and Hazards.” BAAQMD, May 2011, available at: <http://www.baaqmd.gov/~media/Files/Planning%20and%20Research/CEQA/BAAQMD%20Modeling%20Approach.ashx>, p. 65, 86.

²⁴ “Update to District’s Risk Management Policy to Address OEHHA’s Revised Risk Assessment Guidance Document.” SJVAPCD, May 2015, available at: <https://www.valleyair.org/busind/pto/staff-report-5-28-15.pdf>, p. 8, 20, 24.

²⁵ “Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics ‘Hot Spots’ Information and Assessment Act,” July 2018, available at: <http://www.aqmd.gov/docs/default-source/planning/risk-assessment/ab2588supplementalguidelines.pdf>, p. 16.

“Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments.” OEHHA, February 2015, available at: <https://oehha.ca.gov/media/downloads/crnrr/2015guidancemanual.pdf>

²⁶ “Risk Assessment Procedures for Rules 1401, 1401.1, and 212.” SCAQMD, August 2017, available at: http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1401/riskassessmentprocedures_2017_080717.pdf, p. 7.

Adult (Age 16 - 30)	Operation	14	0.3843	261	1.54E-05	1	1.54E-05
Lifetime		30			1.27E-04		7.98E-04
* We, along with CARB and SCAQMD, recommend using the more updated and health protective 2015 OEHHA guidance, which includes ASFs.							

As demonstrated in the table above, the mitigated excess cancer risks for the 3rd trimester of pregnancy, infants, children, and adults at the MEIR located approximately 25 meters away, over the course of Project construction and operation, utilizing ASFs, are approximately 25.4, 614, 142, and 15.4 in one million, respectively. The excess cancer risk over the course of a residential lifetime (30 years), utilizing ASFs, is approximately 798 in one million. The 3rd trimester, infant, child, adult, and lifetime cancer risks exceed the SCAQMD threshold of 10 in one million, thus resulting in a potentially significant impact not previously addressed or identified by the Addendum.

Utilizing ASFs is the most conservative, health-protective analysis according to the most recent guidance by OEHHA and reflects recommendations from the air district. Results without ASFs are presented in the table above, although we do not recommend utilizing these values for health risk analysis. Regardless, the excess cancer risks for the 3rd trimester of pregnancy, infants, children, and adults at the MEIR located approximately 25 meters away, over the course of Project construction and operation, without ASFs, are approximately 2.54, 61.4, 47.5, and 15.4 in one million, respectively. The excess cancer risk over the course of a residential lifetime (30 years), without ASFs, is approximately 127 in one million. The infant, child, and lifetime cancer risks exceed the SCAQMD threshold of 10 in one million, thus resulting in a potentially significant impact not previously addressed or identified by the Addendum. While we recommend the use of ASFs, the Project’s cancer risk without ASFs, as estimated by SWAPE, exceeds the SCAQMD threshold regardless.

An agency must include an analysis of health risks that connects the Project’s air emissions with the health risk posed by those emissions. Our analysis represents a screening-level HRA, which is known to be conservative and tends to err on the side of health protection.²⁷ The purpose of the screening-level construction and operational HRA shown above is to demonstrate the link between the proposed Project’s emissions and the potential health risk. Our screening-level HRA demonstrates that construction and operation of the Project could result in a potentially significant health risk impact, when correct exposure assumptions and up-to-date, applicable guidance are used. Therefore, since our screening-level HRA indicates a potentially significant impact, the City should prepare an updated EIR with an HRA which makes a reasonable effort to connect the Project’s air quality emissions and the potential health risks posed to nearby receptors. Thus, the City should prepare an updated, quantified air pollution model as well as an updated, quantified refined health risk analysis which adequately and accurately evaluates health risk impacts associated with both Project construction and operation.

²⁷ “Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments.” OEHHA, February 2015, available at: <https://oehha.ca.gov/media/downloads/cnr/2015guidancemanual.pdf>, p. 1-5

Disclaimer

SWAPE has received limited discovery regarding this project. Additional information may become available in the future; thus, we retain the right to revise or amend this report when additional information becomes available. Our professional services have been performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable environmental consultants practicing in this or similar localities at the time of service. No other warranty, expressed or implied, is made as to the scope of work, work methodologies and protocols, site conditions, analytical testing results, and findings presented. This report reflects efforts which were limited to information that was reasonably accessible at the time of the work, and may contain informational gaps, inconsistencies, or otherwise be incomplete due to the unavailability or uncertainty of information obtained or provided by third parties.

Sincerely,



Matt Hagemann, P.G., C.Hg.



Paul E. Rosenfeld, Ph.D.

Attachment A: Health Risk Calculations
Attachment B: AERSCREEN Output Files
Attachment C: Matt Hagemann CV
Attachment D: Paul E. Rosenfeld CV

Attachment A

Construction		Total	
2021			
Annual Emissions (tons/year)	0.0276	Total DPM (lbs)	404.250411
Daily Emissions (lbs/day)	0.151232877	Total DPM (g)	183367.9864
Construction Duration (days)	122	Total Construction Days	852
Total DPM (lbs)	18.45041096	Emission Rate (g/s)	0.00249098
Total DPM (g)	8369.106411	Release Height (meters)	3
Start Date	9/1/2021	Total Acreage	0.52
End Date	1/1/2022	Max Horizontal (meters)	64.87
Construction Days	122	Min Horizontal (meters)	32.44
		Initial Vertical Dimension (meters)	1.5
2022		Setting	Urban
Annual Emissions (tons/year)	0.1062	Population	466,776
Daily Emissions (lbs/day)	0.581917808	Start Date	9/1/2021
Construction Duration (days)	365	End Date	1/1/2024
Total DPM (lbs)	212.4	Total Construction Days	852
Total DPM (g)	96344.64	Total Years of Construction	2.33
Start Date	1/1/2022	Total Years of Operation	27.67
End Date	1/1/2023		
Construction Days	365		
2023			
Annual Emissions (tons/year)	0.0867		
Daily Emissions (lbs/day)	0.475068493		
Construction Duration (days)	365		
Total DPM (lbs)	173.4		
Total DPM (g)	78654.24		
Start Date	1/1/2023		
End Date	1/1/2024		
Construction Days	365		
2023			
Annual Emissions (tons/year)	0.00019		
Daily Emissions (lbs/day)	0.001041096		
Construction Duration (days)	3		
Total DPM (lbs)	0.003123288		
Total DPM (g)	1.416723288		
Start Date	1/1/2024		
End Date	1/4/2024		
Construction Days	3		

Operation	
Emission Rate	
Annual Emissions (tons/year)	0.0179
Daily Emissions (lbs/day)	0.098082192
Emission Rate (g/s)	0.000514932
Release Height (meters)	3
Total Acreage	0.52
Max Horizontal (meters)	64.87
Min Horizontal (meters)	32.44
Initial Vertical Dimension (meters)	1.5
Setting	Urban
Population	466,776
Total Pounds of DPM	
Total DPM (lbs)	35.8

Attachment B

Start date and time 09/23/21 11:39:43

AERSCREEN 16216

7th and Locust Development Construction

7th and Locust Development Construction

----- DATA ENTRY VALIDATION -----

METRIC

ENGLISH

** AREADATA **

Emission Rate:	0.249E-02 g/s	0.198E-01 lb/hr
Area Height:	3.00 meters	9.84 feet
Area Source Length:	64.87 meters	212.83 feet
Area Source Width:	32.44 meters	106.43 feet
Vertical Dimension:	1.50 meters	4.92 feet
Model Mode:	URBAN	
Population:	466776	
Dist to Ambient Air:	1.0 meters	3. feet

** BUILDING DATA **

No Building Downwash Parameters

** TERRAIN DATA **

No Terrain Elevations

Source Base Elevation: 0.0 meters 0.0 feet

Probe distance: 5000. meters 16404. feet

No flagpole receptors

No discrete receptors used

** FUMIGATION DATA **

No fumigation requested

** METEOROLOGY DATA **

Min/Max Temperature: 250.0 / 310.0 K -9.7 / 98.3 Deg F

Minimum Wind Speed: 0.5 m/s

Anemometer Height: 10.000 meters

Dominant Surface Profile: Urban

Dominant Climate Type: Average Moisture

Surface friction velocity (u*): not adjusted

DEBUG OPTION ON

AERSCREEN output file:

2021.09.23_7thandLocust_Construction.out

*** AERSCREEN Run is Ready to Begin

No terrain used, AERMAP will not be run

SURFACE CHARACTERISTICS & MAKEMET

Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture

Season	Albedo	Bo	zo
Winter	0.35	1.50	1.000
Spring	0.14	1.00	1.000
Summer	0.16	2.00	1.000
Autumn	0.18	2.00	1.000

