June 21, 2021

Mr. Justin Osler, Principal
The Martin Group
1970 Broadway, Suite 745
Oakland, CA 97205
Justin@TheMartinGroup.com

RE: Response to APL21-0001 Comments II.B, II.C and II.E on the Callan & E. 14th Street Project

Dear Mr. Osler:

At your request, Trinity Consultants, Inc. (Trinity) has prepared responses to the Callan & E. 14th Street Project APL21-0001 appeal comments II.B, II.C and II.E prepared by Adams Broadwell Joseph & Cardozo, Attorneys at Law for the East Bay Residents for Responsible Development c/o Kelilah Federman.

SCOPE OF MEMO

The City of San Leandro's Planning Commission approved the Callan & E. 14th Street Project at its May 6, 2021 meeting using its California Environmental Quality Act (CEQA) Infill Checklist in accordance with CEQA Guidelines Section 15183.3. The City of San Leandro received two appeals on the approval of this project: 1) Adams Broadwell Joseph & Cardozo, Attorneys at Law for the East Bay Residents for Responsible Development c/o Kelilah Federman; and 2) Lozeau Drury LLP from Michael Lozeau on behalf of Laborers International Union of North America, Local 304. This memo specifically provides technical responses to address the air quality and greenhouse gas (GHG) issues in the following comments from the Adams Broadwell letter:

II.B.) The Project will Cause New Significant and Unmitigated Air Quality Impacts
II.C.) The Project Will Cause New Significant and Unmitigated Health Risk Impacts
II.E.) The Project Will Cause New Significant and Unmitigated GHG Emission Impacts

PROJECT SUMMARY AND REGULATORY BACKGROUND

The proposed Project site is located at 1188 E. 14th Street in the City of San Leandro. The proposed Project would demolish 31,000 square feet of building area and develop a five-floor mixed-use residential and retail building. The proposed Project would include 196 dwelling units; a 23,189 square foot (SF) ground-floor grocery store; 5,660 SF of additional ground-floor retail space; and a 286-space above ground parking garage. The Project, proposed by 14th & Callan Street Developer LLC ("Applicant"), is located in the DA-1(S), Downtown Area 1 (Special Policy Area 3) zoning district.

The City of San Leandro developed the Downtown San Leandro Transit-Oriented Development (TOD) Strategy to establish a land use framework, circulation system, development guidelines, and implementation actions to guide new developments such as the proposed Project in the downtown area. The City of San Leandro certified the Downtown San Leandro Transit-Oriented Development (TOD) Strategy Final Environmental Impact Report (FEIR) on June 5, 2007.

Subsequently, the City prepared its 2035 General Plan update (San Leandro 2016a), which incorporates and implements the TOD Strategy. Additionally, the City prepared an Environmental Impact Report (EIR) for the 2035 General Plan update that contains an evaluation of environmental impacts, references uniformly applicable development policies, and relies on those policies and mitigation measures to reduce environmental effects. The City's General Plan Update FEIR (San Leandro 2016b) was certified on September 19, 2016.

The 14th & Callan Street Project included preparation of an Infill Environmental Checklist which tiered off of the 2035 General Plan Update EIR (San Leandro 2016b). The proposed Project-specific Infill Environmental Checklist demonstrated that any significant effects of the proposed Project were analyzed in this prior EIR (the 2016 General Plan EIR) or would be substantially mitigated by the City's uniformly applicable development policies. Pursuant to Public Resources Code Section 21094.5, such impacts are exempt under the California Environmental Quality Act (CEQA) and do not require further environmental analysis. Furthermore, this Checklist incorporates supporting information and impact analysis from the Downtown TOD EIR where applicable (San Leandro 2007b).

In accordance with CEQA Guidelines Section 15183.3, if the proposed infill Project would result in new specific effects or more significant effects, and uniformly applicable development policies or standards would not substantially mitigate such effects, those effects are subject to further review under CEQA. If those effects would be potentially significant, the lead agency must prepare an Project-specific Infill EIR.

APPEAL COMMENTS AND RESPONSES

Comment II.B - The Project Will Cause New Significant and Unmitigated Air Quality Impacts

Comment Summary

The Checklist failed to accurately analyze the Project's construction and operational air quality emissions as well as the public health risks to the surrounding community from exposure to toxic air contaminants ("TACs") generated by the Project, which are new or more severe than previously analyzed.

The Checklist and the 2035 General Plan EIR were inconsistent in their analysis of air quality impacts. The Checklist determined the Air Quality impacts would be less than significant, but the General Plan EIR determined they would be significant and unavoidable. The Project is not consistent with the General Plan because General Plan Policy 31.04 provides that the City must "Require new development to be designed and constructed in a way that reduces the potential for future air quality problems, such as odors and the emission of any and all air pollutants."

Soil / Water / Air Protection Enterprise (SWAPE) determined the Project's construction and operational emissions are underestimated, and therefore the Board's approval of the Project was not based on substantial evidence in violation of CEQA. As follows:

Comment II.B.i) The Infill Environmental Checklist's calculation regarding off-road vehicles is not supported by substantial evidence and therefore underestimated the Project's mobile source operational emissions. The "User Entered Comments and Non-Default Data" table, the justification provided for these changes is: "crane and welders would only be used on site for a portion of the total building construction duration" and "MM: limit crane use" (Infill Environmental Checklist, Appendix A, pp. 83, 105). However, these changes remain unsupported for two reasons. First, the Infill Environmental Checklist fails to mention or justify the revised off-road construction equipment usage hours whatsoever. Second, the AQ & GHG Analysis cannot simply assume that cranes would be used for fewer than 354 hours or that welders would be predominately used during the initial framing phase.

Response to Comment II.B.i) The construction data for all phases except building construction represent the CalEEMod default equipment mix. The hours of use for a crane and welders have been modified to more accurately represent onsite use for equipment that is onsite for a shorter timeframe during vertical building construction (i.e., 1 hour per day over 354 days of building construction [354 hours], which is very conservative given that such equipment is likely only onsite for two weeks [i.e., less than 80 hours]). CalEEMod allows for the modification of default equipment types and usage levels based on Project-specific information that is reasonably representative of the proposed Project's design. Often the modification of default assumptions is based on details in the proposed Project application and engineering drawing, which are the most common form of substantial evidence. However, local air districts do accept modifications of default assumptions in CalEEMod based on the professional judgement of the air experts using CalEEMod and preparing the air quality impact assessment; these adjustments to crane and welder usage are reasonable and legally sufficient to meets the standards of substantial evidence (CEQA Guidelines Section 15384).[1]

Comment II.B.ii) The Infill Environmental Checklist includes CalEEMod modifications to the default operations fleetmix percentages. These changes remain unsupported for two reasons; first, the Infill Environmental Checklist fails to mention or justify the revised off-road operational vehicle fleet mix percentages whatsoever, and second, the assumptions fail to provide a source or explain how the revised operational vehicle fleet mix percentages were derived.

Response to Comment II.B.ii) The CalEEMod default mix assumes an 80% mix of Light Duty, 11% Medium Duty, and 9% Heavy Duty vehicles based on county-level data of vehicle miles traveled. The residential fleet mix was assumed to have a 97% mix of Light Duty, 2% Medium Duty, and 1% Heavy Duty vehicles to better represent the fleet mix for a residential product, which is primarily passenger vehicles. As identified in the Appendix, this mix reflect 19 medium and heavy duty trucks and 609 passenger vehicles (including light duty trucks for home deliveries). This is consistent with data from Caltrans for year 2019 on 14th Street (Highway 185), which reflects an even smaller percentage of medium and heavy trucks (1.62 percent) on residential streets in the vicinity of the proposed Project than that which was modeled.[2] In general, the only medium and heavy duty trucks that are generated by a residential project are garbage, greenwaste, and recycling trucks. As mentioned above, local air districts do accept modifications of default assumptions in CalEEMod based on the professional judgement of the

---

[1] CEQA Guidelines Section 15385(a) defines substantial evidence to mean enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached. CEQA Guidelines Section 15385(b) adds that substantial evidence shall include facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts.

[2] https://dot.ca.gov/programs/traffic-operations/census

air experts using CalEEMod and preparing the air quality impact assessment; these adjustments to the fleet mix are internally consistent within the Infill Environmental Checklist analysis and are reasonable and legally sufficient to meets the standards of substantial evidence (CEQA Guidelines Section 15384).

Comment II.B.iii) The Infill Environmental Checklist did not analyze or substantially mitigate the potentially significant impacts from gas fireplaces. The modifications to the CalEEMod operations model assumes that the Project would not include any gas fireplaces and the justification provided for these changes is: "no fireplaces." However, these changes remain unsupported for two reasons. First, the Infill Environmental Checklist fails to indicate that the Project would not include any gas fireplaces. Second, the Project's air model cannot simply assume the Project would not include gas fireplaces.

Response to Comment II.B.iii) Gas fireplaces were not included in the CalEEMod analysis because the proposed Project does not include gas fireplaces as supported by their exclusion from the Project site plans. These adjustments to CalEEMod defaults for gas fireplaces are reasonable and legally sufficient to meet the standards of substantial evidence (CEQA Guidelines Section 15384).

Comment II.B.iv) The Checklist included unsubstantiated reductions to the default Title 24 electricity energy intensity and Title 24 natural gas intensity values, which may cause the Checklist to underestimate the Project's operational emissions from energy sources. The justification provided for these changes is: "based on NORESCO reductions, see assumptions file" (Appendix A, pp. 130). Furthermore, the AQ & GHG Report provides NORESCO's 2019 Title 24 electricity and natural gas rate reductions (see excerpt below) (Appendix A, pp. 69. First, the source provided for the NORESCO's 2019 Title 24 electricity and natural gas rate reduction fails to provide a link. Thus, we cannot verify the that reductions accurately reflect NORESCO's actual rate reductions. Second, regardless of the accuracy of the source, simply because NORESCO expects reductions in Title 24 electricity and natural gas building energy consumption does not guarantee that these reductions would be implemented locally on the Project site. Absent additional information demonstrating that these reductions would be achieved through the implementation, monitoring, and enforcement of energy-related mitigation measures, we are unable to verify the revised energy use values inputted into the model.

Response to Comment II.B.iv) Please see "2019_Impact_Analysis_Final_Report_2018-06-29" for the NORESCO reference document (Attachment 1). The NORESCO analysis estimates the statewide impacts of 2019 changes to the California Energy Efficiency Standards and provides the energy savings for residential and nonresidential uses over the 2016 Title 24 electricity and natural gas rates, which are used in CalEEMod version 2016.3.2.25. These adjustments to CalEEMod defaults for Title 24 electricity energy intensity and Title 24 natural gas intensity values are reasonable and legally sufficient to meets the standards of substantial evidence (CEQA Guidelines Section 15384).

Comment II.B.v) The Infill Environmental Checklist underestimated indoor and outdoor water use rates. Review of the CalEEMod output files demonstrates that the "Callan and E 14th Street Infill Checklist Project Operations" model includes several reductions to the default indoor and outdoor water use rates (see excerpt below) (Appendix A, pp. 172-173). The indoor use rates were manually reallocated to the residential land use and reduced from the cumulative default value of 16,320,087.33 to 12,191,000.00 gallons per year ("gpy"). Furthermore, the outdoor water use rates were each manually reduced to 0 gpy. The justification provided for these changes is: "assigning all water use to apartments land use, assumes all indoor water and 100% aerobic treatment" (Appendix A, pp. 130). The Infill Environmental

Checklist estimates that the Project would use 47,758 gallons per day ("gpd"), or 17,431,670 gpy. Thus, the model underestimates the Project's anticipated indoor water use rate by 5,240,670 gpy. The Infill Environmental Checklist fails to mention or justify the Project's anticipated outdoor water use rate whatsoever. As such, we cannot verify the revised outdoor water use rates.

Response to Comment II.B.v) Table 4-8 of the Infill Environmental Checklist presents the calculation of the proposed Project's GHG emissions indirectly emitted by water treatent plants. According to the CalEEMod assumptions used, the Project's use of 12.2 million gpy of water will generate 10 $MTCO_2e$ per year. This equates to approximately 2% if the proposed Project's total operational GHG emissions of 472 $MTCO_2e$ per year.

The commenter states that this volume underestimates that true water usage of the proposed Project by calculating annual average totals from daily totals (by multiplying by 365). The Project's annual water usage was estimated on Project-specific estimates incorporating the efficient use of water through such measures as low-flow plumbing fixtures and water-saving appliances.