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR started 09/23/21 11:41:12

Running AERMOD

Processing Winter

Processing surface roughness sector 1

Processing wind flow sector 1

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 0

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 2

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 5

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 3

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 10

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 4

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 15

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 5

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 20

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 6

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 25

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 7

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 30

***** WARNING MESSAGES *****

*** NONE ***

Running AERMOD

Processing Spring

Processing surface roughness sector 1

Processing wind flow sector 1

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 0

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 2

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 5

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 3

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 10

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 4

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 15

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 5

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 20

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 6

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 25

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 7

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 30

***** WARNING MESSAGES *****

*** NONE ***

Running AERMOD

Processing Summer

Processing surface roughness sector 1

Processing wind flow sector 1

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 0

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 2

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 5

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 3

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 10

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 4

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 15

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 5

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 20

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 6

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 25

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 7

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 30

***** WARNING MESSAGES *****

*** NONE ***

Running AERMOD

Processing Autumn

Processing surface roughness sector 1

Processing wind flow sector 1

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 0

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 2

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 5

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 3

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 10

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 4

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 15

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 5

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 20

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 6

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 25

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 7

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 30

***** WARNING MESSAGES *****

*** NONE ***

FLOWSECTOR ended 09/23/21 11:41:18

REFINE started 09/23/21 11:41:18

AERMOD Finishes Successfully for REFINE stage 3 Winter sector 0

***** WARNING MESSAGES *****

*** NONE ***

REFINE ended 09/23/21 11:41:19

AERSCREEN Finished Successfully

With no errors or warnings

Check log file for details

Ending date and time 09/23/21 11:41:21

Concentration	Distance	Elevation	Diag	Season/Month	Zo sector	Date	H0	U*	W*	DT/DZ	ZICNV
ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF WS	HT	REF TA	HT		
0.14828E+02	1.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.18705E+02	25.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
* 0.19577E+02	33.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.11467E+02	50.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.60979E+01	75.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.39760E+01	100.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.28784E+01	125.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.22167E+01	150.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.17827E+01	175.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.14772E+01	200.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.12526E+01	225.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.10813E+01	250.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.94675E+00	275.00	0.00	5.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.83893E+00	300.00	0.00	5.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.75089E+00	325.00	0.00	5.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.67786E+00	350.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.61642E+00	375.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.56387E+00	400.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.51854E+00	425.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.47905E+00	450.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.44450E+00	475.00	0.00	5.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.41406E+00	500.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.38708E+00	525.00	0.00	10.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.36300E+00	550.00	0.00	10.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.34141E+00	575.00	0.00	15.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.32196E+00	600.00	0.00	10.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.30533E+00			625.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.28926E+00			650.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.27461E+00			675.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.26120E+00			700.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.24888E+00			725.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.23753E+00			750.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.22705E+00			775.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.21735E+00			800.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.20834E+00			825.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.19996E+00			850.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.19215E+00			875.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.18485E+00			900.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.17802E+00			925.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.17161E+00			950.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.16559E+00			975.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.15994E+00			1000.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.15460E+00			1025.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.14957E+00			1050.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.14481E+00			1075.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.14032E+00			1100.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.13605E+00			1125.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.13201E+00			1149.99	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.12818E+00			1175.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.12453E+00			1200.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.12106E+00			1225.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.11774E+00			1250.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.11459E+00			1275.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.11158E+00			1300.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.10870E+00			1325.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.10594E+00			1350.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.10331E+00			1375.00	0.00	30.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.10079E+00			1400.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.98372E-01			1425.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.96053E-01			1450.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.93827E-01			1475.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.91689E-01			1500.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.89634E-01			1525.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.87658E-01			1550.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.85756E-01			1574.99	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.83923E-01			1600.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.82158E-01			1625.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.80457E-01			1650.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.78815E-01			1675.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.77230E-01			1700.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.75700E-01			1725.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.74222E-01			1750.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.72793E-01			1775.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.71411E-01			1800.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.70074E-01			1824.99	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.68779E-01			1850.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.67525E-01			1875.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.66311E-01			1899.99	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.65134E-01			1924.99	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.63992E-01			1950.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.62885E-01			1975.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.61810E-01			2000.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.60767E-01			2025.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.59754E-01			2050.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.58770E-01			2075.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.57814E-01			2100.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.56884E-01			2125.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.55980E-01			2150.00	0.00	30.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.55100E-01			2175.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.54244E-01			2200.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.53411E-01			2224.99	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.52600E-01			2250.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.51810E-01			2275.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.51040E-01			2300.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.50290E-01			2325.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.49559E-01			2350.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.48845E-01			2375.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.48150E-01			2400.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.47471E-01			2425.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.46809E-01			2449.99	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.46163E-01			2475.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.45532E-01			2500.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.44916E-01			2525.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.44314E-01			2550.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.43726E-01			2575.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.43151E-01			2600.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.42589E-01			2625.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.42040E-01			2650.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.41503E-01			2675.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.40978E-01			2700.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.40464E-01			2725.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.39961E-01			2750.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.39469E-01			2775.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.38987E-01			2800.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.38516E-01			2825.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.38054E-01			2850.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.37602E-01			2875.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.37159E-01			2900.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.36725E-01			2925.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.36299E-01			2950.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.35882E-01			2975.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.35474E-01			3000.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.35073E-01			3025.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.34680E-01			3050.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.34295E-01			3075.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.33917E-01			3100.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.33546E-01			3125.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.33182E-01			3150.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.32825E-01			3174.99	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.32474E-01			3200.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.32130E-01			3225.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.31792E-01			3250.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.31461E-01			3275.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.31135E-01			3300.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.30815E-01			3325.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.30501E-01			3350.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.30192E-01			3375.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.29889E-01			3400.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.29590E-01			3425.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.29297E-01			3450.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.29009E-01			3475.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.28726E-01			3500.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.28448E-01			3525.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.28174E-01			3550.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.27905E-01			3575.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.27640E-01			3600.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.27379E-01			3625.00	0.00	30.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.27123E-01			3650.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.26871E-01			3675.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.26623E-01			3700.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.26378E-01			3725.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.26138E-01			3750.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.25901E-01			3775.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.25668E-01			3800.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.25439E-01			3825.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.25214E-01			3850.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.24991E-01			3875.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.24772E-01			3900.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.24557E-01			3925.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.24344E-01			3950.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.24135E-01			3975.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.23929E-01			4000.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.23726E-01			4025.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.23526E-01			4050.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.23328E-01			4075.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.23134E-01			4100.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.22942E-01			4125.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.22753E-01			4150.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.22567E-01			4175.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.22383E-01			4200.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.22202E-01			4225.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.22024E-01			4250.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.21848E-01			4275.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.21674E-01			4300.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.21503E-01			4325.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.21334E-01			4350.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.21168E-01			4375.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.21003E-01			4400.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.20841E-01			4425.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.20681E-01			4450.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.20523E-01			4475.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.20367E-01			4500.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.20214E-01			4525.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.20062E-01			4550.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.19912E-01			4575.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.19764E-01			4600.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.19618E-01			4625.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.19474E-01			4650.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.19332E-01			4675.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.19191E-01			4700.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.19052E-01			4725.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.18915E-01			4750.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.18780E-01			4775.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.18646E-01			4800.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.18514E-01			4825.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.18384E-01			4850.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.18255E-01			4875.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.18128E-01			4900.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.18002E-01			4924.99	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.17878E-01			4950.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.17755E-01			4975.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.17634E-01			5000.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									

Start date and time 09/23/21 11:41:45

AERSCREEN 16216

7th and Locust Development Operation

7th and Locust Development Operation

----- DATA ENTRY VALIDATION -----

METRIC

ENGLISH

** AREADATA **

Emission Rate:	0.515E-03 g/s	0.409E-02 lb/hr
Area Height:	3.00 meters	9.84 feet
Area Source Length:	64.87 meters	212.83 feet
Area Source Width:	32.44 meters	106.43 feet
Vertical Dimension:	3.00 meters	9.84 feet
Model Mode:	URBAN	
Population:	466776	
Dist to Ambient Air:	1.0 meters	3. feet

** BUILDING DATA **

No Building Downwash Parameters

** TERRAIN DATA **

No Terrain Elevations

Source Base Elevation: 0.0 meters 0.0 feet

Probe distance: 5000. meters 16404. feet

No flagpole receptors

No discrete receptors used

** FUMIGATION DATA **

No fumigation requested

** METEOROLOGY DATA **

Min/Max Temperature: 250.0 / 310.0 K -9.7 / 98.3 Deg F

Minimum Wind Speed: 0.5 m/s

Anemometer Height: 10.000 meters

Dominant Surface Profile: Urban

Dominant Climate Type: Average Moisture

Surface friction velocity (u*): not adjusted

DEBUG OPTION ON

AERSCREEN output file:

2021.09.23_7thandLocust_Operation.out

*** AERSCREEN Run is Ready to Begin

No terrain used, AERMAP will not be run

SURFACE CHARACTERISTICS & MAKEMET

Obtaining surface characteristics...

Using AERMET seasonal surface characteristics for Urban with Average Moisture

Season	Albedo	Bo	zo
Winter	0.35	1.50	1.000
Spring	0.14	1.00	1.000
Summer	0.16	2.00	1.000
Autumn	0.18	2.00	1.000

Creating met files aerscreen_01_01.sfc & aerscreen_01_01.pfl

Creating met files aerscreen_02_01.sfc & aerscreen_02_01.pfl

Creating met files aerscreen_03_01.sfc & aerscreen_03_01.pfl

Creating met files aerscreen_04_01.sfc & aerscreen_04_01.pfl

Buildings and/or terrain present or rectangular area source, skipping probe

FLOWSECTOR started 09/23/21 11:43:17

Running AERMOD

Processing Winter

Processing surface roughness sector 1

Processing wind flow sector 1

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 0

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 2

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 5

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 3

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 10

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 4

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 15

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 5

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 20

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 6

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 25

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 7

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Winter sector 30

***** WARNING MESSAGES *****

*** NONE ***

Running AERMOD

Processing Spring

Processing surface roughness sector 1

Processing wind flow sector 1

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 0

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 2

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 5

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 3

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 10

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 4

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 15

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 5

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 20

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 6

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 25

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 7

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Spring sector 30

***** WARNING MESSAGES *****

*** NONE ***

Running AERMOD

Processing Summer

Processing surface roughness sector 1

Processing wind flow sector 1

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 0

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 2

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 5

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 3

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 10

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 4

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 15

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 5

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 20

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 6

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 25

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 7

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Summer sector 30

***** WARNING MESSAGES *****

*** NONE ***

Running AERMOD

Processing Autumn

Processing surface roughness sector 1

Processing wind flow sector 1

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 0

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 2

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 5

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 3

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 10

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 4

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 15

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 5

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 20

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 6

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 25

***** WARNING MESSAGES *****

*** NONE ***

Processing wind flow sector 7

AERMOD Finishes Successfully for FLOWSECTOR stage 2 Autumn sector 30

***** WARNING MESSAGES *****

*** NONE ***

FLOWSECTOR ended 09/23/21 11:43:23

REFINE started 09/23/21 11:43:23

AERMOD Finishes Successfully for REFINE stage 3 Winter sector 0

***** WARNING MESSAGES *****

*** NONE ***

REFINE ended 09/23/21 11:43:24

AERSCREEN Finished Successfully

With no errors or warnings

Check log file for details

Ending date and time 09/23/21 11:43:25

Concentration	Distance	Elevation	Diag	Season/Month	Zo sector	Date	H0	U*	W*	DT/DZ	ZICNV
ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF WS	HT	REF TA	HT		
0.30364E+01	1.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.38432E+01	25.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
* 0.40245E+01	33.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.23075E+01	50.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.12455E+01	75.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.81589E+00	100.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.59193E+00	125.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.45642E+00	150.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.36733E+00	175.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.30456E+00	200.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.25835E+00	225.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.22309E+00	250.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.19536E+00	275.00	0.00	5.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.17315E+00	300.00	0.00	5.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.15500E+00	325.00	0.00	5.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.13994E+00	350.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.12727E+00	375.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.11643E+00	400.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.10708E+00	425.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.98928E-01	450.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.91799E-01	475.00	0.00	5.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.85517E-01	500.00	0.00	0.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.79947E-01	525.00	0.00	10.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.74978E-01	550.00	0.00	10.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.70521E-01	575.00	0.00	15.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0					
0.66505E-01	600.00	0.00	10.0	Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999. 21. 6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.63071E-01			625.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.59755E-01			650.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.56729E-01			675.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.53959E-01			700.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.51415E-01			725.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.49072E-01			750.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.46908E-01			775.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.44904E-01			800.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.43044E-01			825.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.41313E-01			850.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.39699E-01			875.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.38192E-01			900.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.36781E-01			925.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.35457E-01			950.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.34215E-01			975.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.33046E-01			1000.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.31944E-01			1025.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.30904E-01			1050.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.29922E-01			1075.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.28993E-01			1100.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.28112E-01			1125.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.27278E-01			1149.99	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.26485E-01			1175.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.25732E-01			1200.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.25014E-01			1225.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.24330E-01			1249.99	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.23678E-01			1275.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.23055E-01			1300.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.22461E-01			1325.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.21892E-01			1350.00	0.00	30.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.21348E-01			1375.00	0.00	30.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.20827E-01			1400.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.20327E-01			1425.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.19848E-01			1450.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.19388E-01			1475.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.18947E-01			1500.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.18522E-01			1525.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.18114E-01			1550.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.17721E-01			1574.99	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.17342E-01			1600.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.16978E-01			1625.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.16626E-01			1650.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.16287E-01			1675.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.15959E-01			1700.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.15643E-01			1725.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.15338E-01			1750.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.15042E-01			1775.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.14757E-01			1800.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.14481E-01			1824.99	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.14213E-01			1850.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.13954E-01			1875.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.13703E-01			1900.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.13460E-01			1925.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.13224E-01			1950.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.12995E-01			1975.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.12773E-01			2000.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.12558E-01			2025.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.12348E-01			2050.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.12145E-01			2075.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.11947E-01			2100.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.11755E-01			2125.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.11568E-01			2150.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.11387E-01			2175.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.11210E-01			2200.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.11038E-01			2225.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.10870E-01			2250.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.10707E-01			2275.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.10548E-01			2300.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.10393E-01			2325.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.10242E-01			2350.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.10094E-01			2375.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.99504E-02			2400.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.98102E-02			2425.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.96734E-02			2449.99	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.95399E-02			2475.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.94095E-02			2500.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.92821E-02			2525.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.91578E-02			2550.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.90362E-02			2575.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.89175E-02			2600.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.88014E-02			2625.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.86879E-02			2650.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.85770E-02			2675.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.84684E-02			2700.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.83622E-02			2725.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.82583E-02			2750.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.81566E-02			2775.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.80571E-02			2800.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.79596E-02			2825.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.78642E-02			2850.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.77708E-02			2875.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.76792E-02			2900.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.75895E-02			2925.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.75016E-02			2950.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.74155E-02			2975.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.73310E-02			3000.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.72482E-02			3025.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.71670E-02			3050.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.70874E-02			3074.99	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.70092E-02			3100.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.69326E-02			3125.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.68574E-02			3150.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.67836E-02			3174.99	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.67112E-02			3200.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.66401E-02			3225.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.65703E-02			3250.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.65017E-02			3275.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.64344E-02			3300.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.63683E-02			3325.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.63033E-02			3350.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.62395E-02			3375.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.61768E-02			3400.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.61152E-02			3425.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.60546E-02			3450.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.59951E-02			3475.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.59366E-02			3500.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.58791E-02			3525.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.58225E-02			3550.00	0.00	25.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.57668E-02			3575.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.57121E-02			3600.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.56582E-02			3625.00	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.56053E-02			3650.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.55532E-02			3675.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.55019E-02			3700.00	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.54514E-02			3724.99	0.00	20.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.54018E-02			3750.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.53529E-02			3775.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.53047E-02			3800.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.52574E-02			3825.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.52107E-02			3849.99	0.00	15.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.51648E-02			3875.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.51195E-02			3900.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.50749E-02			3925.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.50311E-02			3950.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.49878E-02			3975.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.49452E-02			4000.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.49032E-02			4025.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.48619E-02			4050.00	0.00	30.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.48211E-02			4075.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.47809E-02			4100.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.47413E-02			4125.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.47023E-02			4150.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.46638E-02			4175.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.46259E-02			4200.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.45885E-02			4225.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.45516E-02			4250.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.45152E-02			4275.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.44793E-02			4300.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.44440E-02			4325.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.44091E-02			4350.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.43746E-02			4375.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.43407E-02			4400.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.43071E-02			4425.00	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.42741E-02			4449.99	0.00	10.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.42414E-02			4475.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.42092E-02			4500.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.41775E-02			4525.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.41461E-02			4550.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.41151E-02			4575.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.40845E-02			4600.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.40544E-02			4625.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0									
0.40246E-02			4650.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21. 6.0

1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.39952E-02			4675.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.39661E-02			4700.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.39375E-02			4725.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.39092E-02			4750.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.38812E-02			4775.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.38535E-02			4800.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.38263E-02			4825.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.37993E-02			4850.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.37727E-02			4875.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.37464E-02			4900.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.37204E-02			4925.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.36947E-02			4950.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.36693E-02			4975.00	0.00	0.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										
0.36443E-02			5000.00	0.00	5.0		Winter	0-360	10011001	-1.30	0.043	-9.000	0.020	-999.	21.	6.0
1.000	1.50	0.35	0.50	10.0	310.0	2.0										



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Matthew F. Hagemann, P.G.,* C.Hg**

**Geologic and Hydrogeologic
Characterization, Investigation
and Remediation Strategies
Expert Testimony
Industrial Stormwater Compliance
CEQA Review**

Professional Certifications:

*Professional Geologist

**Certified Hydrogeologist

Education:

M.S. Degree, Geology, California State University Los Angeles, Los Angeles, CA, 1984.

B.A. Degree, Geology, Humboldt State University, Arcata, CA, 1982.

Professional Certifications:

California Professional Geologist

California Certified Hydrogeologist

Professional Experience:

30 years of experience in environmental policy, contaminant assessment and remediation, stormwater compliance, and CEQA review. Spent nine years with the U.S. EPA in the Resource Conservation Recovery Act (RCRA) and

Superfund programs and served as EPA's Senior Science Policy Advisor in the Western Regional Office where he identified emerging threats to groundwater. While with EPA, served as a Senior Hydrogeologist in the oversight of the assessment of seven major military facilities undergoing base closure. Led numerous enforcement actions under provisions of the Resource Conservation and Recovery Act (RCRA) and directed efforts to improve hydrogeologic characterization and water quality monitoring. For the past 15 years, as a founding partner with SWAPE, developed extensive client relationships and has managed complex projects that include consultations as an expert witness and a regulatory specialist, and managing projects ranging from industrial stormwater compliance to CEQA review of impacts from hazardous waste, air quality and greenhouse gas emissions.

Positions held include:

Government:

- Senior Science Policy Advisor and Hydrogeologist, U.S. Environmental Protection Agency (1989–1998);
- Hydrogeologist, National Park Service, Water Resources Division (1998 – 2000);
- Geologist, U.S. Forest Service (1986 – 1998)

Educational:

- Geology Instructor, Golden West College, 2010 – 2104, 2017;
- Adjunct Faculty Member, San Francisco State University, Department of Geosciences (1993 – 1998);
- Instructor, College of Marin, Department of Science (1990 – 1995);

Private Sector:

- Founding Partner, Soil/Water/Air Protection Enterprise (SWAPE) (2003 – present);
- Senior Environmental Analyst, Komex H2O Science, Inc. (2000 -- 2003);
- Executive Director, Orange Coast Watch (2001 – 2004);
- Geologist, Dames & Moore (1984 – 1986).

Senior Regulatory and Litigation Support Analyst:

With SWAPE, responsibilities have included:

- Lead analyst and testifying expert, for both plaintiffs and defendants, in the review of over 300 environmental impact reports and negative declarations since 2003 under CEQA that identify significant issues with regard to

hazardous waste, water resources, water quality, air quality, greenhouse gas emissions, and geologic hazards.

- Recommending additional mitigation measures to lead agencies at the local and county level to include additional characterization of health risks and implementation of protective measures to reduce exposure to hazards from toxins.
- Stormwater analysis, sampling and best management practice evaluation, for both government agencies and corporate clients, at more than 150 industrial facilities.
- Serving as expert witness for both plaintiffs and defendants in cases including contamination of groundwater, CERCLA compliance in assessment and remediation, and industrial stormwater contamination.
- Technical assistance and litigation support for vapor intrusion concerns, for both government agencies and corporate clients.
- Lead analyst and testifying expert in the review of environmental issues in license applications for large solar power plants before the California Energy Commission.
- Manager of a project to evaluate numerous formerly used military sites in the western U.S.
- Manager of a comprehensive evaluation of potential sources of perchlorate contamination in Southern California drinking water wells.
- Manager and designated expert for litigation support under provisions of Proposition 65 in the review of releases of gasoline to sources drinking water at major refineries and hundreds of gas stations throughout California.

With Komex H₂O Science Inc., duties included the following:

- Senior author of a report on the extent of perchlorate contamination that was used in testimony by the former U.S. EPA Administrator and General Counsel.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of MTBE use, research, and regulation.
- Senior researcher in the development of a comprehensive, electronically interactive chronology of perchlorate use, research, and regulation.
- Senior researcher in a study that estimates nationwide costs for MTBE remediation and drinking water treatment, results of which were published in newspapers nationwide and in testimony against provisions of an energy bill that would limit liability for oil companies.
- Research to support litigation to restore drinking water supplies that have been contaminated by MTBE in California and New York.
- Lead author for a multi-volume remedial investigation report for an

operating school in Los Angeles that met strict regulatory requirements and rigorous deadlines.

- Development of strategic approaches for cleanup of contaminated sites in consultation with clients and regulators.

Executive Director:

As Executive Director with Orange Coast Watch, an Orange County-based not-for-profit water-quality organization, led efforts to restore water quality at Orange County beaches from multiple sources of contamination including urban runoff and the discharge of wastewater. In reporting to a Board of Directors that included representatives from leading Orange County universities and businesses, prepared issue papers in the areas of treatment and disinfection of wastewater and control of the discharge of grease to sewer systems. Actively participated in the development of countywide water quality permits for the control of urban runoff and permits for the discharge of wastewater. Worked with other nonprofits to protect and restore water quality, including Surfrider, Natural Resources Defense Council and Orange County CoastKeeper as well as with business institutions including the Orange County Business Council.

Hydrogeology:

As a Senior Hydrogeologist with the U.S. Environmental Protection Agency, led investigations to characterize and cleanup closing military bases, including Mare Island Naval Shipyard, Hunters Point Naval Shipyard, Treasure Island Naval Station, Alameda Naval Station, Moffett Field, Mather Army Airfield, and Sacramento Army Depot. Specific activities included:

- Leading efforts to model groundwater flow and contaminant transport, ensured adequacy of monitoring networks, and assessed cleanup alternatives for contaminated sediment, soil, and groundwater.
- Initiating a regional program for evaluation of groundwater sampling practices and laboratory analysis at military bases.
- Identifying emerging issues, wrote technical guidance, and assisted in policy and regulation development through work on four national U.S. EPA workgroups, including the Superfund Groundwater Technical Forum and the Federal Facilities Forum.

At the request of the State of Hawaii, developed a methodology to determine the vulnerability of groundwater to contamination on the islands of Maui and Oahu. Used

analytical models and a GIS to show zones of vulnerability, and the results were adopted and published by the State of Hawaii and County of Maui.

As a hydrogeologist with the EPA Groundwater Protection Section, worked with provisions of the Safe Drinking Water Act and NEPA to prevent drinking water contamination. Specific activities included the following:

- Received an EPA Bronze Medal for contribution to the development of national guidance for the protection of drinking water.
- Managed the Sole Source Aquifer Program and protected the drinking water of two communities through designation under the Safe Drinking Water Act. Prepared geologic reports, conducted hearings, and responded to public comments from residents who were very concerned about the impact of designation.
- Reviewed a number of Environmental Impact Statements for planned major developments, including large hazardous and solid waste disposal facilities, mine reclamation, and water transfer.