However, to address this concern, the proposed Project's GHG emissions were recalculated using CalEEMod based on default indoor and outdoor water usage rates. The default values indicate that 24.6 million gpy of water useage. If this change were made, it would increase proposed Project GHG emissions by 5.2 MT CO_2e, or by about 1.1%. Therefore, the difference in proposed Project operational GHG emissions would be negligible if CalEEMod default values were used as shown in the table below. The revised CalEEMod annual output report is included as Attachment 2 to this response.

Project GHG Emissions from Water Usage ($MTCO_2e$ Per Year)						
	Bio-CO_2	NBio-CO_2	Total CO_2	CH_4	N_2O	CO_2e
Infill Checklist	3.5	3.7	7.1	0.012	7.6E-03	9.7
CalEEMod Defaults	4.6	6.9	11.5	0.017	1.0E-02	14.9
Difference	1.1	3.2	4.4	0.005	~0	5.2

Comment II.B.vi) The Infill Environmental Checklist included several unsubstantiated changes to the default wastewater system percentages (see excerpt below) (Appendix A, pp. 172-173). The justification provided for these changes is: "assumes all indoor water and 100% aerobic treatment" (Infill Environmental Checklist, Appendix A, pp. 130). Review of the San Leandro Water Pollution Control Plant (SLWPCP) treatment process demonstrates that the facility utilizes anaerobic digesters. As a result, the appellants claim the model is incorrect in assuming that the Project's wastewater would be treated entirely aerobically, and we cannot verify the revised wastewater treatment system percentages.

Response to Comment II.B.vi) The commenter questions why the default wastewater treatment method was changed from the statewide defaults of 10.33% septic tanks, 87.46 aerobic treatment, and 2.21% facultative lagoons. The proposed Project will be connected to the City of San Leandro Water Pollution Control Plant. This plant utilizes a conventional activated sludge system where up to 3,000 scfm of air is injected into aeration tanks. The plant does not utilize facultative lagoons. No portion of the proposed Project's wastewater will be treated by septic tanks. Therefore, it is appropriate to change the default wastewater treatment method to "100% aerobic" based on the known treatment method. These adjustments to CalEEMod defaults for wastewater treatment method are reasonable and legally sufficient to meets the standards of substantial evidence (CEQA Guidelines Section 15384).

Comment II.B.vii) Tier 4 Interim measures do not constitute adequate mitigation because they do not go above-and-beyond existing laws, regulations, and requirements that would reduce environmental impacts. Tier 4 Interim measures would already be considered part of the Project, as the Infill Environmental Checklist states they are required by the EPA. The Tier 4 Interim measures are not within the mitigation monitoring and reporting plan ("MMRP"). As such, these mitigation measures are not enforceable. Tier 4 Interim measures do not constitute adequate mitigation because they do not go above-and-beyond existing laws, regulations, and requirements that would reduce environmental impacts. The appellants claim that Tier 4 Interim measures would already be considered part of the Project, as the Infill Environmental Checklist states they are required by the EPA.

Response to Comment II.B.vii) The commenter is claiming that the use of Tier 4 Interim engines for all diesel-fueled construction equipment >25 horsepower and operating >20 hours over the entire duration of the construction activities does not constitute adequate mitigation because the requirement does not go above-and-beyond existing laws and regulations. The commenter may be misinterpreting the intent of the text of in the Infill Environmental Checklist, which is clarified as follows:

Tier 4 interim diesel engine certification standards apply only to manufacturers of engines and equipment and not to owners/operations. These standards apply on a model-year basis and, for the pollutant of particulate matter (equivelant to diesel particulate matter or "DPM"), are the same as current Tier 4 Final certification standards for engines >50 HP. There are no local, state, or federal requirements otherwise prohibiting the use of construction equipment containing prior-tiered engines (e.g., Tier 3) by owners/operators.

The phase-out of prior-tiered diesel engines occurs on an individual fleet basis, according to CARB's Regulation for In-Use Off-Road Diesel-Fueled Fleets Rule (13 CCR § 2449 et al.). CARB's regulation requires that individual fleets meet a fleet average emission rate target that declines each year. The final targets occur on January 1, 2023 (for large fleets) and January 1, 2028 (for small fleets), and require (approximately) a fleet average emission rate equivelant to Tier 4 Interim standards. However, fleets utilizing certain compliance options and extensions (such as the BACT Credit Option) will have several additional years beyond January 1, 2023 to meet the Tier 4 Interim equivalent fleet average.

For the proposed Project, the Tier 4 Interim requirement is enforced by conformance with Mitigation Measures AQ-2A and AQ-2B-2 of the 2035 General Plan EIR. This requires that the applicant prepare and submit to the City a technical assessment evaluating construction-related air quality impacts, and if those impacts are found to potentially exceed BAAQMD thresholds of significance, the applicant is to incorporate mitigation measures to reduce air pollutant emissions during construction activities to below these thresholds. The identified measures are then incorporated by the City into its Conditions of Approval and all appropriate construction documents, such as construction management plans, which would include the requirements listed on page 4-18 of the Infill Environmenntal Checklist (as three bullet points). The adopted Conditions of Approval for PLN18-0036 includes the following:

- 83. Air Quality. The Project's construction contractors shall use equipment that meets the United States Environmental Protection Agency Tier 4 interim emissions standards for off-road diesel-powered construction equipment with more than 25 horsepower, unless it can be demonstrated that such equipment is not available. Any emissions control device used by the contractor shall achieve emissions reductions that are no less than what could be achieved by a Tier 4 interim emissions standard for a similarly sized engine, as defined by the California Air Resources Board's regulations. The requirement to use Tier 4 interim equipment for engines over 25 horsepower shall be identified in construction bids.

In its deliberations during ***Covington v. Great Basin Unified Air Pollution Control District* (Dec. 23, 2019) Cal.App.5th,** the Court of Appeal determined that "compliance with performance standards is a substitute for substantial evidence to support a finding of mitigation."

The approval of the PLN18-0036 includes the implementation of the aforementioned Condition of Approval 83 – Air Quality which meets this standard and no additional mitigation measures are required.

Comment II.B.viii) The Infill Environmental Checklist includes incorrect application of water-related operational mitigation measures. The CalEEMod output files show use of water usage mitigation measures but there are no comments to justify its use nor formal mitigation measures to guarantee that they would be implemented, monitored, and enforced on the Project site.

Response to Comment II.B.viii) The City of San Leandro's 2035 General Plan policies include the following water conservation measures:

- Policy OSC-7.2: Water Conservation. Promote the efficient use of existing water supplies through a variety of water conservation measures, including the use of recycled water for landscaping.
- Action OSC-7.2.A: Urban Water Management Plan. Take the actions necessary to implement EBMUD's Urban Water Management Plan at the local level.
- Policy OSC-7.3: Drought-Tolerant Landscaping. Encourage the use of native vegetation and Bay-friendly landscaping and enforce the State Department of Water Resources Model Water Efficient Landscape Ordinance (WELO).
- Policy OSC-7.4: Development Standards. Maintain local planning and building standards that require the efficient use of water through such measures as low-flow plumbing fixtures and water-saving appliances. Require water conservation measures as a condition of approval for major developments.

The adopted Conditions of Approval for PLN18-0036 includes the following:

- 14. Water Conservation. Final building plans submitted for building permit shall incorporate a range of water conservation measures to substantially reduce average per capita daily use. These measures shall include the use of equipment, devices and methods for plumbing fixtures and irrigation that provide for long-term efficient water use, subject to the review and approval of the Community Development Director.

In its deliberations during ***Covington v. Great Basin Unified Air Pollution Control District* (Dec. 23, 2019) Cal.App.5th,** the Court of Appeal determined that "compliance with performance standards is a substitute for substantial evidence to support a finding of mitigation."

The approval of the PLN18-0036 includes the implementation of the aforementioned General Plan Policies and Actions as well as the aforementioned Condition of Approval 14 – Water Conservation which meets this standard and no additional mitigation measures are required.

Comment II.B.ix) The Appellants claim that design features should be included as mitigation measures They claim their analysis demonstrates that the Project would result in potentially significant air quality, health risk, and GHG impacts that should be mitigated further. The Appellants recommend that the Checklist implement all Project Design Features ("PDFs") and regulatory compliance measures, such as the inclusion of Tier 4 Interim emissions standards, low-flow appliances, and water efficient irrigation systems, as formal mitigation measures. If the design feasures were adopted as mitigation measures, then there would be a guarantee that these measures would be implemented, monitored, and enforced on the Project site. Including formal mitigation measures by properly committing to their implementation would result in verifiable emissions reductions that may help reduce emissions to less-than-significant levels.

Response to Comment II.B.ix) In its deliberations during ***Covington v. Great Basin Unified Air Pollution Control District*** **(Dec. 23, 2019) Cal.App.5th,** the Court of Appeal determined that "compliance with performance standards is a substitute for substantial evidence to support a finding of mitigation."

The approval of the PLN18-0036 includes the implementation of the aforementioned General Plan Policies and Actions as well as the aforementioned Condition of Approval 14 – Water Conservation and 83 – Air Quality which meet this standard and no additional mitigation measures are required.

The Appellants claim that as a result of their above claims, an Infill EIR is required to remedy their allegations that there are significant deficiencies in the construction and operational emission analysis. In our review of their comments, we find no new information which meets the substantial evidence test to require additional analysis through an EIR.

Comment II.C - The Project Will Cause New Significant and Unmitigated Health Risk Impacts

Comment Summary

The Project exceeds allowable Cancer Risk thresholds. The Project's unmitigated construction health risk assessment indicates that the Project would pose an excess cancer risk of 54.7 in one million to people living nearby. The Infill Environmental Checklist conflates analysis and mitigation by concluding that impacts would be less than significant because Uniformly Applicable Development Policies would decrease cancer risk impacts to the off-site residential MEIR from 54.7 in a million to 4.9 in a million. The Infill Environmental Checklist states: "The proposed Project would not include stationary sources that emit TACs. The approximately 23,000-sf grocery store would generate 8 to 10 truck trips of various size per day. This amount of heavy-duty truck trips would not be a significant source of diesel particulate matter (DPM). Therefore, the proposed Project would not expose sensitive receptors to substantial concentrations of air pollutant emissions during operation. Impacts would be less than significant and would not be more significant than described in the prior EIR" (p. 4-19).

Comment II.C.i) The Infill Environmental Checklist contains no mitigation to address the Project's operational health risk, and that the Project's construction-related health risk would not be substantially mitigated by the Uniformly Applicable Development Policies because the Checklist applied Tier 4 Interim emissions reductions in its health risk modeling which is not required by the City's Standard Conditions of Approval.

Response to Comment II.C.i) The Project's unmitigated construction health risk level of 54.7 in a million reflects the default construction model year distribution contained in CalEEMod. This model year distribution reflects data from the statewide emissions inventory—CARB's OFFROAD model, which in turn reflects the effects of CARB's Regulation for In-Use Off-Road Diesel-Fueled Fleets Rule, but not the use of only Tier 4 Interim engines. When the use of Tier 4 Interim engines is evaluated, construction-related health risk declines to 4.9 in one million, which is below BAAQMD's threshold of significance of 10 in one million. The use of Tier 4 Interim engines will be required by the method described above under Response to Comment II.B.vii.

Comment II.C.ii) The Infill Environmental Checklist states "The approximately 23,000-sf grocery store would generate 8 to 10 truck trips of various size per day. This amount of heavy-duty truck trips would not be a significant source of diesel particulate matter (DPM)." This statement is not supported by substantial evidence.

Response to Comment II.C.ii) The commenter states that substantial evidence has not been provided supporting that the the health risk from 8 to 10 truck trips per day visiting the grocery store would not cause a significant health risk due to emissions of DPM. Regarding the impact of health risk from Toxic Air Contaminants, Section 5.2.4 of the BAAQMD CEQA Guide addresses sources not requiring a BAAQMD permit (e.g., development projects) and references BAAQMD's *Recommended Methods for Screening and Modeling Local Risks and Hazards* (May 2012).[3] Section 2.1 of the referenced guidance addresses the process of identifying sources that have the potential to create significant operational health risk impacts. These are divided into "common sources," "complex sources," and "minor, low-impact sources."

For sources in the third category — "minor, low-impact sources" — the guidance states "that [they] do not pose a significant health impact even in combination with other nearby sources" as determined "through extensive modeling, source tests, and evaluation of their TAC emissions." The guidance also states that "sources that meet these criteria can be excluded from the CEQA process."

Included in the "minor, low-impact sources" category are "Roads with less than 10,000 total vehicles per day and less than 1,000 trucks per day." Therefore, the 8-10 truck trips per day visiting the grocery store is Project information that is presented in the Project Description, which meets the standards of substantial evidence in CEQA Guidelines Section 15384, and further is substantially below a level of truck activity that would trigger further evaluation of health risk impacts under CEQA through an EIR.

Comment II.E - The Project Will Cause New Significant and Unmitigated GHG Emission Impacts

Comment Summary

The Infill Environmental Checklist estimates that the Project would generate net annual construction-related and operational GHG emissions of 472 metric tons of carbon dioxide equivalents per year ("MT CO2e/year") (see excerpt below) (p. 4-55, Table 4-8). The Checklist's conclusion that GHG emissions will be less than significant is not based on substantial evidence due to:

[3] Available at: https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/risk-modeling-approach-may-2012.pdf?la=en

Comment II.E.i) Unsubstantiated changes to CO2, CH4 and N2O intensity factors. Although the Checklist states that "Electrical needs to the Project site would be provided by East Bay Clean Energy (EBCE). EBCE obtains electricity from conventional and renewable sources throughout California. In 2019, 59.9 percent of the electricity from EBCE's Bright Choice Power Mix was generated from renewable energy sources; 25.3 percent from large hydroelectric generators; 1.5 percent from nuclear sources; and 13.3 percent from other and unspecified sources" (p. 4-42). The 2019 EBCE Power Content Label fails to provide the revised intensity factors. Furthermore, review of the 2019 EBCE Power Content Label demonstrates that East Bay Clean Energy provides four categories of power mixes (Renewable 100, Brilliant 100, Bright Choice, and 2019 CA Power Mix). Without additional information regarding which power mix the Project would use, we cannot verify the revised intensity factors. As a result, the changes remain unsupported.

Response to Comment II.E.i) Please see tabs 9a, 9b, and 9c of the attached "COSL-04.1 Assumptions" file (Attachment 3). The EBCE carbon intensity factors are based on the 2019 EBCE power mix and the 2016 eGrid data for powerplants; this meets the standards of substantial evidence in CEQA Guidelines Section 15384.

Comment II.E.ii) The Infill Environmental Checklist relies upon the Project's consistency with CARB's 2017 Scoping Plan to determine Project GHG significance (p. 4-56 – 4-57). However, this is incorrect, as the Checklist fails to consider performance-based measures proposed by CARB. SWAPE compares the 2017 Scoping Plan daily VMT per capita values against the daily VMT per capita values for the Project based on the Checklist's modeling and claims the Checklist's modeling shows that the Project exceeds the CARB 2017 Scoping Plan projections for 2010, 2023, and 2030. The Appellants then conclude that because the Project exceeds the CARB 2017 Scoping Plan performance-based daily VMT per capita projections, the Project conflicts with the CARB 2017 Scoping Plan and SB 375.

Response to Comment II.E.ii) The commenter states that it is incorrect for the Project to rely on consistency with CARB's 2017 GHG Scoping Plan in determining that the project's GHG emissions would not be more significant that those described in the 2035 General Plan EIR. The commenter then performs a VMT-per-capita comparison of the Project in isolation against VMT-per-capital projections in the Scoping Plan, claiming that the Project's ratio is higher than the Scoping Plan's ratio for calendar years 2010, 2023, and 2030. The comparison is made for light-duty vehicles only.

This is an inappropriate comparison for two reasons:

First, the comparison incorrectly attributes 100 percent of the Project's VMT (as calculated by CalEEMod) to the Project's 560 new residents, 8 residential staff, and 53 new employees, i.e., the proposed Project's "service population." This ignores the fact that the Project's 23,189 square foot (SF) of ground-floor grocery store and 5,660 SF of additional ground-floor retail space (comprising over 85% of Project VMT) will be used by both existing and new service population.

If applied on a project-specific basis, this type of comparison would result in vastly different VMT-to-service population ratios for mixed use projects depending on the relative fractions of residential, retail, and commercial space. It is for this reason that metrics involving service population can only be applied at a plan level, such as BAAQMD's CO_2e service population GHG efficiency threshold for plan-level operational impacts.

Second, the method in which VMT is calculated within CalEEMod differs from that used in CARB's 2017 Scoping Plan. CalEEMod utilizes trip generation rates based on the Institute for Transportation Engineers (ITE) Trip Generation Manual. In contrast, the 2017 Scoping Plan relies on trip generation rates from CARB's EMFAC model. Because the ITE Trip Generation Manual provides trip generation rates based on land use and, in contrast, EMFAC provides trip generation rates based on geography and vehicle class, the trip generation rates (and hence VMT ratios) are not directly comparable.

SUMMARY OF FINDINGS

The Appellants claim through comments II.B, II.C and II.E that an Infill EIR is required to remedy their allegations of significant deficiencies in the Infill Environmental Checklist. In reviewing and responding to the Appellant comments II.B, II.C and II.E, Trinity finds no new information which meets the substantial evidence test to require additional analysis through an EIR. Trinity further finds there is legally sufficient substantial evidence provided in the Infill Environmental Checklist, as supported by the Air Quality Technical Report, its supporting references (Attachments 1 and 2) and review of its emissions workbook (Attachment 3) to meet CEQA Guidelines requirements as supported by case law (as previously cited).

We appreciate the opportunity to support The Martin Group and the City of San Leandro with these responses to appeal comments IIB, II.C and II.E. Please let us know if you have any questions or additional requests.

Sincerely,
TRINITY CONSULTANTS, INC.

Valerie Rosenkrantz
Managing Consultant

Allan Daly
Senior Consultant

Attachments
c: Jim Lyons, Trinity Consultants, Inc.

ATTACHMENT 1 – NORESCO: 2019_IMPACT_ANALYSIS_FINAL_REPORT_2018-06-29

IMPACT ANALYSIS

2019 Update to the California Energy Efficiency Standards for Residential and Non-Residential Buildings

Contract 400-15-006, Work Authorization 9, Task 2.2

Prepared for:

California Energy Commission
1516 9th Street
Sacramento, CA 95814

Prepared by:

Non-Residential

NORESCO
475 Sansome Street, Suite 500
San Francisco, CA 94111

Residential

Ken Nittler, P.E.
Enercomp

Prepared on:

June 29, 2018

ACKNOWLEDGEMENTS

This report was prepared by NORESCO as part of the 2019 Non-residential Technical Support project. Residential energy savings estimates and residential narratives were prepared by Ken Nittler as part of the 2019 Residential Support project for prime contractor Bruce Wilcox, P.E. NORESCO developed the estimates of non-residential energy and demand savings, prepared the non-residential portions of the report, and incorporated the residential content developed by Mr. Nittler. Special thanks to the significant contributions from the following individuals.

Primary Author(s):

NORESCO (Non-residential)

Dimitri Contoyannis, Skye Lei, Chitra Nambiar, John Arent, Silas Taylor, Nikhil Kapur

Enercomp (Residential)

Ken Nittler

Contributing Agencies and Consultants:

Energy Solutions

Heidi Hauenstein, Rahul Athalye

Frontier Energy

Alea German

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

1 EXECUTIVE SUMMARY

This report estimates the statewide impacts of 2019 changes to the California Energy Efficiency Standards on a regional and statewide basis. This impact analysis draws from changes approved in the 2019 Standards 15-day code language published by the California Energy Commission (Energy Commission) on April 20, 2018 with subsequent changes adopted on May 18, 2018.

The total estimated impact of the 2019 updates incorporates both the residential and non-residential building sectors. Within each sector, the Standards affect both newly constructed buildings as well as alterations to existing buildings. Table 1 summarizes the first-year electricity, peak demand and natural gas savings by building sector and construction activity. Based on this analysis, the 2019 updates to the Standards are estimated to result in approximately 1,419 GWh in electricity savings and 353.1 MW in peak demand reduction. In addition, this analysis reveals that natural gas consumption may be reduced by 0.02 million therms. The savings will accumulate as the Standards affect each subsequent year of construction.

More detail on energy savings is provided in the following tables. Electricity energy savings are summarized in Table 2, electric demand savings in Table 3, and natural gas savings in Table 3.

Table 1 – Total Energy Savings Summary

	Electricity		Demand		Gas
	Savings (GWh)	Percent of Total	Savings (MW)	Percent of Total	Savings (millions therms)
Single-Family Newly Constructed Buildings and Alterations	596	42%	50.4	14%	4.42
Multi-Family Newly Constructed Buildings and Alterations	91	6%	4.1	1%	0.25
Nonresidential Newly Constructed Buildings	197	14%	76.6	22%	0.27
Nonresidential Alterations	536	38%	222.0	63%	-4.92
Grand Total	**1,419**	**100%**	**353.1**	**100%**	**0.02**

1.1 Low-rise Residential Newly Constructed Buildings and Alterations

The first-year savings for single-family homes are 596 GWh of electricity, 50.4 MW of demand and 4.42 million therms of gas. For low-rise multi-family buildings, the first-year electricity savings are 91 GWh, 4.1 MW of demand, and 0.25 million therms of gas.

On a percent savings basis compared to the 2016 standards, the single-family savings are 79% of electricity, 17% of demand and 9% of gas. For low-rise multi-family, savings are 79% of electricity, 11% of demand and 5% of gas.

These savings include the impact of photovoltaic systems on new construction homes. For the impact of energy efficiency measures only on new construction homes, please refer to Section 2.4 Analysis and Detailed Results under Low-rise Residential.

Low-rise single-family estimates are based on 117,069 housing starts each year, and low-rise multi-family estimates are based on 30,067 dwelling units. Energy savings for low-rise residential were calculated using the prototype approach similar to the method used for previous standards updates. The savings for each prototype in each climate were weighted by estimated annual housing starts in each climate to yield an estimate of statewide savings.

1.2 Non-residential Newly Constructed Buildings

The first-year savings for newly constructed non-residential buildings are 197 GWh of electricity, 76.6 MW of demand, and 0.27 million therms of gas, representing reductions from the 2016 Standard of 10.7%, 9%, and 1%, respectively. The savings for non-residential buildings were calculated using the Non-Residential Construction Forecast dataset, which predicts 176 million square feet of non-residential new construction in 2020 and multifamily residential forecast for High Rise Residential Multi-Family which predicts 17 million square feet of new construction in 2020. The total square footage for all non-residential construction buildings is predicted to be 193 million square feet. Sixteen building prototypes were used to predict energy savings. The EnergyPlus models generated from CBECC-Com were parameterized such that changes at run time would result in buildings that were compliant with the 2016 standards by all 16 climate zones, or would include any or all of the measures added to the 2019 standard. When all measures are included, the result is a building which is compliant with the 2019 standard. The results of these simulations were then weighted by forecast construction of building type and climate zone to determine statewide energy consumption for new construction.

1.3 Alterations to Existing Non-residential Buildings

Savings for alterations to existing buildings are significantly greater than the savings for new construction in both electricity savings and demand reduction. First-year electricity savings are expected to be 536 GWh, first-year demand reduction is 222 MW and first-year gas savings are –4.92 million therms for alterations. Nearly all of the energy savings for alterations can be attributed to improvements in lighting, with less than 1% resulting from increased HVAC equipment efficiency requirements. The negative savings in natural gas result primarily from the interactive effects with reduced lighting load.