Served as a hydrogeologist with the RCRA Hazardous Waste program. Duties included:

- Supervised the hydrogeologic investigation of hazardous waste sites to determine compliance with Subtitle C requirements.
 - Reviewed and wrote "part B" permits for the disposal of hazardous waste.
- Conducted RCRA Corrective Action investigations of waste sites and led inspections that formed the basis for significant enforcement actions that were developed in close coordination with U.S. EPA legal counsel.
- Wrote contract specifications and supervised contractor's investigations of waste sites.

With the National Park Service, directed service-wide investigations of contaminant sources to prevent degradation of water quality, including the following:

- Applied pertinent laws and regulations including CERCLA, RCRA, NEPA, NRDA, and the Clean Water Act to control military, mining, and landfill contaminants.
- Conducted watershed-scale investigations of contaminants at parks, including Yellowstone and Olympic National Park.
- Identified high-levels of perchlorate in soil adjacent to a national park in New Mexico and advised park superintendent on appropriate response actions under CERCLA.
- Served as a Park Service representative on the Interagency Perchlorate Steering Committee, a national workgroup.

- Developed a program to conduct environmental compliance audits of all National Parks while serving on a national workgroup.
- Co-authored two papers on the potential for water contamination from the operation of personal watercraft and snowmobiles, these papers serving as the basis for the development of nation-wide policy on the use of these vehicles in National Parks.
- Contributed to the Federal Multi-Agency Source Water Agreement under the Clean Water Action Plan.

Policy:

Served as senior management as the Senior Science Policy Advisor with the U.S. Environmental Protection Agency, Region 9. Activities included the following:

- Advising the Regional Administrator and senior management on emerging issues such as the potential for the gasoline additive MTBE and ammonium perchlorate to contaminate drinking water supplies.
- Shaping EPA's national response to these threats by serving on workgroups and by contributing to guidance, including the Office of Research and Development publication, Oxygenates in Water: Critical Information and Research Needs.
- Improving the technical training of EPA's scientific and engineering staff.
- Earning an EPA Bronze Medal for representing the region's 300 scientists and engineers in negotiations with the Administrator and senior management to better integrate scientific principles into the policy-making process.
- Establishing national protocol for the peer review of scientific documents.

Geology:

With the U.S. Forest Service, led investigations to determine hillslope stability of areas proposed for timber harvest in the central Oregon Coast Range. Specific activities included:

- Mapping geology in the field, and used aerial photographic interpretation and mathematical models to determine slope stability.
- Coordinating research with community stakeholders who were concerned with natural resource protection.
- Characterizing the geology of an aquifer that serves as the sole source of drinking water for the city of Medford, Oregon.

As a consultant with Dames and Moore, led geologic investigations of two contaminated sites (later listed on the Superfund NPL) in the Portland, Oregon, area and a large

hazardous waste site in eastern Oregon. Duties included the following:

- Supervising year-long effort for soil and groundwater sampling.
- Conducting aquifer tests.
 - Investigating active faults beneath sites proposed for hazardous waste disposal.

Teaching:

From 1990 to 1998, taught at least one course per semester at the community college and university levels:

- At San Francisco State University, held an adjunct faculty position and taught courses in environmental geology, oceanography (lab and lecture), hydrogeology, and groundwater contamination.
- Served as a committee member for graduate and undergraduate students.
- Taught courses in environmental geology and oceanography at the College of Marin.
- Part time geology instructor at Golden West College in Huntington Beach, California from 2010 to 2014 and in 2017.

Invited Testimony, Reports, Papers and Presentations:

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Presentation to the Public Environmental Law Conference, Eugene, Oregon.

Hagemann, M.F., 2008. Disclosure of Hazardous Waste Issues under CEQA. Invited presentation to U.S. EPA Region 9, San Francisco, California.

Hagemann, M.F., 2005. Use of Electronic Databases in Environmental Regulation, Policy Making and Public Participation. Brownfields 2005, Denver, Colorado.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Nevada and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Las Vegas, NV (served on conference organizing committee).

Hagemann, M.F., 2004. Invited testimony to a California Senate committee hearing on air toxins at schools in Southern California, Los Angeles.

Brown, A., Farrow, J., Gray, A. and **Hagemann, M.**, 2004. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells.

Presentation to the Ground Water and Environmental Law Conference, National

Groundwater Association.

Hagemann, M.F., 2004. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in Arizona and the Southwestern U.S. Presentation to a meeting of the American Groundwater Trust, Phoenix, AZ (served on conference organizing committee).

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River and Impacts to Drinking Water in the Southwestern U.S. Invited presentation to a special committee meeting of the National Academy of Sciences, Irvine, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a tribal EPA meeting, Pechanga, CA.

Hagemann, M.F., 2003. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal representatives, Parker, AZ.

Hagemann, M.F., 2003. Impact of Perchlorate on the Colorado River and Associated Drinking Water Supplies. Invited presentation to the Inter-Tribal Meeting, Torres Martinez Tribe.

Hagemann, M.F., 2003. The Emergence of Perchlorate as a Widespread Drinking Water Contaminant. Invited presentation to the U.S. EPA Region 9.

Hagemann, M.F., 2003. A Deductive Approach to the Assessment of Perchlorate Contamination. Invited presentation to the California Assembly Natural Resources Committee.

Hagemann, M.F., 2003. Perchlorate: A Cold War Legacy in Drinking Water. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. From Tank to Tap: A Chronology of MTBE in Groundwater. Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. A Chronology of MTBE in Groundwater and an Estimate of Costs to Address Impacts to Groundwater. Presentation to the annual meeting of the Society of Environmental Journalists.

Hagemann, M.F., 2002. An Estimate of the Cost to Address MTBE Contamination in

Groundwater(and Who Will Pay). Presentation to a meeting of the National Groundwater Association.

Hagemann, M.F., 2002. An Estimate of Costs to Address MTBE Releases from Underground Storage Tanks and the Resulting Impact to Drinking Water Wells. Presentation to a meeting of the U.S. EPA and State Underground Storage Tank Program managers.

Hagemann, M.F., 2001. From Tank to Tap: A Chronology of MTBE in Groundwater. Unpublished report.

Hagemann, M.F., 2001. Estimated Cleanup Cost for MTBE in Groundwater Used as Drinking Water. Unpublished report.

Hagemann, M.F., 2001. Estimated Costs to Address MTBE Releases from Leaking Underground Storage Tanks. Unpublished report.

Hagemann, M.F., and VanMouwerik, M., 1999. Potential Water Concerns Related to Snowmobile Usage. Water Resources Division, National Park Service, Technical Report.

VanMouwerik, M. and **Hagemann, M.F.** 1999, Water Quality Concerns Related to Personal Watercraft Usage. Water Resources Division, National Park Service, Technical Report.

Hagemann, M.F., 1999, Is Dilution the Solution to Pollution in National Parks? The George Wright Society Biannual Meeting, Asheville, North Carolina.

Hagemann, M.F., 1997, The Potential for MTBE to Contaminate Groundwater. U.S. EPA Superfund Groundwater Technical Forum Annual Meeting, Las Vegas, Nevada.

Hagemann, M.F., and Gill, M., 1996, Impediments to Intrinsic Remediation, Moffett Field Naval Air Station, Conference on Intrinsic Remediation of Chlorinated Hydrocarbons, Salt Lake City.

Hagemann, M.F., Fukunaga, G.L., 1996, The Vulnerability of Groundwater to Anthropogenic Contaminants on the Island of Maui, Hawaii. Hawaii Water Works Association Annual Meeting, Maui, October 1996.

Hagemann, M. F., Fukunaga, G. L., 1996, Ranking Groundwater Vulnerability in Central Oahu, Hawaii. Proceedings, Geographic Information Systems in Environmental Resources Management, Air and Waste Management Association Publication VIP-61.

Hagemann, M.F., 1994. Groundwater Characterization and Cleanup at Closing Military Bases in California. Proceedings, California Groundwater Resources Association Meeting.

Hagemann, M.F. and Sabol, M.A., 1993. Role of the U.S. EPA in the High Plains States Groundwater Recharge Demonstration Program. Proceedings, Sixth Biennial Symposium on the Artificial Recharge of Groundwater.

Hagemann, M.F., 1993. U.S. EPA Policy on the Technical Impracticability of the Cleanup of DNAPL-contaminated Groundwater. California Groundwater Resources Association Meeting.

Hagemann, M.F., 1992. Dense Nonaqueous Phase Liquid Contamination of Groundwater: An Ounce of Prevention... Proceedings, Association of Engineering Geologists Annual Meeting, v. 35.

Other Experience:

Selected as subject matter expert for the California Professional Geologist licensing examinations, 2009-2011.



Technical Consultation, Data Analysis and
Litigation Support for the Environment

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Paul Rosenfeld, Ph.D.

Chemical Fate and Transport & Air Dispersion Modeling

Principal Environmental Chemist

Risk Assessment And Remediation Specialist

Education

Ph.D. Soil Chemistry, University of Washington, 1999. Dissertation on VOC filtration.

M.S. Environmental Science, U.C. Berkeley, 1995. Thesis on organic waste economics.

B.A. Environmental Studies, U.C. Santa Barbara, 1991. Thesis on wastewater treatment.

Professional Experience

Dr. Rosenfeld is the environmental chemist at Soil Water Air Protection Enterprise (SWAPE). His focus is the fate and transport of environmental contaminants, risk assessment, and ecological restoration. His project experience ranges from monitoring and modeling of pollution sources as they relate to human and ecological health. Dr. Rosenfeld has investigated and designed remediation programs and risk assessments for contaminated sites containing, petroleum, MtBE and fuel oxygenates, chlorinated solvents, pesticides, radioactive waste, PCBs, PAHs, dioxins, furans, volatile organics, semi-volatile organics, perchlorate, heavy metals, asbestos, PFOA, unusual polymers, and odor. Significant projects performed by Dr. Rosenfeld include the following:

Litigation Support

Client: Nexsen Pruet, LLC (Charleston, South Carolina)

Serving as expert in chlorine exposure in railroad tank car accident where approximately 120,000 pounds of chlorine were released.

Client: Buzbee Law Firm (Houston, Texas)

Serving as expert in catalyst release and refinery emissions cases against BP Texas City. One case settled regarding worker exposure, but ongoing litigation remains involving ~21,500 plaintiffs who have health claims and are seeking remediation from chemicals released from BP facility.

Client: Girardi Keese (Los Angeles, California)

Serving as expert investigating hydrocarbon exposure and property damage for ~600 individuals and ~280 properties in Carson, California, where homes were constructed above a large tank farm formerly owned by Shell.

Client: Brent Coon Law Firm (Cleveland, Ohio)

Served as expert calculating an environmental exposure to benzene, PAHs, and VOCs from a Chevron Refinery in Hooven Ohio. Ran AERMOD to calculate cumulative dose.

Client: Girardi Keese (Los Angeles, California)

Served as expert testifying on hydrocarbon exposure to a woman who worked on a fuel barge operated by Chevron. Demonstrated that the plaintiff was exposed to excessive amounts of benzene.

Client: Lundy Davis (Lake Charles, Louisiana)

Served as consulting expert on an oil field case representing the lease holder of a contaminated oil field. Conducted field work evaluating oil field contamination in Sulfur, Louisiana. Property is owned by Conoco Phillips, but leased by Yellow Rock, a small oil firm.

Client: Cox Cox Filo (Lake Charles, Louisiana)

Serving as testifying expert on multimillion gallon oil spill in Lake Charles which occurred on June 19, 2006, resulting in hydrocarbon vapor exposure to hundreds of workers and residents. Prepared air model and calculated dose. Demonstrated that petroleum odor alone can result in significant health harms.

Client: Cotchett Pitre & McCarthy (San Francisco, California)

Served as testifying expert representing homeowners who unknowingly purchased homes built on an old oil field in Santa Maria, California. Properties have high concentrations of petroleum hydrocarbons in subsurface soils resulting in diminished property value.

Client: Baron & Budd (Dallas, Texas) & Weitz & Luxenberg (New York, NY)

Serving as consulting expert in MTBE Federal Multi District Litigation (MDL) in New York. Consolidated ground water data, created maps for test cases, constructed damage model, evaluated taste and odor threshold levels.

Client: Law Offices Of Anthony Liberatore P.C. (Los Angeles, California)

Served as testifying expert representing individuals who rented homes on the Inglewood Oil Field in California. Plaintiffs were exposed to hydrocarbon contaminated water and air, and experienced health harms associated with the petroleum exposure.

Client: Baron & Budd P.C. Dallas Texas and Korein Tillery (Madison, County)

Illinois, Private Wells Analysis: Coordinated data acquisition and GIS analysis evaluating private well proximity to leaking underground storage tanks to support litigation noting that private well owners should be compensated for MTBE testing.

Client: Orange County District Attorney (Orange County, California)

Coordinated a review of 143 ARCO gas stations in Orange County to assist the District Attorney's prosecution of CCR Title 23 and California Health and Safety Code violators.

Client: Environmental Litigation Group (Birmingham, Alabama)

Serving as testifying expert in a health effects case against ABC Coke/Drummond Co for polluting a community with PAHs, benzene, particulate matter, heavy metals, and coke oven emissions. Created air dispersions models and conducted attic dust sampling, exposure modeling, and risk assessment for plaintiffs.

Client: Masry Vitatoe (Westlake Village, CA), Engstrom Lipscomb Lack (Los Angeles, CA) & Baron & Budd (Dallas Texas).

Served as consulting expert in Proposition 65 lawsuit filed against the major oil companies for benzene and toluene releases from gas stations and refineries which contaminated groundwater. Settlement included over \$110 million dollars in injunctive relief.

Client: Tommy Franks Law Firm (Austin, Texas)

Served as expert evaluating groundwater contamination which resulted from the hazardous waste injection program and negligent actions of Morton Thiokol and Rohm Hass. Interpreted drinking water contamination and community exposure.

Client: Baron & Budd (Dallas Texas) and Sher Leff (San Francisco, California)

Serving as consulting expert for several California cities which have filed defective product cases against Dow Chemical and Shell for 1,2,3-trichloropropane groundwater contamination. Generated maps showing capture zones of impacted wells for various municipalities.

Client: Baron & Budd (Dallas Texas) and Korein Tillery (Madison County, Illinois)

Serving as consulting expert for a Class Action defective product Atrazine claim filed in Madison County, Illinois against Syngenta and five other manufactures. The plaintiff class representative is Holiday Shores Water System which is evaluating health issues associated with atrazine, costing out treatment for filtration of public drinking water supplies.

Client: Weitz & Luxenberg (New York, NY)

Serving as expert on Property Damage and Nuisance claims resulting from emissions from the Countywide Landfill in Ohio. The landfill had an exothermic reaction or fire resulting from aluminum dross dumping, and the EPA fined the landfill \$10,000,000 dollars.

Client: Baron & Budd (Dallas Texas)

Serving as consulting expert for a groundwater contamination case in Pensacola Florida where fluorinated compounds contaminated wells operated by Escambia County.

Client: Environmental Litigation Group (Birmingham, Alabama)

Serving as an expert on property damage, medical monitoring and toxic tort claims that have been filed on behalf of over 12,000 plaintiffs who were exposed to PCBs and dioxins/furans resulting from emissions from Monsanto and Cerro Copper's operations in East Sauget, Illinois.

Client: Environmental Litigation Group (Birmingham, Alabama)

Served as an expert on groundwater case when Exxon Mobil and Helena Chemical released ethylene dichloride into groundwater resulting in a large plume. Prepared report on the appropriate treatment technology and cost, and flaws with the proposed on site remedy.

Client: Environmental Litigation Group (Birmingham, Alabama)

Serving as an expert on air emissions released when a Bartlo Packaging Incorporated facility in West Helena Arkansas exploded resulting in community exposure to pesticides and smoke from combustion of pesticides.

Client: Omara & Padilla (San Diego, California)

Served as testifying expert on nuisance case against Nutro Dogfood Company that constructed a large dog food processing facility in the middle of a residential community in Victorville California with no odor control devices. The facility has undergone significant modifications including installation of a regenerative thermal oxidizer.

Client: Environmental Litigation Group (Birmingham, Alabama)

Serving as an expert on property damage and medical monitoring claims that have been filed against International Paper resulting from chemical emissions from facilities located in Bastrop Louisiana, Prattville, Alabama, and Georgetown South Carolina.

Client: Estep and Shafer (West Virginia)

Served as expert running various air models to calculate acid emissions dose to residents resulting from emissions from a coal fired power plant in West Virginia.

Client: Watts Law Firm (Austin, Texas), Woodfill Pressler (Houston, Texas), Woska & Ass. (Oklahoma)

Served as testifying expert on community and worker exposure to CCA, creosote, PAHs, and dioxins/furans from a BNSF and Kopper's Facility in Somerville, Texas. Conducted field sampling, risk assessment, dose assessment and air modelling to quantify exposure to workers and community members.

Client: Environmental Litigation Group (Birmingham, Alabama)

Served as expert regarding community exposure to CCA, creosote, PAHs, and dioxins/furans from a Louisiana Pacific wood treatment facility in Florala, Alabama. Conducted blood sampling and environmental sampling to determine environmental exposure to dioxins/furans and PAHs.

Client: Sanders Law (Colorado Springs, Co) and Vamvoras & Schwartzberg (Lake Charles, Louisiana)

Serving as expert calculating chemical exposure to over 500 workers from large ethylene dichloride spill in Lake Charles, Louisiana, at the Conoco Phillips Refinery.

Client: Baron & Budd P.C. (Dallas, Texas)

Served as consulting expert in a defective product lawsuit against Dow Agrosience focusing on Clopyralid, a recalcitrant herbicide that damaged numerous compost facilities across the United States.

Client: Sullivan Papain Block McGrath & Cannavo (NY, NY) and The Cochran Firm (Dothan, MS)

Served as expert regarding community exposure to metals, PAHs PCBs, and dioxins/furans from the burning of Ford Paint Sludge and municipal solid waste in Ringwood, New Jersey.

Client: Rose, Klein Marias (Los Angeles, CA)

Serving as expert in Proposition 65 cases, each one citing an individual facility in the Port of Oakland. Prepared air dispersion and risk models to demonstrate that each facility emits diesel particulate matter that results in risks exceeding 1/100,000, hence violating the Proposition 65 Statute.

Client: Rose, Klein Marias (Los Angeles, CA)

Serving as expert in 55 Proposition 65 cases, each one citing an individual facility in the Port of Los Angeles and Port of Long Beach as the defendant. Prepared air dispersion and risk models to demonstrate that each facility emits diesel particulate matter that results in risks exceeding 1/100,000, hence violating the Proposition 65 Statute.

Client: Graham & Associates (Calabasas, CA)

Served as expert in a case in which General Motors is the plaintiff and BP Arco is the defendant. Conducted air models to demonstrate that sulfur emissions from the BP Arco facility formed sulfuric acid, destroying paint on over 350 automobiles.

Client: Rose, Klien Marias (Los Angeles, CA) and Environmental Law Foundation (San Francisco, CA)

Served as expert in a Proposition 65 case against potato chip manufacturers. Conducted an analysis of several brands of potato chips for acrylamide concentration and found that all samples exceeded Proposition 65 No Significant Risk Levels.

Client: Gonzales & Robinson (Westlake Village, CA)

Served as testifying expert in a toxic tort case against Chevron (Ortho) for allowing a community to be contaminated with lead arsenate pesticide. Created air dispersion models, soil vadose zone transport models, and evaluated bioaccumulation of lead arsenate in food.

Client: Environment Now (Santa Monica, CA)

Served as expert for Environment Now to convince the State of California to file a nuisance claim against the automobile manufactures to recover MediCal damages from expenditures on asthma-related health care costs.

Client: Trutanich Michell (Long Beach, California)

Served as expert representing San Pedro Boat Works in the Port of Los Angeles. Prepared air dispersion, particulate air dispersion, and storm water discharge models to demonstrate that Kaiser Bulk Loading is responsible for copper concentrate accumulating in the bay sediment.

Client: Azurix of North America (Fort Myers, Florida)

Provided expert opinions, reports and research pertaining to a proposed County Ordinance requiring biosolids applicators to measure VOC and odor concentrations at application sites' boundaries.

Client: MCP Polyurethane (Pittsburg, Kansas)

Provided expert opinions and reports regarding metal-laden landfill runoff that damaged a running track by causing the reversion of the polyurethane due to its catalytic properties.

Risk Assessment And Modeling

Client: ABT-Haskell (San Bernardino, California)

Prepared air dispersion model for a proposed state-of-the-art enclosed compost facility. Developed odor detection limits to predict 1, 8, and 24-hour off-site concentrations of sulfur, ammonia, and amine as well as prepared a traffic analysis.

Client: Jefferson PRP Group (Los Angeles, California)

Evaluated exposure pathways for chlorinated solvents and hexavalent chromium for human health risk assessment of Los Angeles Academy (formerly Jefferson New Middle School) operated by Los Angeles Unified School District.

Client: Covanta (Susanville California)

Prepared human health risk assessment for Covanta Energy focusing on agricultural worker exposure to caustic fertilizer.

Client: CIWMB (Sacramento California)

Used dispersion models to estimate traveling distance and VOC concentrations downwind from a composting facility for the California Integrated Waste Management Board.

Client: Carboquimeca (Bogotá, Columbia)

Evaluated exposure pathways for human health risk assessment for a confidential client focusing on significant concentrations of arsenic and chlorinated solvents contaminating groundwater used for drinking water.

Client: Navy Base Realignment and Closure Team (Treasure Island, California)

Used Johnson-Ettinger model to estimate indoor air PCB concentrations and compared estimated values with empirical data collected in homes. Negotiated action levels with DTSC.

Client: San Diego State University (San Diego California)

Measured CO₂ flux from soils amended with different quantities of biosolids compost at Camp Pendleton to determine CO₂ credit values for coastal sage under fertilized and non-fertilized conditions.

Client: Navy Base Realignment and Closure Team (MCAS Tustin, California)

Evaluated cumulative risk of a multiple pathway scenario with a child resident and a construction worker's exposure to air and soil via particulate and vapor inhalation, incidental soil ingestion, and dermal contact with soil.