Table 2 – Summary of First-Year Electricity Savings (GWh)

	2016	2019	Savings	Percent Savings	Percent of Total Savings
Single-Family Newly Constructed & Alterations	754	158	595.7	79.0%	42.0%
Low-rise Multi-Family Newly Constructed & Alterations	115	25	90.6	78.7%	6.4%
Indoor Lighting Power Densities	1,839	1,709	130.6	7.1%	9.2%
Indoor Lighting Manual ON Time-Switch		1,839	0.4	0.0%	0.0%
Indoor Occupant Sensing Light Controls in Restrooms		1,838	1.2	0.1%	0.1%
Outdoor Lighting Controls - Scheduling Controls		1,837	2.3	0.1%	0.2%
Outdoor Lighting Controls - Bi-Level, Remove 75 Watt Threshold		1,836	3.0	0.2%	0.2%
Fan System Power		1,830	9.8	0.5%	0.7%
Equipment Efficiency		1,839	0.4	0.0%	0.0%
Waterside Economizers		1,839	0.2	0.0%	0.0%
Transfer Air for Exhaust Air Makeup		1,839	0.4	0.0%	0.0%
Demand Controlled Ventilation for Classrooms		1,836	3.0	0.2%	0.2%
Occupant Sensor Ventilation Requirements		1,819	21.0	1.1%	1.5%
Cooling Tower Minimum Efficiency		1,839	0.1	0.0%	0.0%
Economizer Fault Detection Diagnostics		1,839	0.9	0.0%	0.1%
Variable Exhaust Flow Control and High Efficiency Fume Hoods		1,832	7.8	0.4%	0.5%
Adiabatic Condensers (Option B)		1,839	0.7	0.0%	0.0%
Outdoor Lighting Power Allowance		1,824	15.8	0.9%	1.1%
2019 Total New Construction		1,642	197	10.7%	13.9%
Lighting Alterations	12,046	11,529	518	4.3%	36.5%
Indoor Lighting Manual ON Time-Switch			1	N/A	0.1%
Outdoor Lighting Controls - Scheduling Controls			7	N/A	0.5%
Outdoor Lighting Controls - Bi-Level, Remove 75 Watt Threshold			9	N/A	0.6%
HVAC Alterations	4,517	4,516	1	0.0%	0.1%
2019 Alterations Total			536	N/A	37.7%
2019 Total			**1,419**	**N/A**	**100.0%**

Table 3 – Summary of First-Year Electric Demand Savings (MW)

	2016	2019	Savings	Percent Savings	Percent of Total Savings
Single-Family Newly Constructed & Alterations	297.2	247	50.44	17.0%	14.3%
Low-rise Multi-Family Newly Constructed & Alterations	37.6	34	4.07	10.8%	1.2%
Indoor Lighting Power Densities	847.6	802.4	45.2	5.3%	12.8%
Indoor Lighting Manual ON Time-Switch		847.6	0.0	0.0%	0.0%
Indoor Occupant Sensing Light Controls in Restrooms		847.1	0.4	0.1%	0.1%
Outdoor Lighting Controls - Scheduling Controls		847.6	0.0	0.0%	0.0%
Outdoor Lighting Controls - Bi-Level, Remove 75 Watt Threshold		847.4	0.2	0.0%	0.0%
Fan System Power		844.3	3.3	0.4%	0.9%
Equipment Efficiency		847.2	0.4	0.0%	0.1%
Waterside Economizers		847.6	0.0	0.0%	0.0%
Transfer Air for Exhaust Air Makeup		846.7	0.9	0.1%	0.2%
Demand Controlled Ventilation for Classrooms		836.8	10.8	1.3%	3.1%
Occupant Sensor Ventilation Requirements		839.0	8.6	1.0%	2.4%
Cooling Tower Minimum Efficiency		847.4	0.1	0.0%	0.0%
Economizer Fault Detection Diagnostics		846.5	1.1	0.1%	0.3%
Variable Exhaust Flow Control and High Efficiency Fume Hoods		845.9	1.7	0.2%	0.5%
Adiabatic Condensers (Option B)		847.5	0.1	0.0%	0.0%
Outdoor Lighting Power Allowance		843.6	4.0	0.5%	1.1%
2019 Total New Construction		770.9	76.6	9.0%	21.7%
Lighting Alterations	5,547	5,326	220.8	4.0%	62.5%
Indoor Lighting Manual ON Time-Switch			0.0	N/A	0.0%
Outdoor Lighting Controls - Scheduling Controls			0.0	N/A	0.0%
Outdoor Lighting Controls - Bi-Level, Remove 75 Watt Threshold			0.0	N/A	0.0%
HVAC Alterations	2,080	2,079	1	0.1%	0.3%
2019 Alterations Total			222.0	N/A	62.9%
2019 Total			**353.1**	**N/A**	**100.0%**

Table 4 – Summary of First-Year Gas Savings (millions Therms)

	2016	2019	Savings	Percent Savings
Single-Family Newly Constructed & Alterations	46.97	43	4.42	9.4%
Low-rise Multi-Family Newly Constructed & Alterations	5.29	5	0.25	4.7%
Indoor Lighting Power Densities	27.88	28.15	-0.27	-
Indoor Lighting Manual ON Time-Switch		27.88	0.00	-
Indoor Occupant Sensing Light Controls in Restrooms		27.88	0.00	-
Outdoor Lighting Controls - Scheduling Controls		27.88	0.00	-
Outdoor Lighting Controls - Bi-Level, Remove 75 Watt Threshold		27.88	0.00	-
Fan System Power		27.89	-0.01	-
Equipment Efficiency		27.88	0.00	-
Waterside Economizers		27.88	0.00	-
Transfer Air for Exhaust Air Makeup		27.85	0.03	-
Demand Controlled Ventilation for Classrooms		27.63	0.25	-
Occupant Sensor Ventilation Requirements		27.61	0.27	-
Cooling Tower Minimum Efficiency		27.88	0.00	-
Economizer Fault Detection Diagnostics		27.87	0.01	-
Variable Exhaust Flow Control and High Efficiency Fume Hoods		27.88	0.00	-
Adiabatic Condensers (Option B)		27.88	0.00	-
Outdoor Lighting Power Allowance		27.88	0.00	-
2019 Total New Construction		27.61	0.27	-
Lighting Alterations	180	185	-4.92	-
Indoor Lighting Manual ON Time-Switch			0.00	-
Outdoor Lighting Controls - Scheduling Controls			0.00	-
Outdoor Lighting Controls - Bi-Level, Remove 75 Watt Threshold			0.00	-
HVAC Alterations	67	67	0.00	-
2019 Alterations Total			-4.92	N/A
2019 Total			**0.02**	**N/A**

1.4 Emissions

The standard is expected to have a significant impact on reducing greenhouse gas and other air emissions. The estimates are shown in Table 5. Carbon dioxide, one of the more significant greenhouse gases, would be reduced by 683,506 tons each year. The emissions reductions are estimated based on the statewide emission factors provided by the Energy Commission.

Table 5 – Summary of Air Emissions Reductions

	Emission Reductions				
	NO_X (lb)	SO_X (lb)	CO (lb)	CO_2 (tons)	$PM_{2.5}$ (lb)
Single-Family Newly Constructed Buildings and Alterations	69,919	4,422	60,308	312,062	16,302
Multi-Family Newly Constructed Buildings and Alterations	6,846	648	7,558	45,024	2,172
Nonresidential Newly Constructed Buildings Total	**12,514**	**1,398**	**15,456**	**96,653**	**4,542**
Electricity	10,072	1,382	14,417	95,094	4,345
Gas	2,442	16	1,039	1,558	197
Nonresidential Alterations Total	**-16,717**	**3,468**	**20,359**	**229,767**	**8,222**
Electricity	27,314	3,749	39,096	257,872	11,782
Gas	-44,031	-281	-18,736	-28,105	-3,560
Grand Total	**72,562**	**9,936**	**103,682**	**683,506**	**31,239**

2 LOW-RISE RESIDENTIAL NEWLY CONSTRUCTED BUILDINGS AND ALTERATIONS

The following sections describe the significant 2019 changes made to the residential standards, the methods used to evaluate the energy and demand impacts, and the results of the analysis.

2.1 Standards Requirements

The changes to the Standards that result in savings are described in the following sections. Compliance options or "credits" are not considered since these are assumed to be energy neutral. The changes to ventilation and indoor air quality and the modeling of high solar heat gain climate zones as well as any updates to background assumptions in CBECC-Res are treated as modeling assumptions with the same values applied for all modeling in this analysis.

2.2 Measures Included in Analysis

The following measures that can be modeled with Alternative Calculation Method (ACM) algorithms are included in this analysis.

Table 6 – Low-Rise Residential Measure List

Measure	Single-Family	Multi-Family
High Performance Walls	R21 insulation between the framing plus R5 sheathing insulation in climate zones 1-5 and 8-16	No change to U-factor
High Performance Attics	R38 ceiling insulation with R19 below roof deck insulation in climate zones 4, 8, 9 and 10-16	R38 ceiling insulation with R19 below roof deck insulation for tile roofs in climate zones 4, 8, 9 and 11-15
High Performance Windows	0.30 U-factor in all climate zones. 0.23 SHGC in climate zones 2, 4 and 6-15. 0.35 SHGC assumed in climate zones 1, 3, 5 and 16[1]	Same as Single-Family
High Performance Doors	0.20 U-factor in all climate zones	Same as Single-Family
Quality Insulation Installation	Improved in all climate zones	Improved in climate zones 1-6 and 8-16
Air-handling Unit Fan Efficacy	0.45 W/CFM for gas furnace air-handling units in all climate zones	Same as Single-Family
Photovoltaic (PV) Requirements	PV sized in accordance with ACM requirements to offset total kWh energy use.	Same as Single-Family

2.3 Methodology

2.3.1 Prototype Buildings

The energy and electric demand impact of implementing the 2019 building heating, cooling and water heating requirements is estimated through the use of three prototype buildings: a 2,100 ft^2 one story home, a 2,700 ft^2 two story home and a 6,960 ft^2 two story 8 dwelling multifamily building. These prototypes were also used in the development of the 2016 standards. Each prototype building is made to minimally comply with the 2016 and the 2019 Standards. The prototypes are described in Appendix A of the Alternative Calculation Method Approval Manual.

2.3.2 Glazing Area

The prototype glazing area is 20% of the floor area for single-family and 15% for multifamily. The glazing is distributed equally on the north, east, south and west orientations.

2.3.3 Computer Modeling

Heating, cooling, and water heating energy use is modeled using the Commission's 2019 CBECC-Res research software. This software is used on estimates for both the 2016 and 2019 standards to establish the savings so there is a valid comparison of the prescriptive feature differences, not software differences. 2019 TDV values are used in all calculations.

2.3.4 Energy Design Ratings (EDR)

Compliance with the 2019 standards for newly constructed buildings will be determined using Energy Design Rating (EDR) values that are based on TDV energy. The Energy Design Rating (EDR) has two components, the Energy Efficiency Design Rating, and the Solar Electric Generation and Demand Flexibility Design Rating. The Solar Electric Generation and Demand Flexibility Design Rating shall be subtracted from the Energy Efficiency Design Rating to determine the Total Energy Design Rating. The Proposed Building shall separately comply with the Energy Efficiency Design Rating and the Total Energy Design Rating. While the energy savings in this analysis are presented in traditional quantities like kTDV/ft2, kWh and therms, EDR values are included in the tables below where appropriate.

2.3.5 Photovoltaic (PV) Energy

Compliance with the 2019 standards for newly constructed buildings also requires the installation of solar photovoltaic systems. Where appropriate, the size of the PV system in kWdc is included in the tables below.

2.3.6 Housing Starts

Table 7 shows the estimated housing starts for both low-rise single-family and low-rise multi-family buildings in 2020.The multi-family values are the number of dwelling units in each climate zone.

Table 7 – Estimated Low-Rise Housing Starts by Climate Zone

Climate Zone	Single-Family	Multi-Family
1	465	111
2	3,090	1,318
3	11,496	2,831
4	7,435	1,089
5	1,444	747
6	6,450	1,400
7	5,779	3,939
8	9,948	1,899
9	12,293	4,419
10	18,399	2,897
11	3,947	522
12	19,414	4,935
13	7,034	1,309
14	3,484	756
15	3,203	454
16	3,188	1,441
Total	117,069	30,067

2.3.7 Weighting

The analysis is completed for all 16 California climate zones, and the results are then weighted by the estimated number of housing starts in each zone for each prototype. For single-family, 45% of the homes are weighted as the 2100 ft^2 prototype and 55% as the 2700 ft^2 prototype. When Statewide results are shown, they are weighted by the building starts in each climate zone to give a more representative statewide result than a simple average.

2.3.8 Additions and Alterations

The projected savings for newly constructed homes are increased by 28% to account for additions and alterations to existing homes except for savings due to PV that do not apply for additions and alterations. The adjustment is equal to the dollar value of residential addition and alterations construction divided by total new construction for 2016 as reported by the Construction Industry Research Board (CIRB).

2.4 Analysis and Detailed Results

2.4.1 Prototype TDV Savings

Tables 8 through 10 show the first-year $kTDV/ft^2$ savings by end use and climate zone for each of the prototype buildings. End uses not shown were not affected by changes in the 2019 standards.