Client: MCAS Miramar (San Diego, California)

Evaluated exposure pathways of metals in soil, comparing site data to background data. Risk assessment incorporated multiple pathway scenarios assuming child resident and construction worker exposure to particulate and vapor inhalation, soil ingestion, and dermal soil contact.

Client: Naval Weapons Station (Seal Beach, California)

Used a multiple pathway model to generate dust emission factors from automobiles driving on dirt roads. Calculated bioaccumulation of metals, PCBs, dioxin congeners and pesticides to estimate human and ecological risk.

Client: King County, Douglas County (Washington State)

Measured PM₁₀ and PM_{2.5} emissions from windblown soil treated with biosolids and a polyacrylamide polymer in Douglas County Washington. Used Pilat Mark V impactor for measurement and compared data to EPA particulate regulations.

Client: King County, Seattle, Washington.

Conducted emission inventory for several compost and wastewater facilities comparing VOC, particulate, and fungi concentrations to NIOSH values estimating risk to workers and individuals at neighboring facilities.

Air Pollution Investigation and Remediation

Client: Republic Landfill (Santa Clarita, CA)

Managed a field investigation of odor around a landfill during 30+ events. Using hedonic tone, butanol scale, dilution-to-threshold values, and odor character to evaluate odor sources and character and intensity.

Client: California Biomass (Victorville, CA)

Managed a field investigation of odor around landfill during 9+ events. Using hedonic tone, butanol scale, dilution-to-threshold values, and odor character to evaluate odor sources, character and intensity.

Client: ABT-Haskell (Redlands, California)

Assisted in permitting a compost facility that will be completely enclosed with a complex scrubbing system using acid scrubbers, base scrubbers, biofilters, heat exchangers and chlorine to reduce VOC emissions by 99 percent.

Client: Synagro (Corona, California)

Designed and monitored 30-foot by 20-foot by 6-foot biofilter for VOC control from an industrial composting facility in Corona, California, reducing VOC emissions by 99 percent.

Client: Jeff Gage, (Tacoma, Washington)

Conducted emission inventory at industrial compost facility using GC/MS analyses for VOCs. Evaluated effectiveness of VOC and odor control systems and estimated human health risk.

Client: Daishowa America (Port Angeles Mill, Washington)

Analyzed industrial paper sludge and ash for VOCs, heavy metals and nutrients to develop a land application program. Metals were compared to federal guidelines to determine maximum allowable land application rates.

Client: Jeff Gage (Puyallup Washington)

Measured effectiveness of biofilters at composting facility and ran EPA dispersion models to estimate traveling distance of odor and human health risk from exposure to volatile organics.

Surface Water, Groundwater, and Wastewater Investigation/Remediation

Client: Confidential (Downey, California)

Managed groundwater investigation to determine horizontal extent of 1,000 foot TCE plume associated with a metal finishing shop.

Client: Confidential (West Hollywood, California)

Designed soil vapor extraction system that is currently being installed for confidential client. Managed groundwater investigation to determine horizontal extent of TCE plume associated with dry cleaning.

Client: Synagro Technologies (Sacramento, California)

Managed groundwater investigation to determine if biosolids application impacted salinity and nutrient concentrations in groundwater.

Client: Navy Base Realignment and Closure Team (Treasure Island, California)

Assisted in the design and remediation of PCB, chlorinated solvent, hydrocarbon and lead contaminated groundwater and soil on Treasure Island. Negotiated screening levels with DTSC and Water Board. Assisted in the preparation of FSP/QAPP, RI/FS, and RAP documents and assisted in CEQA document preparation.

Client: Navy Base Realignment and Closure Team (MCAS Tustin, California)

Assisted in the design of groundwater monitoring systems for chlorinated solvents at Tustin MCAS. Contributed to the preparation of FS for groundwater treatment.

Client: MCP (Walnut, California)

Conducted forensic surface water and sediment sampling. Designed and conducted bench scale laboratory experiments. Demonstrated that metal and organic contaminants in storm water and sediment from landfill flooded and chemically compromised a polyurethane track.

Client: Mission Cleaning Facility (Salinas California)

Prepared a RAP and cost estimate for using an oxygen releasing compound (ORC) and molasses to oxidize diesel fuel in soil and groundwater at Mission Cleaning in Salinas.

Client: King County, Washington

Established and monitored experimental plots at a US EPA Superfund Site in wetland and upland mine tailings contaminated with zinc and lead in Smelterville, Idaho. Used organic matter and pH adjustment for wetland remediation and erosion control.

Client: City of Redmond (Richmond, Washington)

Collected storm water from compost-amended and fertilized turf to measure nutrients in urban runoff. Evaluated effectiveness of organic matter-lined detention ponds on reduction of peak flow during storm events. Drafted compost amended landscape installation guidelines to promote storm water detention and nutrient runoff reduction.

Client: City of Seattle (Seattle, Washington)

Measured VOC emissions from Renton wastewater treatment plant in Washington. Ran GC/MS, dispersion models, and sensory panels to characterize, quantify, control and estimate risk from VOCs.

Client: Plumas County (Quincy, California)

Installed wetland to treat contaminated water containing 1% copper in an EPA Superfund site. Revegetated 10 acres of acidic and metal laden sand dunes resulting from hydraulic mining. Installed and monitored piezometers in wetland estimating metal loading.

Client: Adams Egg Farm (St. Kitts, West Indies)

Designed, constructed, and maintained 3 anaerobic digesters at Springfield Egg Farm, St. Kitts. Digesters treated chicken excrement before effluent discharged into sea. Chicken waste was converted into methane cooking gas.

Client: BLM (Kremmling Colorado)

Collected water samples for monitoring program along upper stretch of the Colorado River. Rafted along river, protecting water quality by digging and repairing latrines.

Soil Science and Restoration Projects

Client: Kinder Morgan (San Diego County California)

Designed and monitored the restoration of a 110-acre project on Camp Pendleton along a 26-mile pipeline. Managed crew of 20, planting coastal sage, riparian, wetland, native grassland, and marsh ecosystems. Negotiated with the CDFW concerning species planting list and success standards.

Client: NAVY BRAC (Orote Landfill, Guam)

Designed and monitored pilot landfill cap mimicking limestone forest. Measured different species' root-penetration into landfill cap. Plants were used to evapotranspire water, reducing water leaching through soil profile.

Client: LA Sanitation District Puente Hills Landfill (Whittier, California)

Monitored success of upland and wetland mitigation at Puente Hills Landfill operated by Sanitation Districts of Los Angeles. Negotiated with the Army Corps of Engineers and CDFG to obtain an early sign-off.

Client: City of Escondido (Escondido California)

Designed, managed, installed, and monitored a 20-acre coastal sage scrub restoration project at Kit Carson Park, Escondido, California.

Client: Home Depot (Encinitas, California)

Designed, managed, installed and monitored a 15-acre coastal sage scrub and wetland restoration project at Home Depot in Encinitas, California.

Client: Alvarado Water Filtration Plant (San Diego, California)

Planned, installed and monitored 2-acre riparian and coastal sage scrub mitigation in San Diego California.

Client: Monsanto and James River Corporation (Clatskanie Oregon)

Served as a soil scientist on a 50,000-acre hybrid poplar farm. Worked on genetically engineering study of Poplar trees to see if glyphosate resistant poplar clones were economically viable.

Client: World Wildlife Fund (St. Kitts, West Indies)

Managed 2-year biodiversity study, quantifying and qualifying the various flora and fauna in St. Kitts' expanding volcanic rainforest. Collaborated with skilled botanists, ornithologists and herpetologists.

Publications

Rosenfeld, P.E. & Feng, L. (2011). *The Risks of Hazardous Waste*, Amsterdam: Elsevier Publishing.

Cheremisinoff, N.P., & **Rosenfeld, P.E.** (2011). *Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Agrochemical Industry*, Amsterdam: Elsevier Publishing.

Gonzalez, J., Feng, L., Sutherland, A., Waller, C., Sok, H., Hesse, R., **Rosenfeld, P.** (2011). PCBs and Dioxins/Furans in Attic Dust Collected Near Former PCB Production and Secondary Copper Facilities in Sauget, IL. *Procedia Environmental Sciences* 4(2011):113-125.

Feng, L., Wu, C., Tam, L., Sutherland, A.J., Clark, J.J., **Rosenfeld, P.E.**, (2010). Dioxin and Furan Blood Lipid and Attic Dust Concentrations in Populations Living Near Four Wood Treatment Facilities in the United States. *Journal of Environmental Health* 73(6):34-46.

Cheremisinoff, N.P., & **Rosenfeld, P.E.** (2010). *Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Wood and Paper Industries*, Amsterdam: Elsevier Publishing.

Cheremisinoff, N.P., & **Rosenfeld, P.E.** (2009). *Handbook of Pollution Prevention and Cleaner Production: Best Practices in the Petroleum Industry*, Amsterdam: Elsevier Publishing.

Wu, C., Tam, L., Clark, J., **Rosenfeld, P.** (2009). 'Dioxin and furan blood lipid concentrations in populations living near four wood treatment facilities in the United States', in Brebbia, C.A. and Popov, V., eds., *Air Pollution XVII*:

Proceedings of the Seventeenth International Conference on Modelling, Monitoring and Management of Air Pollution, Tallinn, Estonia. 20-22 July, 2009, Southampton, Boston. WIT Press.

Tam L. K., Wu C. D., Clark J. J. and **Rosenfeld, P.E.** (2008) A Statistical Analysis Of Attic Dust And Blood Lipid Concentrations Of Tetrachloro-p-Dibenzodioxin (TCDD) Toxicity Equivalency Quotients (TEQ) In Two Populations Near Wood Treatment Facilities. *Organohalogen Compounds*, Volume 70 (2008) page 002254.

Tam L. K., Wu C. D., Clark J. J. and **Rosenfeld, P.E.** (2008) Methods For Collect Samples For Assessing Dioxins And Other Environmental Contaminants In Attic Dust: A Review. *Organohalogen Compounds*, Volume 70 (2008) page 000527.

Hensley, A.R. A. Scott, J. J. J. Clark, **P. E. Rosenfeld** (2007) "Attic Dust and Human Blood Samples Collected near a Former Wood Treatment Facility" *Environmental Research*. 105, pp 194-197.

Rosenfeld, P.E., J. J. J. Clark, A. R. Hensley, M. Suffet. (2007) "The Use of an Odor Wheel Classification for Evaluation of Human Health Risk Criteria for Compost Facilities" –*Water Science & Technology* 55(5): 345-357.

Rosenfeld, P. E., M. Suffet. (2007) "The Anatomy Of Odour Wheels For Odours Of Drinking Water, Wastewater, Compost And The Urban Environment " *Water Science & Technology* 55(5): 335-344.

Sullivan, P. J. Clark, J.J.J., Agardy, F. J., **Rosenfeld, P.E.**, (2007) "Toxic Legacy, Synthetic Toxins in the Food, Water, and Air in American Cities," Elsevier Publishing, Boston Massachusetts.

Rosenfeld P.E., and Suffet, I.H. (Mel) (2007) "Anatomy Of An Odor Wheel" *Water Science and Technology*, In Press.

Rosenfeld, P.E., Clark, J.J.J., Hensley A.R., Suffet, I.H. (Mel) (2007) "The use of an odor wheel classification for evaluation of human health risk criteria for compost facilities." *Water Science And Technology*, In Press.

Hensley A.R., Scott, A., **Rosenfeld P.E.**, Clark, J.J.J. (2006) "Dioxin Containing Attic Dust And Human Blood Samples Collected Near A Former Wood Treatment Facility." *The 26th International Symposium on Halogenated Persistent Organic Pollutants – DIOXIN2006*, August 21 – 25, 2006. Radisson SAS Scandinavia Hotel in Oslo Norway.

Rosenfeld, P.E., and Suffet I.H. (2004) "Control of Compost Odor Using High Carbon Wood Ash", *Water Science and Technology*, Vol. 49, No. 9. pp. 171-178.

Rosenfeld, P.E., Clark J. J. and Suffet, I.H. (2004) "Value of and Urban Odor Wheel." (2004). *WEFTEC 2004*. New Orleans, October 2 - 6, 2004.

Rosenfeld, P.E., and Suffet, I.H. (2004) "Understanding Odorants Associated With Compost, Biomass Facilities, and the Land Application of Biosolids" *Water Science and Technology*. Vol. 49, No. 9. pp 193-199.

Rosenfeld, P.E., and Suffet I.H. (2004) "Control of Compost Odor Using High Carbon Wood Ash", Water Science and Technology, Vol. 49, No. 9. pp. 171-178.

Rosenfeld, P. E., Grey, M. A., Sellew, P. (2004) Measurement of Biosolids Odor and Odorant Emissions from Windrows, Static Pile and Biofilter. Water Environment Research. 76 (4): 310-315 JUL-AUG 2004.

Rosenfeld, P. E., Grey, M., (2003) Two stage biofilter for biosolids composting odor control. Seventh International In Situ And On Site Bioremediation Symposium. Batelle Conference Orlando Florida. June 2 and June 6, 2003.

Rosenfeld, P.E., Grey, M and Suffet, M. 2002. "Controlling Odors Using High Carbon Wood Ash." Biocycle, March 2002, Page 42.

Rosenfeld, P.E., Grey, M and Suffet, M. (2002). "Compost Demonstration Project, Sacramento, California Using High-Carbon Wood Ash to Control Odor at a Green Materials Composting Facility Integrated Waste Management Board Public Affairs Office, Publications Clearinghouse (MS-6), Sacramento, CA Publication #442-02-008. April 2002.

Rosenfeld, P.E., and C.L. Henry. 2001. Characterization of odor emissions from three different biosolids. Water Soil and Air pollution. Vol. 127 Nos. 1-4, pp. 173-191

Rosenfeld, P.E., and Henry C. L., 2000. Wood ash control of odor emissions from biosolids application. Journal of Environmental Quality. 29:1662-1668.

Rosenfeld, P.E., C.L. Henry and D. Bennett. 2001. Wastewater dewatering polymer affect on biosolids odor emissions and microbial activity. Water Environment Research. 73: 363-367.

Rosenfeld, P.E., and C.L. Henry. 2001. Activated Carbon and Wood Ash Sorption of Wastewater, Compost, and Biosolids Odorants Water Environment Research, 73: 388-392.

Rosenfeld, P.E., and Henry C. L., 2001. High carbon wood ash effect on biosolids microbial activity and odor. Water Environment Research. Volume 131 No. 1-4, pp. 247-262

Rosenfeld, P.E., C.L. Henry, R. Harrison. 1998. Oat and Grass Seed Germination and Nitrogen and Sulfur Emissions Following Biosolids Incorporation With High-Carbon Wood-Ash. Water Environment Federation 12th Annual Residuals and Biosolids Management Conference Proceedings. Bellevue Washington.

Chollack, T. and **P. Rosenfeld.** 1998. Compost Amendment Handbook For Landscaping. Prepared for and distributed by the City of Redmond, Washington State.

P. Rosenfeld. 1992. The Mount Liamuiga Crater Trail. Heritage Magazine of St. Kitts, Vol. 3 No. 2.

P. Rosenfeld. 1993. High School Biogas Project to Prevent Deforestation On St. Kitts. Biomass Users Network, Vol. 7, No. 1, 1993.

P. Rosenfeld. 1992. British West Indies, St. Kitts. Surf Report, April issue.

P. Rosenfeld. 1998. Characterization, Quantification, and Control of Odor Emissions From Biosolids Application To Forest Soil. Doctoral Thesis. University of Washington College of Forest Resources.

P. Rosenfeld. 1994. Potential Utilization of Small Diameter Trees On Sierra County Public Land. Masters thesis reprinted by the Sierra County Economic Council. Sierra County, California.

P. Rosenfeld. 1991. How to Build a Small Rural Anaerobic Digester & Uses Of Biogas In The First And Third World. Bachelors Thesis. University of California.

England Environmental Agency, 2002. Landfill Gas Control Technologies. Publishing Organization Environment Agency, Rio House, Waterside Drive, Aztec West, Almondsbury BRISTOL, BS32 4UD

Presentations

Sok, H.L.; Waller, C.C.; Feng, L.; Gonzalez, J.; Sutherland, A.J.; Wisdom-Stack, T.; Sahai, R.K.; Hesse, R.C.; **Rosenfeld, P.E.** "Atrazine: A Persistent Pesticide in Urban Drinking Water." Urban Environmental Pollution, Boston, MA, June 20-23, 2010.

Feng, L.; Gonzalez, J.; Sok, H.L.; Sutherland, A.J.; Waller, C.C.; Wisdom-Stack, T.; Sahai, R.K.; La, M.; Hesse, R.C.; **Rosenfeld, P.E.** "Bringing Environmental Justice to East St. Louis, Illinois." Urban Environmental Pollution, Boston, MA, June 20-23, 2010.

Rosenfeld, P.E. (2009) "Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonate (PFOS) Contamination in Drinking Water From the Use of Aqueous Film Forming Foams (AFFF) at Airports in the United States" Presentation at the 2009 Ground Water Summit and 2009 Ground Water Protection Council Spring Meeting, April 19-23, 2009. Tuscon, AZ.

Rosenfeld, P.E. (2009) "Cost to Filter Atrazine Contamination from Drinking Water in the United States" Contamination in Drinking Water From the Use of Aqueous Film Forming Foams (AFFF) at Airports in the United States" Presentation at the 2009 Ground Water Summit and 2009 Ground Water Protection Council Spring Meeting, April 19-23, 2009. Tuscon, AZ.

Rosenfeld, P. E. (2007) "Moss Point Community Exposure To Contaminants From A Releasing Facility" Platform Presentation at the 23rd Annual International Conferences on Soils Sediment and Water, October 15-18, 2007. University of Massachusetts, Amherst MA.

Rosenfeld, P. E. (2007) "The Repeated Trespass of Tritium-Contaminated Water Into A Surrounding Community Form Repeated Waste Spills From A Nuclear Power Plant" Platform Presentation at the 23rd Annual International Conferences on Soils Sediment and Water, October 15-18, 2007. University of Massachusetts, Amherst MA.

Rosenfeld, P. E. (2007) “Somerville Community Exposure To Contaminants From Wood Treatment Facility Emissions” Poster Presentation at the 23rd Annual International Conferences on Soils Sediment and Water, October 15-18, 2007. University of Massachusetts, Amherst MA.

Rosenfeld P. E. “Production, Chemical Properties, Toxicology, & Treatment Case Studies of 1,2,3-Trichloropropane (TCP)” – Platform Presentation at the Association for Environmental Health and Sciences (AEHS) Annual Meeting, San Diego, CA, 3/2007

Rosenfeld P. E. “Blood and Attic Sampling for Dioxin/Furan, PAH, and Metal Exposure in Floral, Alabama” – Platform Presentation at the AEHS Annual Meeting, San Diego, CA, 3/2007

Hensley A.R., Scott, A., **Rosenfeld P.E.**, Clark, J.J.J. (2006) “Dioxin Containing Attic Dust And Human Blood Samples Collected Near A Former Wood Treatment Facility.” APHA 134 Annual Meeting & Exposition, Boston Massachusetts. November 4 to 8th, 2006.

Paul Rosenfeld Ph.D. “Fate, Transport and Persistence of PFOA and Related Chemicals.” Mealey’s C8/PFOA Science, Risk & Litigation Conference” October 24, 25. The Rittenhouse Hotel, Philadelphia.

Paul Rosenfeld Ph.D. “Brominated Flame Retardants in Groundwater: Pathways to Human Ingestion, Toxicology and Remediation PEMA Emerging Contaminant Conference. September 19. Hilton Hotel, Irvine California.

Paul Rosenfeld Ph.D. “Fate, Transport, Toxicity, And Persistence of 1,2,3-TCP.” PEMA Emerging Contaminant Conference. September 19. Hilton Hotel in Irvine, California.

Paul Rosenfeld Ph.D. “Fate, Transport and Persistence of PDBEs.” Mealey’s Groundwater Conference. September 26, 27. Ritz Carlton Hotel, Marina Del Ray, California.

Paul Rosenfeld Ph.D. “Fate, Transport and Persistence of PFOA and Related Chemicals.” International Society of Environmental Forensics: Focus On Emerging Contaminants. June 7,8. Sheraton Oceanfront Hotel, Virginia Beach, Virginia.

Paul Rosenfeld Ph.D. “Rate Transport, Persistence and Toxicology of PFOA and Related Perfluorochemicals”. 2005 National Groundwater Association Ground Water And Environmental Law Conference. July 21-22, 2005. Wyndham Baltimore Inner Harbor, Baltimore Maryland.

Paul Rosenfeld Ph.D. “Brominated Flame Retardants in Groundwater: Pathways to Human Ingestion, Toxicology and Remediation.” 2005 National Groundwater Association Ground Water And Environmental Law Conference. July 21-22, 2005. Wyndham Baltimore Inner Harbor, Baltimore Maryland.

Paul Rosenfeld, Ph.D. and James Clark Ph.D. and Rob Hesse R.G. Tert-butyl Alcohol Liability and Toxicology, A National Problem and Unquantified Liability. National Groundwater Association. Environmental Law Conference. May 5-6, 2004. Congress Plaza Hotel, Chicago Illinois.

Paul Rosenfeld, Ph.D., 2004. Perchlorate Toxicology. Presentation to a meeting of the American Groundwater Trust. March 7th, 2004. Pheonix Arizona.

Hagemann, M.F., **Paul Rosenfeld, Ph.D.** and Rob Hesse, 2004. Perchlorate Contamination of the Colorado River. Invited presentation to a meeting of tribal representatives, Parker, AZ.

Paul Rosenfeld, Ph.D. A National Damage Assessment Model For PCE and Dry Cleaners. Drycleaner Symposium. California Ground Water Association. Radison Hotel, Sacramento, California. April 7, 2004.