Table 8 – 2,100 ft² Single-Family First- Year TDV Savings by Climate Zone and End Use (kTDV/ ft²)

Climate Zone	Space Heating	Space Cooling	Efficiency Total	Photovoltaics	Total With PV
1	9.90	0.00	9.90	43.65	53.55
2	4.67	1.19	5.86	43.45	49.33
3	5.22	0.00	5.22	42.20	47.41
4	3.65	0.30	3.95	43.10	47.09
5	5.38	0.00	5.38	42.18	47.55
6	2.04	1.30	3.34	41.56	44.91
7	1.11	0.39	1.50	41.42	42.93
8	1.50	5.01	6.51	44.18	50.71
9	1.98	6.61	8.59	45.69	54.30
10	2.32	6.51	8.83	45.30	54.14
11	4.76	9.82	14.58	56.76	71.35
12	4.73	6.89	11.62	46.90	58.54
13	4.19	10.64	14.83	56.86	71.70
14	4.57	8.93	13.50	53.90	67.40
15	0.68	19.78	20.46	83.89	104.34
16	10.41	0.73	11.14	43.17	54.32
Statewide	3.48	5.22	8.70	46.91	55.62

Table 9 – 2,700 ft² Single-Family First -Year TDV Savings by Climate Zone and End Use (kTDV/ft²)

Climate Zone	Space Heating	Space Cooling	Efficiency Total	PV	Total With PV
1	8.49	0.00	8.49	38.79	47.28
2	4.11	2.11	6.22	39.18	45.42
3	4.55	0.00	4.55	37.81	42.35
4	3.29	3.08	6.37	39.05	45.45
5	4.63	0.00	4.63	37.79	42.40
6	1.68	1.29	2.97	37.64	40.62
7	0.89	0.52	1.41	37.36	38.77
8	1.35	4.61	5.96	40.61	46.58
9	1.77	5.92	7.69	42.29	49.99
10	2.04	6.02	8.06	42.15	50.21
11	4.20	9.22	13.42	53.30	66.73
12	4.14	6.36	10.50	43.42	53.94
13	3.73	9.73	13.46	53.40	66.87
14	4.06	8.24	12.30	50.73	63.03
15	0.76	17.34	18.10	76.93	95.02
16	9.28	0.65	9.93	39.82	49.75
Statewide	3.06	5.00	8.05	43.19	51.25

Table 10 – 6,960 ft² Multi-Family TDV Savings by Climate Zone and End Use (kTDV/ft²)

Climate Zone	Space Heating	Space Cooling	Efficiency Total	PV	Total With PV
1	5.81	0.00	5.81	70.22	75.91
2	3.05	1.77	4.82	72.44	77.22
3	2.70	0.05	2.75	69.73	72.37
4	2.21	3.12	5.33	72.69	78.01
5	2.53	-0.43	2.10	69.89	71.83
6	0.84	1.46	2.30	70.58	72.82
7	0.05	1.08	1.13	70.28	71.41
8	0.47	3.88	4.35	75.88	80.18
9	0.81	5.35	6.16	77.31	83.43
10	1.02	5.09	6.11	76.64	82.70
11	3.03	7.82	10.85	90.14	100.96
12	2.98	5.67	8.65	79.70	88.33
13	2.66	8.53	11.19	89.58	100.74
14	2.93	7.10	10.03	85.78	95.78
15	0.09	14.64	14.73	114.10	128.78
16	6.94	0.63	7.57	72.35	79.85
Statewide	1.91	3.78	5.69	76.30	81.95

2.4.2 Prototype Energy Savings

Tables 11 through 13 show the first-year Therm, kWh and demand savings by climate zone for each of the prototype buildings. The kWh and demand values to the right include the contribution by PV.

Table 11 – 2,100 ft² Single-Family Energy Savings

Climate Zone	Gas (Therms)	Electricity (kWh)	Demand (kW)	Electricity With PV (kWh)	Demand with PV (kW)
1	81	150	0.00	4,190	0.11
2	36	85	0.06	4,066	0.13
3	42	70	0.00	3,990	0.08
4	28	65	0.02	4,013	0.09
5	44	68	0.00	3,979	0.05
6	16	44	0.06	3,970	0.11
7	9	17	0.04	3,895	0.07
8	12	101	0.26	4,197	0.30
9	16	165	0.35	4,469	0.39
10	19	205	0.36	4,624	0.39
11	37	400	0.41	5,492	0.50
12	37	191	0.40	4,393	0.47
13	33	436	0.45	5,671	0.53
14	36	370	0.40	5,405	0.44
15	6	884	0.73	9,016	0.79
16	81	177	0.08	4,323	0.15
Statewide	27	187	0.26	4,563	0.32

Table 12 – 2,700 ft² Single-Family Energy Savings

Climate Zone	Gas (Therms)	Electricity (kWh)	Demand (kW)	Electricity With PV (kWh)	Demand with PV (kW)
1	91	152	0.00	4,769	0.12
2	41	109	0.09	4,725	0.18
3	48	72	0.00	4,589	0.09
4	33	101	0.18	4,703	0.26
5	50	69	0.00	4,573	0.06
6	17	51	0.08	4,624	0.13
7	10	22	0.04	4,522	0.07
8	14	122	0.26	4,965	0.30
9	18	207	0.40	5,332	0.45
10	21	253	0.40	5,545	0.44
11	42	474	0.50	6,628	0.60
12	41	248	0.44	5,255	0.52
13	37	506	0.55	6,834	0.64
14	41	441	0.47	6,542	0.52
15	8	1,046	0.83	10,640	0.89
16	93	201	0.09	5,122	0.17
Statewide	31	228	0.31	5,411	0.38

Table 13 – 6,960 ft² Multi-Family Energy Savings

Climate Zone	Gas (Therms)	Electricity (kWh)	Demand (kW)	Electricity With PV (kWh)	Demand with PV (kW)
1	163	201	-0.01	21,705	0.58
2	82	212	0.28	22,185	0.69
3	74	55	0.02	21,495	0.44
4	60	278	0.64	22,332	1.02
5	71	20	-0.11	21,461	0.17
6	23	99	0.23	22,181	0.48
7	1	52	0.22	21,856	0.39
8	13	355	0.59	23,691	0.79
9	23	522	0.90	24,662	1.15
10	28	533	0.87	25,305	1.06
11	81	1,031	1.08	27,773	1.53
12	80	613	0.90	24,292	1.30
13	71	1,119	1.24	28,391	1.62
14	79	959	1.04	27,448	1.25
15	3	2,287	1.71	38,731	1.96
16	183	352	0.24	23,355	0.61
Statewide	52	431	0.61	23,973	0.91

2.4.3 Prototype Compliance Results

Tables 14 through 16 show the TDV Percent Savings, Energy Design Ratings and PV system sizes for the prototypes. The percent savings show the percent savings over the 2016 standards and are calculated by taking the 2019 kTDV/ft^2 energy savings divided by the 2016 values. The efficiency percent savings are based on regulated loads only while the Total with PV is based on all home energy loads.

Table 14 – 2,100 ft² Single-Family Percent Savings, Energy Design Ratings and PV Sizes

Climate Zone	Efficiency TDV Percent Savings	Total TDV Percent Savings	Efficiency EDR	Final EDR	PV Size (kWdc)
1	15%	44%	56.4	34.3	3.0
2	13%	49%	47.3	25.5	2.5
3	14%	52%	47.9	24.6	2.5
4	11%	52%	44.4	22.1	2.5
5	15%	52%	45.7	23.1	2.3
6	12%	56%	50.3	23.1	2.5
7	9%	60%	49.5	20.1	2.4
8	20%	59%	47.2	20.9	2.6
9	18%	54%	48.0	24.2	2.6
10	18%	53%	46.9	24.3	2.7
11	17%	52%	45.9	24.8	3.2
12	18%	49%	46.1	26.0	2.7
13	17%	51%	47.3	25.9	3.4
14	17%	51%	47.2	25.7	2.8
15	17%	61%	50.2	22.5	4.9
16	16%	43%	49.7	30.9	2.4
Statewide	16%	53%	47.4	24.2	2.7

Table 15 – 2,700 ft² Single-Family Percent Savings, Energy Design Ratings and PV Sizes

Climate Zone	Efficiency TDV Percent Savings	Total TDV Percent Savings	Efficiency EDR	Final EDR	PV Size (kWdc)
1	16%	47%	51.7	29.8	3.5
2	15%	51%	44.1	23.4	2.9
3	15%	54%	44.7	21.9	2.9
4	17%	53%	43.1	22.0	2.9
5	16%	55%	42.4	20.2	2.7
6	12%	56%	48.6	22.2	2.9
7	9%	61%	47.8	19.1	2.7
8	18%	59%	45.9	20.5	3.1
9	17%	54%	46.1	23.3	3.1
10	16%	52%	45.1	23.4	3.2
11	17%	52%	43.3	23.2	3.9
12	17%	49%	43.6	24.6	3.2
13	16%	51%	44.7	24.3	4.1
14	16%	51%	44.9	24.2	3.4
15	16%	60%	47.2	21.2	5.7
16	15%	44%	47.3	29.1	2.9
Statewide	16%	53%	45.2	23.0	3.2

Table 16 – 6,960 ft² Multi-Family Percent Savings, Energy Design Ratings and PV Sizes

Climate Zone	Efficiency TDV Percent Savings	Total TDV Percent Savings	Efficiency EDR	Final EDR	PV Size (kWdc)
1	12%	54%	58.5	27.9	16.1
2	10%	55%	55.3	25.6	14.0
3	8%	57%	56.0	24.3	13.6
4	11%	56%	55.2	25.1	13.7
5	7%	58%	56.0	24.1	12.7
6	6%	58%	61.8	26.6	14.0
7	4%	58%	63.0	26.6	13.3
8	9%	59%	60.3	25.4	14.7
9	11%	57%	58.8	26.2	14.8
10	10%	56%	57.6	26.5	15.2
11	13%	57%	53.7	24.6	16.8
12	12%	55%	54.6	26.2	15.1
13	13%	56%	54.2	25.5	17.6
14	12%	57%	55.2	25.5	14.7
15	12%	60%	58.8	25.0	21.8
16	12%	51%	56.2	29.1	13.5
Statewide	10%	56%	57.7	26.0	14.6

2.4.4 Statewide Results

Tables 17 through 20 show the first-year energy, demand and emission savings for single-family and multi-family buildings, with and without PV. This data is calculated by taking the weighted prototype savings, applying the adjustment for additions and alterations for all values except PV, then multiplying times the housing starts. The electric demand values in this report were calculated using an 8760 hour file of multipliers and hourly electricity consumption to provide a weighted average contribution to statewide electricity demand. Emissions are calculated from the energy savings using the emission factors shown in Section 8.1.

The percent at the bottom of the tables is the 2019 savings divided by the 2016 values.