Paul Rosenfeld, Ph.D. and James Clark Ph.D. Understanding Historical Use, Chemical Properties, Toxicity and Regulatory Guidance of 1,4 Dioxane. National Groundwater Association. Southwest Focus Conference. Water Supply and Emerging Contaminants. February 20-21, 2003. Hyatt Regency Phoenix Arizona.

Paul Rosenfeld, Ph.D. Underground Storage Tank Litigation and Remediation. California CUPA Forum. Marriott Hotel. Anaheim California. February 6-7, 2003.

Paul Rosenfeld, Ph.D. Underground Storage Tank Litigation and Remediation. EPA Underground Storage Tank Roundtable. Sacramento California. October 23, 2002

Rosenfeld, P.E. and Suffet, M. 2002. Understanding Odor from Compost, Wastewater and Industrial Processes. Sixth Annual Symposium On Off Flavors in the Aquatic Environment. International Water Association. Barcelona Spain. October 7- 10.

Rosenfeld, P.E. and Suffet, M. 2002. Using High Carbon Wood Ash to Control Compost Odor. Sixth Annual Symposium On Off Flavors in the Aquatic Environment. International Water Association. Barcelona Spain. October 7- 10.

Rosenfeld, P.E. and Grey, M. A. 2002. Biocycle Composting For Coastal Sage Restoration. Northwest Biosolids Management Association. Vancouver Washington. September 22-24.

Rosenfeld, P.E. and Grey, M. A. 2002. Soil Science Society Annual Conference. Indianapolis, Maryland. November 11-14.

Rosenfeld. P.E. 2000. Two stage biofilter for biosolids composting odor control. Water Environment Federation. Anaheim California. September 16, 2000.

Rosenfeld. P. E. 2000. Wood ash and biofilter control of compost odor. Biofest. October 16, 2000.Ocean Shores, California

Rosenfeld, P. E. 2000. Bioremediation Using Organic Soil Amendments. California Resource Recovery Association. Sacramento California.

Rosenfeld, P.E., C.L. Henry, R. Harrison. 1998. Oat and Grass Seed Germination and Nitrogen and Sulfur Emissions Following Biosolids Incorporation With High-Carbon Wood-Ash. Water Environment Federation 12th Annual Residuals and Biosolids Management Conference Proceedings. Bellevue Washington.

Rosenfeld, P.E., and C.L. Henry. 1999. An evaluation of ash incorporation with biosolids for odor reduction. Soil Science Society of America. Salt Lake City Utah.

Rosenfeld, P.E., C.L. Henry, R. Harrison. 1998. Comparison of Microbial Activity and Odor Emissions from Three Different Biosolids Applied to Forest Soil. Brown and Caldwell, Seattle Washington.

Rosenfeld, P.E., C.L. Henry. 1998. Characterization, Quantification, and Control of Odor Emissions from Biosolids Application To Forest Soil. Biofest Lake Chelan, Washington.

Rosenfeld, P.E., C.L. Henry, R. B. Harrison, and R. Dills. 1997. Comparison of Odor Emissions From Three Different Biosolids Applied to Forest Soil. Soil Science Society of America, Anaheim California.

Professional History

Soil Water Air Protection Enterprise (SWAPE); 2003 to present; Founding And Managing Partner

UCLA School of Public Health; 2007 to present; Lecturer (Asst Res)

UCLA School of Public Health; 2003 to 2006; Adjunct Professor

UCLA Environmental Science and Engineering Program; 2002-2004; Doctoral Intern Coordinator

UCLA Institute of the Environment, 2001-2002; Research Associate

Komex H₂O Science, 2001 to 2003; Senior Remediation Scientist

National Groundwater Association, 2002-2004; Lecturer

San Diego State University, 1999-2001; Adjunct Professor

Anteon Corp., San Diego, 2000-2001; Remediation Project Manager

Ogden (now Amec), San Diego, 2000-2000; Remediation Project Manager

Bechtel, San Diego, California, 1999 – 2000; Risk Assessor

King County, Seattle, 1996 – 1999; Scientist

James River Corp., Washington, 1995-96; Scientist

Big Creek Lumber, Davenport, California, 1995; Scientist

Plumas Corp., California and USFS, Tahoe 1993-1995; Scientist

Peace Corps and World Wildlife Fund, St. Kitts, West Indies, 1991-1993; Scientist

Bureau of Land Management, Kremmling Colorado 1990; Scientist

Teaching Experience

UCLA Department of Environmental Health (Summer 2003 through 2010) Teach Environmental Health Science 100 to students, including undergrad, medical doctors, public health professionals and nurses. Course focuses on the health effects of environmental contaminants.

National Ground Water Association, Successful Remediation Technologies. Custom Course In Sante Fe, New Mexico. May 21, 2002. Focused on fate and transport of fuel contaminants associated with underground storage tanks.

National Ground Water Association; Successful Remediation Technologies Course in Chicago Illinois. April 1, 2002. Focused on fate and transport of contaminants associated with Superfund and RCRA sites.

California Integrated Waste Management Board, April and May, 2001. Alternative Landfill Caps Seminar in San Diego, Ventura, and San Francisco. Focused on both prescriptive and innovative landfill cover design.

UCLA Department of Environmental Engineering, February 5 2002 Seminar on Successful Remediation Technologies focusing on Groundwater Remediation.

University Of Washington, Soil Science Program, Teaching Assistant for several courses including: Soil Chemistry, Organic Soil Amendments, and Soil Stability.

U.C. Berkeley, Environmental Science Program Teaching Assistant for Environmental Science 10.

Academic Grants Awarded

California Integrated Waste Management Board. \$41,000 grant awarded to UCLA Institute of the Environment. Goal: To investigate effect of high carbon wood ash on volatile organic emissions from compost. 2001.

Synagro Technologies, Corona California: \$10,000 grant awarded to San Diego State University. Goal: investigate effect of biosolids for restoration and remediation of degraded coastal sage soils. 2000.

King County, Department of Research and Technology, Washington State. \$100,000 grant awarded to University of Washington: Goal: To investigate odor emissions from biosolids application and the effect of polymers and ash on VOC emissions. 1998.

Northwest Biosolids Management Association, Washington State. \$20,000 grant awarded to investigate effect of polymers and ash on VOC emissions from biosolids. 1997.

James River Corporation, Oregon: \$10,000 grant was awarded to investigate the success of genetically engineered Poplar trees with resistance to round-up. 1996.

United State Forest Service, Tahoe National Forest: \$15,000 grant was awarded to investigating fire ecology of the Tahoe National Forest. 1995.

Kellogg Foundation, Washington D.C. \$500 grant was awarded to construct a large anaerobic digester on St. Kitts in West Indies. 1993.

Cases that Dr. Rosenfeld Provided Deposition or Trial Testimony

In the Court of Common Pleas for the Second Judicial Circuit, State of South Carolina, County of Aiken
David Anderson, et al., *Plaintiffs*, vs. Norfolk Southern Corporation, et al., *Defendants*.
Case Number: 2007-CP-02-1584

In the Circuit Court of Jefferson County Alabama
Jaeanette Moss Anthony, et al., *Plaintiffs*, vs. Drummond Company Inc., et al., *Defendants*
Civil action No. CV 2008-2076

In the Ninth Judicial District Court, Parish of Rapides, State of Louisiana
Roger Price, et al., *Plaintiffs*, vs. Roy O. Martin, L.P., et al., *Defendants*.
Civil Suit Number 224,041 Division G

In the United States District Court, Western District Lafayette Division
Ackle et al., *Plaintiffs*, vs. Citgo Petroleum Corporation, et al., *Defendants*.
Case Number 2:07CV1052

In the United States District Court for the Southern District of Ohio
Carolyn Baker, et al., *Plaintiffs*, vs. Chevron Oil Company, et al., *Defendants*.
Case Number 1:05 CV 227

In the Fourth Judicial District Court, Parish of Calcasieu, State of Louisiana
Craig Steven Arabie, et al., *Plaintiffs*, vs. Citgo Petroleum Corporation, et al., *Defendants*.
Case Number 07-2738 G

In the Fourteenth Judicial District Court, Parish of Calcasieu, State of Louisiana
Leon B. Brydels, *Plaintiffs*, vs. Conoco, Inc., et al., *Defendants*.
Case Number 2004-6941 Division A

In the District Court of Tarrant County, Texas, 153rd Judicial District
Linda Faust, *Plaintiff*, vs. Burlington Northern Santa Fe Rail Way Company, Witco Chemical Corporation
A/K/A Witco Corporation, Solvents and Chemicals, Inc. and Koppers Industries, Inc., *Defendants*.
Case Number 153-212928-05

In the Superior Court of the State of California in and for the County of San Bernardino
Leroy Allen, et al., *Plaintiffs*, vs. Nutro Products, Inc., a California Corporation and DOES 1 to 100,
inclusive, *Defendants*.
John Loney, Plaintiff, vs. James H. Didion, Sr.; Nutro Products, Inc.; DOES 1 through 20, inclusive,
Defendants.
Case Number VCVVS044671

In the United States District Court for the Middle District of Alabama, Northern Division
James K. Benefield, et al., *Plaintiffs*, vs. International Paper Company, *Defendant*.
Civil Action Number 2:09-cv-232-WHA-TFM

In the Superior Court of the State of California in and for the County of Los Angeles
Leslie Hensley and Rick Hensley, *Plaintiffs*, vs. Peter T. Hoss, as trustee on behalf of the Cone Fee Trust;
Plains Exploration & Production Company, a Delaware corporation; Rayne Water Conditioning, Inc., a

California corporation; and DOES 1 through 100, *Defendants*.
Case Number SC094173

In the Superior Court of the State of California in and for the County of Santa Barbara, Santa Maria Branch
Clifford and Shirley Adelhelm, et al., all individually, *Plaintiffs*, vs. Unocal Corporation, a Delaware
Corporation; Union Oil Company of California, a California corporation; Chevron Corporation, a
California corporation; ConocoPhillips, a Texas corporation; Kerr-McGee Corporation, an Oklahoma
corporation; and DOES 1 though 100, *Defendants*.
Case Number 1229251 (Consolidated with case number 1231299)

In the United States District Court for Eastern District of Arkansas, Eastern District of Arkansas
Harry Stephens Farms, Inc, and Harry Stephens, individual and as managing partner of Stephens
Partnership, *Plaintiffs*, vs. Helena Chemical Company, and Exxon Mobil Corp., successor to Mobil
Chemical Co., *Defendants*.
Case Number 2:06-CV-00166 JMM (Consolidated with case number 4:07CV00278 JMM)

In the United States District Court for the Western District of Arkansas, Texarkana Division
Rhonda Brasel, et al., *Plaintiffs*, vs. Weyerhaeuser Company and DOES 1 through 100, *Defendants*.
Civil Action Number 07-4037

In The Superior Court of the State of California County of Santa Cruz
Constance Acevedo, et al. *Plaintiffs* Vs. California Spray Company, et al. *Defendants*
Case No CV 146344

In the District Court of Texas 21st Judicial District of Burleson County
Dennis Davis, *Plaintiff*, vs. Burlington Northern Santa Fe Rail Way Company, *Defendant*.
Case Number 25,151