Table 17 – Statewide Impact – Single-Family Without PV

Climate Zone	Energy and Demand				Emissions				
	TDV (GTDV)	Gas (Mtherms)	Electricity (GWh)	Demand (MW)	NOx (tons)	SOx (tons)	CO(tons)	PM2.5 (tons)	CO2e (tons)
1	13	0.05	0.09	0.00	0.23	0.00	0.10	0.02	337
2	58	0.15	0.39	0.31	0.70	0.01	0.31	0.06	1,062
3	173	0.67	1.04	0.00	3.00	0.02	1.30	0.25	4,302
4	123	0.29	0.80	1.03	1.34	0.01	0.59	0.12	2,066
5	22	0.09	0.13	0.00	0.39	0.00	0.17	0.03	561
6	63	0.14	0.40	0.57	0.62	0.01	0.28	0.05	973
7	26	0.07	0.14	0.27	0.32	0.00	0.14	0.03	471
8	193	0.17	1.43	3.31	0.79	0.01	0.37	0.08	1,646
9	310	0.27	2.96	5.94	1.28	0.02	0.62	0.13	2,964
10	481	0.47	5.45	9.00	2.25	0.03	1.10	0.23	5,321
11	171	0.20	2.23	2.32	0.96	0.01	0.47	0.10	2,227
12	666	0.97	5.52	10.44	4.50	0.05	2.05	0.41	8,219
13	308	0.32	4.27	4.59	1.52	0.02	0.76	0.16	3,863
14	139	0.17	1.82	1.95	0.82	0.01	0.39	0.08	1,861
15	191	0.03	3.99	3.21	0.23	0.01	0.20	0.05	2,084
16	104	0.36	0.78	0.35	1.62	0.01	0.71	0.14	2,420
Total	3,042	4.42	31.44	43.31	20.57	0.24	9.56	1.94	40,377
Percent	8%	9%	4%	15%	9%	6%	8%	8%	6%

Table 18 – Statewide Impact – Single-Family With PV

Climate Zone	Energy and Demand				Emissions				
	TDV (GTDV)	Gas (Mtherms)	Electricity (GWh)	Demand (MW)	NOx (tons)	SOx (tons)	CO(tons)	PM2.5 (tons)	CO2e (tons)
1	60	0.05	2.12	0.05	0.28	0.01	0.18	0.04	1,313
2	367	0.15	13.77	0.56	1.04	0.05	0.79	0.21	7,505
3	1,285	0.67	49.89	0.94	4.25	0.19	3.09	0.79	27,819
4	861	0.29	32.83	1.59	2.15	0.12	1.76	0.47	17,488
5	162	0.09	6.24	0.08	0.55	0.02	0.39	0.10	3,506
6	681	0.14	28.02	0.89	1.33	0.10	1.28	0.36	14,272
7	576	0.07	24.53	0.47	0.94	0.09	1.03	0.30	12,215
8	1,213	0.17	46.27	3.68	1.93	0.17	2.01	0.57	23,234
9	1,619	0.27	61.41	6.54	2.77	0.22	2.75	0.77	31,109
10	2,429	0.47	95.59	9.70	4.55	0.35	4.39	1.22	48,723
11	697	0.20	24.63	2.69	1.53	0.09	1.28	0.34	13,015
12	2,788	0.97	95.70	11.98	6.80	0.36	5.35	1.40	51,640
13	1,248	0.32	45.33	5.16	2.57	0.17	2.26	0.61	23,630
14	581	0.17	21.41	2.11	1.32	0.08	1.11	0.30	11,290
15	814	0.03	32.61	3.41	0.96	0.11	1.24	0.37	15,864
16	424	0.36	15.35	0.58	1.99	0.06	1.24	0.30	9,438
Total	15,804	4.42	595.69	50.44	34.96	2.21	30.15	8.15	312,062
Percent	43%	9%	79%	17%	15%	56%	26%	32%	49%

Table 19 – Statewide Impact – Multi-Family Without PV

Climate Zone	TDV (GTDV)	Gas (Mtherms)	Electricity (GWh)	Demand (MW)	NOx (tons)	SOx (tons)	CO(tons)	PM2.5 (tons)	CO2e (tons)
	Energy and Demand				Emissions				
1	1	0.00	0.00	0.00	0.01	0.00	0.01	0.00	18
2	7	0.02	0.04	0.06	0.08	0.00	0.03	0.01	120
3	8	0.03	0.02	0.01	0.15	0.00	0.07	0.01	204
4	6	0.01	0.05	0.11	0.05	0.00	0.02	0.00	83
5	2	0.01	0.00	-0.01	0.04	0.00	0.02	0.00	50
6	3	0.01	0.02	0.05	0.02	0.00	0.01	0.00	40
7	5	0.00	0.03	0.14	0.00	0.00	0.00	0.00	20
8	9	0.00	0.11	0.18	0.02	0.00	0.01	0.00	74
9	30	0.02	0.37	0.64	0.08	0.00	0.04	0.01	271
10	20	0.01	0.25	0.40	0.07	0.00	0.03	0.01	194
11	6	0.01	0.09	0.09	0.03	0.00	0.02	0.00	80
12	47	0.06	0.48	0.71	0.30	0.00	0.14	0.03	594
13	16	0.01	0.23	0.26	0.07	0.00	0.04	0.01	198
14	8	0.01	0.12	0.13	0.05	0.00	0.02	0.00	110
15	7	0.00	0.17	0.12	0.01	0.00	0.01	0.00	81
16	12	0.04	0.08	0.06	0.19	0.00	0.08	0.02	280
Total	189	0.25	2.07	2.94	1.17	0.01	0.55	0.11	2,419
Percent	4%	5%	2%	8%	4%	3%	4%	4%	3%

Table 20 – Statewide Impact – Multi-Family With PV

Climate Zone	TDV (GTDV)	Gas (Mtherms)	Electricity (GWh)	Demand (MW)	NOx (tons)	SOx (tons)	CO(tons)	PM2.5 (tons)	CO2e (tons)
	Energy and Demand				Emissions				
1	7	0.00	0.30	0.01	0.02	0.00	0.02	0.00	162
2	90	0.02	3.66	0.13	0.17	0.01	0.17	0.05	1,864
3	180	0.03	7.61	0.16	0.34	0.03	0.34	0.10	3,858
4	75	0.01	3.05	0.16	0.12	0.01	0.13	0.04	1,529
5	47	0.01	2.00	0.01	0.09	0.01	0.09	0.03	1,014
6	89	0.01	3.89	0.10	0.12	0.01	0.15	0.04	1,901
7	246	0.00	10.77	0.22	0.28	0.04	0.39	0.12	5,188
8	134	0.00	5.65	0.23	0.16	0.02	0.21	0.06	2,741
9	327	0.02	13.70	0.78	0.42	0.05	0.53	0.16	6,692
10	213	0.01	9.22	0.47	0.29	0.03	0.36	0.11	4,513
11	47	0.01	1.83	0.12	0.08	0.01	0.08	0.02	920
12	390	0.06	15.09	0.96	0.67	0.05	0.67	0.19	7,627
13	118	0.01	4.70	0.32	0.19	0.02	0.20	0.06	2,347
14	65	0.01	2.62	0.15	0.11	0.01	0.11	0.03	1,316
15	52	0.00	2.23	0.14	0.06	0.01	0.08	0.02	1,077
16	103	0.04	4.22	0.12	0.30	0.02	0.23	0.06	2,275
Total	2,185	0.25	90.55	4.07	3.42	0.32	3.78	1.09	45,024
Percent	45%	5%	79%	11%	13%	58%	26%	34%	52%

3 NON-RESIDENTIAL NEWLY CONSTRUCTED BUILDINGS

3.1 Statewide Building Data Projections

The projection of energy savings for individually modeled buildings to a statewide impact was based on building floor area data and forecasts from the CEC. The Non-Residential Construction Forecast dataset, developed by the Energy Commission's Demand Analysis office, provides floor areas for new construction. Energy Solutions translated the projections from forecast climate zone to Title 24 climate zones. These data are shown in Table 21.

The high-rise apartment data in Table 21 are based on 2020 residential multifamily starts data from Energy Solutions, shown in Table 22. Energy Solutions provided data which gave fractions of the total starts which are high-rise by climate zone. However, the proportion of high-rise residential for the 2019 impact study will be consistent with the 2016 impact study, where it was recommended that the statewide average of 26% be used for all climate zones, due to low confidence in the climate zone specific values. Based on the high-rise apartment prototype, the total average conditioned floor area per dwelling unit is 1,248 ft^2. This includes common area floor space, allocated to the dwelling units. This square footage per unit, in combination with the projected high-rise multifamily starts, is used to project the total square footage for high-rise residential projects.

Table 21 – Projected 2020 Construction by Building Types and Climate Zone from the Non-Residential Construction Forecast (10^6 ft^2)

	California Climate Zone																
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**TOTAL**
Small Office	0.062	0.263	0.859	0.587	0.114	0.788	1.055	1.097	1.076	1.233	0.349	1.871	0.757	0.201	0.270	0.278	10.860
Restaurant	0.021	0.116	0.485	0.264	0.051	0.577	0.317	0.830	0.918	0.802	0.108	0.538	0.250	0.153	0.106	0.170	5.706
Retail	0.108	0.890	3.951	2.138	0.415	3.311	2.042	4.779	5.048	3.831	0.807	4.394	1.789	0.757	0.665	0.957	35.882
Food	0.036	0.234	0.918	0.555	0.108	0.828	0.628	1.189	1.225	1.075	0.275	1.158	0.603	0.204	0.226	0.258	9.519
Warehouse	0.046	0.596	3.573	1.353	0.263	2.717	1.143	3.860	4.133	3.283	0.800	3.759	1.533	0.641	0.718	0.670	29.088
Ref. Warehouse	0.003	0.048	0.231	0.119	0.023	0.118	0.011	0.164	0.138	0.075	0.095	0.279	0.246	0.023	0.021	0.042	1.635
School	0.083	0.412	1.513	0.931	0.181	1.000	1.076	1.459	1.480	2.066	0.538	2.197	1.191	0.376	0.380	0.406	15.288
College	0.035	0.205	0.913	0.461	0.089	0.572	0.471	0.802	0.943	0.689	0.173	0.845	0.346	0.122	0.092	0.209	6.968
Hospital	0.039	0.265	1.047	0.636	0.123	0.632	0.668	0.963	1.369	0.815	0.260	1.237	0.564	0.161	0.113	0.237	9.128
Hotel	0.032	0.296	1.664	0.661	0.128	0.771	0.674	1.108	1.275	0.738	0.179	1.104	0.402	0.139	0.167	0.189	9.527
Large Office	0.069	1.044	6.928	2.343	0.455	4.366	2.200	6.392	8.623	2.170	0.412	4.504	0.790	0.544	0.272	1.247	42.359
Hi-Rise Res.	0.036	0.515	2.747	1.254	0.243	1.101	1.283	1.679	3.372	1.366	0.243	1.962	0.448	0.246	0.148	0.470	17.115
TOTAL	0.571	4.883	24.83	11.30	2.194	16.78	11.56	24.32	29.59	18.14	4.240	23.84	8.918	3.567	3.177	5.131	193.07

Table 22 – Multifamily Data by Climate Zone

CZ	Existing Multifamily Household Units	Existing High-Rise Multifamily Household Units	New Construction Multifamily Housing Units	New Construction High-Rise Multifamily Housing Units
1	3,395,774	2,721	111	29
2	33,513,642	26,854	1,582	413
3	194,606,029	155,934	8,432	2201
4	75,897,612	60,815	3,848	1005
5	14,736,527	11,808	747	195
6	104,592,265	83,808	3,379	882
7	104,317,267	83,588	3,939	1028
8	163,406,088	130,934	5,153	1345
9	303,179,906	242,933	10,350	2702
10	100,854,046	80,813	4,191	1094
11	22,927,180	18,371	747	195
12	141,972,176	113,760	6,023	1572
13	47,800,853	38,302	1,375	359
14	21,199,316	16,987	756	197
15	14,413,958	11,550	454	119
16	39,961,117	32,020	1,441	376
TOTAL	1,386,773,757	1,111,197	52,528	13,714

The Non-Residential Construction Forecast dataset also includes estimates of existing building floor area by building type and climate zone. These data were used to extrapolate savings for alteration projects to statewide savings. These data are shown in Table 23.

The high-rise apartment data in Table 23 are based on 2020 residential multifamily housing units data from Energy Solutions, shown in Table 22. The number of households was converted to floor area using the same procedure that was used for the new housing starts data, described above.

Table 23 – Existing Building Floor Area in 2020 by Building Types and Climate Zone from the Non-Residential Construction Forecast (10^6 ft²)

	California Climate Zone																
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**TOTAL**
Small Office	3	12	39	28	5	39	45	53	48	57	15	75	32	9	12	12	484
Restaurant	1	5	18	10	2	26	13	37	39	37	4	21	10	7	5	7	241
Retail	5	36	151	88	17	152	92	216	209	181	32	179	69	35	28	42	1532
Food	2	10	35	23	4	38	28	54	51	50	11	47	23	9	9	11	406
Warehouse	2	25	132	60	12	141	61	198	188	194	35	160	59	36	35	33	1372
Ref. Warehouse	0	2	9	5	1	6	1	8	6	4	4	12	10	1	1	2	72
School	4	20	77	45	9	67	44	94	84	87	22	92	49	16	14	18	741
College	2	11	45	25	5	38	24	52	55	36	9	42	18	6	4	11	382
Hospital	2	13	53	32	6	40	33	59	71	42	13	63	27	8	6	12	482
Hotel	2	13	61	29	6	42	39	60	59	41	7	47	15	7	7	9	443
Large Office	3	42	254	99	19	186	101	270	325	97	16	176	28	23	11	47	1695
Hi-Rise Res.	3	34	195	76	15	105	104	163	303	101	23	142	48	21	14	40	1387
TOTAL	28	223	1068	520	101	877	585	1265	1438	927	191	1056	389	180	146	243	9237

Not all of the building types included in the Non-Residential Construction Forecast were used for this analysis:

- Hospital was excluded from this impact analysis because the 2019 Standards is the first code cycle to include measures that impact the Hospital building type. Since there is no baseline to compare the measures against, this study did not include the Hospital building type.
- Refrigerated Warehouse was excluded because the energy consumption is dominated by refrigeration equipment for which a well-defined baseline is not available.
- Food was also excluded because of the significance of refrigeration equipment in building energy consumption, although refrigeration is not as dominant as in refrigerated warehouses. While the prototypes do not support refrigeration modeling, NORESCO has included savings based on the CASE report estimates for adiabatic condensers. Please refer to Section 3.8 for more details on the savings for adiabatic condensers.

3.2 Prototype Building Models

The remaining building types were then mapped to a series of prototype building models. The prototypes used are briefly described in Table 24, with additional details included in Appendix 1: Prototype Model Descriptions included with this report.

Table 24 – Summary of Prototype Descriptions Mapped to Construction Forecast Building Type

Construction Forecast Building Type	Description	Prototype	Floor Area (ft²)	Stories	Notes
Small office	Offices less than 30,000 square feet	Small Office	5,503	1	Five zone office model with unconditioned attic and pitched roof.
Restaurant	Any facility that serves food	Small Restaurant	2,501	1	Similar to a fast food restaurant with a small kitchen and dining areas.
Retail	Retail stores and shopping centers	Stand-Alone Retail	24,566	1	Stand Alone store, such as convenience and pharmacy stores.
		Large Retail	240,023	1	Big box retail building, such as national consumer electronic stores.
		Strip Mall	9,376	1	Four unit strip mall retail building. West end unit is twice as large as other three.
		Mixed-Use Retail	9,376	1	Four unit retail representing the ground floor units in a mixed use building. Same as the strip mall with adiabatic ceilings.
Food	Any service facility that sells food and or liquor	Not included			
Non-refrigerated warehouse	Non-refrigerated warehouses	Warehouse	52,050	1	High ceiling warehouse space with small office area.
Refrigerated warehouse	Refrigerated Warehouses	Not included			
Schools	Schools K-12, not including	Small School	24,415	1	Similar to an elementary school with classrooms, support spaces and small dining area.

	colleges	Large School	210,907	2	Similar to high school with classrooms, commercial kitchen, auditorium, gymnasium and support spaces.
College	Colleges, universities, community colleges	Small Office	5,503	1	Five zone office model with unconditioned attic and pitched roof.
		Medium Office	53,633	3	Five zones per floor office building with plenums on each floor.
		Medium Office/Lab	53,633	3	Five zones per floor building with a combination of 27% office and 73% lab spaces.
		Large School	210,907	2	Similar to high school with classrooms, commercial kitchen, auditorium, gymnasium and support spaces.
		High Rise Apartment	94,097	10	75 residential units along with common spaces and a penthouse. Multipliers are used to represent typical floors.
Hospital	Hospitals and other health-related facilities	Not included			
Hotel/motel	Hotels and motels	Hotel	43,206	4	Hotel building with common spaces and 77 guest rooms.
Large offices	Offices larger than 30,000 square feet	Medium Office	53,633	3	Five zones per floor office building with plenums on each floor.
		Large Office	498,637	12	Five zones per floor office building with plenums on each floor. Middle floors represented using multipliers.
High Rise Apartment	High-rise multifamily residential building	HR Apartment	94,097	10	75 residential units along with common spaces and a penthouse. Multipliers are used to represent typical floors.

In addition to the existing prototypes, this analysis involved the creation of new variants of existing CBECC-Com prototypes in order to address the specific building or system needs not currently available in the existing prototypes. The following prototype variants were developed for modeling some of the proposed 2019 Title 24 measures.

Construction Forecast Building Type	Description	Prototype	Floor Area (ft²)	Stories	Notes
Schools	Schools K-12, not including colleges	Small School SPVAC	24,415	1	Similar to an elementary school with classrooms, support spaces and small dining area with packaged vertical air conditioners.
		Small School SPVHP	24,415	1	Similar to an elementary school with classrooms, support spaces and small dining area with packaged vertical heat pumps.

The following table shows the mapping of the existing prototypes to the construction forecast building types. Where multiple building prototypes map to single construction forecast building type, a weighting fraction will be applied as shown in the Table 25.

Table 25 – Correspondence between the California Forecasted Construction and Prototype Buildings

California Forecasted Construction Building Type	Prototype Building Type	Prototype Building Share of CA Forecasted Construction
Small Office	Small Office	100%
Large Office	Large Office	50%
	Medium Office	50%
Restaurant	Small Restaurant	100%
Retail	Stand-Alone Retail	10%
	Large Retail	75%
	Strip Mall	5%
	Mixed-Use Retail	10%
Food	Not included	
Non-refrigerated Warehouse	Warehouse	100%
Refrigerated Warehouse	Not included	
College	Small Office	6%
	Medium Office	16%
	Medium Office/Lab	21%
	Large School	31%
	High Rise Apartment	26%
Hospital	Not included	
Hotel	Small Hotel	100%
High Rise Residential	Large Apartment	100%

Where variants to existing prototypes are required, the weighting fractions for the prototype variants will be based on the CASE reports of applicable measures, while the weighting of the existing prototypes will be proportionately adjusted as shown in Table 26.

Table 26 - Prototype Weighting Adjustments

California Forecasted Construction Building Type	Prototype Building Type	Prototype Building Share of CA Forecasted Construction
School	Small School	18%
	Small School with Single Packaged Vertical Heat Pump (variant)	30%
	Small School with Single Packaged Vertical Air Conditioner (variant)	12%
	Large School	40%

3.3 New Construction Energy Savings Methodology

EnergyPlus, version 8.5, was used to simulate buildings that are compliant with the 2016 and 2019 versions of the Standards, with the differences in energy consumption showing the impact of the changes to the Standards. These models were originally built in CBECC-Com as minimally compliant with Title 24 2016. The EnergyPlus files generated from CBECC-Com were modified to include parameters that would allow them to be made compliant with Title 24-2019, or to represent any of the specific measures added to the 2019 Standards.

Energy consumption by prototype building and climate zone were divided by conditioned floor area to provide energy use intensities (EUIs). These were then multiplied by the 2020 construction forecasts (in millions of square feet) to determine annual energy consumption for new construction in each climate zone under the 2016 or 2019 Standards. Statewide total energy consumption was then found by summing the climate zone specific consumption. The savings attributed to the 2019 Standards is then the difference in consumption between the 2016 and 2019 cases. Energy consumption was calculated as site kWh, site therms, site Btus, and TDV Btus. TDV calculations were done in EnergyPlus, using the 15 year, Non-Res hourly TDV factors for electricity and natural gas for each climate zone.
Calculation of energy use intensity is shown in Equation 1:

$$EUI_{16zp} = E_{16zp} \div CFA_p \qquad (1)$$

where: EUI_{16zp} = Energy Use Intensity of prototype *p*, in climate zone *z* under 2016 Standards,
E_{16zp} = Energy Use of prototype *p*, in climate zone *z* under 2016 Standards, and
CFA_p = Conditioned Floor Area of prototype *p*

EUI_{19zp} would be calculated in the same way using E_{19zp}, the energy use under the 2019 standards.

Calculation of statewide energy consumption for newly constructed buildings of a specific type is shown in Equation 2:

$$ET_{16b} = \sum_{p=1}^{16} \sum_{z=1}^{16} EUI_{16zp} \cdot FA_{zb} \cdot WF_{bp} \qquad (2)$$

where: ET_{16b} = Statewide total energy for building type b under the 2016 Standards,
FA_{zb} = Projected new construction floor area of building type *b*, in climate zone *z*, and
WF_{bp} = Weighting factor for prototype *p* used to represent building type *b* (from Table 16)

ET_{19b} would be calculated in the same way using EUI_{19zp}, the energy use intensity under the 2019 standards.

Total statewide energy savings for new construction is found using Equation 3:

$$Sav_{NC} = \sum_{b=1}^{8} ET_{16b} - \sum_{b=1}^{8} ET_{19b} \qquad (3)$$

where: Sav_{NC} = Total statewide total energy savings for new construction.

Statewide demand reductions were also calculated using climate zone specific hourly demand factors. The hourly energy consumption was multiplied by these factors to calculate a demand impact for the hour. These were summed over the 8,760 hours of the analysis to determine the total demand impact. These demand values were again divided by floor area, and then accumulated in the same manner as the energy consumption to get statewide demand impact under the 2016 and 2019 Standards, with the difference being the demand savings attributed to the 2019 Standards.

All simulations were performed using weather files for representative cities for each of the 16 California climate zones as per 2016 Reference Joint Appendix JA2. The different climate zones were represented by specific weather files, shown in Table 27. These weather files were used in EnergyPlus for the analysis.

Table 27 – California Climate Zone Mapping

Climate Zone (CZ)	Representative City and Weather Station ID
CZ 01	ARCATA_725945
CZ 02	SANTA-ROSA_724957
CZ 03	OAKLAND_724930
CZ 04	SAN-JOSE-REID_724946
CZ 05	SANTA-MARIA_723940
CZ 06	TORRANCE_722955
CZ 07	SAN-DIEGO-LINDBERGH
CZ 08	FULLERTON_722976
CZ 09	BURBANK-GLENDALE_722880
CZ 10	RIVERSIDE_722869
CZ 11	RED-BLUFF_725910
CZ 12	SACRAMENTO-EXECUTIVE_724830
CZ 13	FRESNO_723890
CZ 14	PALMDALE_723820
CZ 15	PALM-SPRINGS-INTL
CZ 16	BLUE-CANYON_725845

3.4 Alterations Energy Savings Methodology

The impact of new systems in existing building undergoing alterations is due to the difference between the 2016 and 2019 standards. Although the systems being replaced are expected to have significantly higher energy consumption than those which are compliant with the 2016 standard, the savings claimed are only the additional savings for improvements beyond those already required by the 2016 standard. The analysis was performed by comparing 2016 compliant buildings to the same buildings with 2019 compliant systems. The results were weighted by the existing floor area in each climate zone, shown in Table 16, and buildings were classified as shown in Table 17.

For lighting, the analysis assumes minimal compliance with the standards. Section 141.0, specifically Table 141.0-E, provides exceptions to certain control requirements if the lighting power is less than 85% of the lighting power allowance specified in Section 140.6(c)2, Area Category Method. However, the assumption of this study is that minimal compliance is interpreted to mean that the lighting power is equal to the Area Category Method lighting power allowance, and so none of the exceptions apply. Also, the assumption is that lighting alterations meet the requirements of Section 141.0(b)2Ji (meet the lighting power allowance in Section 140.6 and comply with the control requirements in Table 141.0-E).Section 141.0(b)2Jii compliance is not assumed as no information is available as to the characteristics of the existing luminaires being replaced.

It was assumed that lighting systems are replaced every 15 years, meaning that 1/15th of the existing floor area included in the analysis. Similarly, HVAC system alterations were analyzed by comparing the 2016 compliant buildings that use small packaged vertical air conditioners and small packaged vertical heat pumps against the same buildings with efficiencies that are compliant with the 2019 standard. It was assumed that packaged units are replaced every 20 years, meaning that 1/20th of the existing floor area were used in the analysis.

Calculation of alterations savings follows the process described with the exception that EUI_{16zp} and ET_{16b} are replaced with EUI_{mzp} and ET_{mb}, where m is the specific measure, either the lighting or HVAC. These are calculated in Equations 4 and 5:

$$EUI_{mzp} = E_{mzp} \div CFA_p \qquad (4)$$

where: EUI_{mzp} = Energy Use Intensity of prototype *p*, in climate zone *z* under 2016 Standards plus the measure *m*,
E_{mzp} = Energy Use of prototype *p*, in climate zone *z* under 2016 Standards plus measure m, and
CFA_p = Conditioned Floor Area of prototype *p*

EUI_{19zp} would be calculated in the same way using E_{19zp}, the energy use under the 2019 standards.

Calculation of statewide energy consumption for existing building alterations of a specific type is shown in Equation 5:

$$ET_{mb} = \sum_{p=1}^{16} \sum_{z=1}^{16} EUI_{mzp} \cdot EFA_{zb} \cdot {}^{1}/_{MF_m} \qquad (5)$$

where: ET_{mb} = Statewide total energy for building type b under the 2019 Standards plus measure *m*,
EFA_{zb} = Existing floor area of building type *b*, in climate zone *z*,
MFm = the frequency measure *m* is applied (yrs)

Total statewide energy savings for alterations is found using Equation 6:

$$Sav_{Alt} = \sum_{m-1}^{2} \left(\sum_{b=1}^{8} ET_{16b} - \sum_{b=1}^{8} ET_{mb} \right) \qquad (6)$$

where: Sav_{Alt} = Total statewide total energy savings for alterations.

Total statewide energy savings is found using Equation 7:

$$TotalSavings = Sav_{NC} + Sav_{Alt} \qquad (7)$$

3.5 CASE Measure List

The following sections describe the CASE measures conducted for the 2019 Standards that recommend changes to the non-residential 2019 Standards. The measures are categorized by interior lighting, exterior lighting, HVAC and process loads. Most requirements apply to new construction, but some are evaluated for their impact as alterations to existing buildings. The 15-day language published by the Energy Commission was used as the source of the measures, and later verified against the final adoption of the code. For the purpose of Impact Analysis, some of these measures were modeled using appropriate building prototypes, while some relied on methodologies and assumptions specified in the CASE reports. The list of measures included in the non-residential portion of the analysis is presented in Table 28.

Table 28 - Non-residential Measures *Included* in the 2019 Impact Analysis

Category	CASE Measure ID	Measure Title	Title 24 Section	Modeling
Interior Lighting	2019-NR-LIGHT2-F	Lighting Power Densities	§140.6	✓
	2019-NR-LIGHT4-F	Lighting Controls: Manual ON Time-Switch	§130.1	
		Lighting Controls: Occupant Sensors in Restrooms	§130.1, §140.6	✓
Exterior Lighting	2019-NR-LIGHT1-F	Lighting Power Allowances	§100.1, §130.2, §140.7	✓
	2019-NR-LIGHT3-F	Lighting Controls: 50% Reduction After-Hours	§130.2	
		Lighting Controls: Remove 75 Watt Threshold for Bi-Level Motion Controlled Lighting	§130.2	
HVAC	2019-NR-ASHRAE90.1F	Fan System Power	§140.4	✓
		Equipment Efficiency	§110.2	✓
		Waterside Economizers	§140.4	
		Transfer Air for Exhaust Air Makeup	§140.4	
		Demand Controlled Ventilation for Classrooms	§120.1	✓
		Occupant Sensor Ventilation Requirements	§120.1, §120.2	✓
HVAC	2019-NR-MECH1-F	Cooling Tower Minimum Efficiency	§140.4	✓
	2019-NR-MECH2-F	Economizer Fault Detection Diagnostics	§120.2	
Process	2019-NR-MECH3-F	Variable Exhaust Flow Control	§140.9. 141.1	✓
	2019-NR-MECH4-F	High Efficiency Fume Hoods	§140.9	✓
	2019-NR-MECH6-F	Adiabatic Condensers	§120.6	

Some of the other CASE measures were excluded from this analysis for various reasons: (1) if they were not adopted into the final version of 2019 Standards, (2) if they were only adopted as compliance options in the 2019 Standards, (3) if they are not expected to generate code savings. The list of excluded measures was reviewed and approved by the Energy Commission during the course of this analysis.

Specifically, measures that <u>were not covered</u> in the scope of this analysis are listed in

Table 29 with corresponding reasons for exclusion.

Table 29 - Non-residential Measures *NOT Included* from the 2019 Impact Analysis

Category	CASE Measure ID	Measure Title	Reason for Exclusion
Interior Lighting	2019-NR-LIGHT4-F	Lighting Controls: Mandatory Automatic Daylight Dimming Plus OFF Controls	No savings expected as this is a compliance option
Exterior Lighting	2019-NR-LIGHT3-F	Lighting Controls: Bi-level Motion Controlled Lighting: 75% Reduced Wattage When Vacant After-Hours	Not adopted in the 2019 Standards
Advanced Daylighting	2019-NR-LIGHT5-F	Power Adjustment Factors and Performance Compliance Options	No savings expected as this is a compliance option
		Min VT Interpretation for Tubular Daylighting Devices	No savings reported as a result of changes made in the 2019 Standards
		Update to Daylit Zones Definitions	No savings reported as a result of changes in the 2019 Standards
HVAC	2019-NR-ASHRAE90.1-F	Exhaust Air Heat Recovery	Not adopted in the 2019 Standards
Envelope	2019-RES-ENV5-F	Loading Dock Seals in Warehouses	Not adopted in the 2019 Standards
Air Quality	2019-NR-ASHRAE62.1-F	Non-residential Indoor Air Quality	No savings expected due to minimal changes to ventilation rates

3.6 Simulation Order

The individual measures selected for modeling in this analysis, according to Table 28, were sequentially added to the 2016 minimally-compliant baseline prototypes in the order listed in Table 30. 2019 compliant version runs were also created by adding all the measures. Energy consumption for the baseline and each added measure run was converted to Energy Use Intensity (EUI) values for each energy type and unit. The measure EUI was then projected to a statewide consumption by multiplying the EUI with the statewide construction forecast building area for each prototype and each California climate zone. Savings were calculated by taking the difference in statewide energy consumption for each additional measure category.

Table 30 - Order of Modeling Simulation

Category	Measure Title
Lighting	Indoor Lighting Power Density
	Lighting Controls: Occupant Sensors in Restrooms
Process	Variable Exhaust Flow Control
	High Efficiency Fume Hoods
HVAC	Equipment Efficiency
	Fan System Power
	Demand Controlled Ventilation for Classrooms
	Occupant Sensor Ventilation Requirements
	Cooling Tower Minimum Efficiency
Exterior Lighting	Outdoor Lighting Power Allowances

3.7 Measure Simulation Details

The scope of the non-residential and high-rise residential impact analysis covers the following energy efficiency measures from the 2019 Standards. For the purpose of this analysis, some of the measures were modeled using appropriate building prototypes, while other measures had savings extracted from the CASE reports. The following sections by measure category describe the measures and modeling methodologies conducted in this analysis.

3.7.1 Lighting

1. Indoor Lighting Power Density – §140.6

CASE Measure ID: 2019-NR-LIGHT2-F

The 2019 Standards have revised lighting power density values in Table 140.6-C. Indoor lighting power reductions were modeled based on the updated lighting power density values (LPDs) in the area category method. The prototype models do not cover all of the space types that are impacted by the changes to the area category method. All simulation models use a certain amount of abstraction when converting from the real building to the simulation model. Since the prototypes are not models of particular buildings but are representation of “typical” buildings, this abstraction presents a particular issue with the models. An example of this is that the office building models are made up of spaces which are all (or nearly all) assigned the space function of “Office (Greater than 250 square feet in floor area).”In reality, an office building will have some fraction of space which is small private offices, conference rooms, corridors, restrooms, lobbies, kitchenettes, mechanical rooms, janitors’ closets, and other space types. Rather than try to include physical representations of all of the detailed space uses of the real building in the simulation model, this analysis took an area weighting approach to overcome the space type limitation. The area weighting approach involves calculating averaged characteristics from multiple space types, but simulating them by applying the averaged value to a particular space. This approach was recommended to the CASE Team at the inception of the 2019 CASE measure analysis efforts for consistency.

For this impact study, the area weightings of space categories for the prototypes were determined based on information provided in the 2019-T24-CASE Report-Indoor Light Sources, while the area category LPD values came from Table 140.6-C of the 2019 Standards. Please review Appendix 2: Area Weighted Lighting Power Density Calculation included with this report for details of space types included to calculate the area weighted lighting power density of each prototype and the weightings. Based on the area weightings, the calculated weighted LPD’s for each prototype for 2016 and 2019 Standards are listed for comparison in Table 31.

Table 31 – Area-weighted Lighting Power Densities

Building Type	Prototype	2016 LPD (W/ft^2)	2019 LPD (W/ft^2)
Small Office	Small Office	0.84	0.68
Large Office	Large Office	0.85	0.67
	Medium Office	0.84	0.67
Restaurant	Small Restaurant	0.98	0.57
Retail	Stand-Alone Retail	1.09	0.9
	Large Retail	1.05	0.86
	Strip Mall	1.09	0.9
	Mixed-Use Retail	1.09	0.9
Non-refrigerated Warehouse	Warehouse	0.96	0.64
School	Small School	0.99	0.64
	Small School SPVAC	0.99	0.64
	Small School SPVHP	0.99	0.64
	Large School	0.94	0.63
College	Small Office	0.84	0.68
	Medium Office	0.84	0.67
	Medium Office/Lab	1.26	0.91
	Large School	0.94	0.63
	High Rise Apartment	0.57	0.44
Hotel	Small Hotel	1.15	0.77
High Rise Residential	Large Apartment	0.57	0.44

2. Lighting Controls, Occupant Sensing Controls in Restrooms – §130.1

CASE Measure ID: 2019-NR-LIGHT4-F

The 2019 Standards have added a mandatory requirement for occupant sensing full OFF controls in non-residential restrooms for new construction and lighting alterations. This measure was modeled by applying modified occupancy and lighting schedules to building prototypes that have restroom spaces. The impact of this measure was evaluated in both new construction and alterations. Per the CASE report restroom lighting controls result in a 30% reduction in full load hours (FLH). Based on this assumption, the restroom lighting schedule was adjusted from 34 FLH to 26 FLH in the school prototypes and from 38 FLH to 29 FLH in all other prototypes that have restroom spaces.

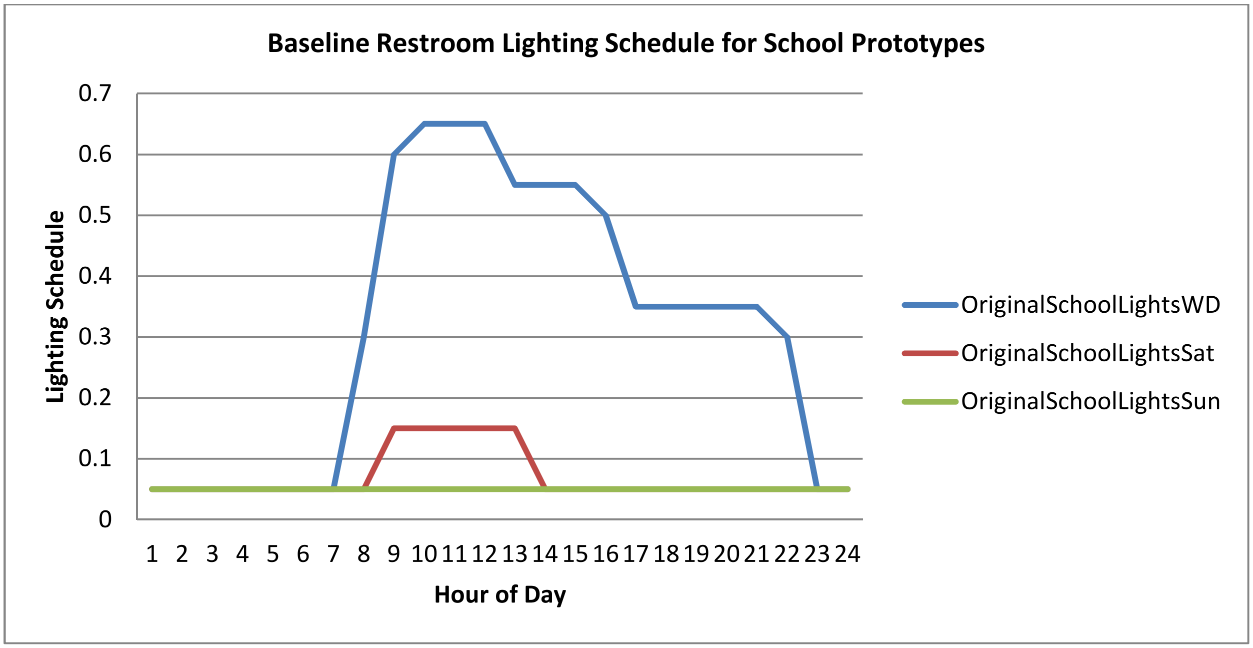

Figure 1 – Baseline School Restroom Lighting Schedule

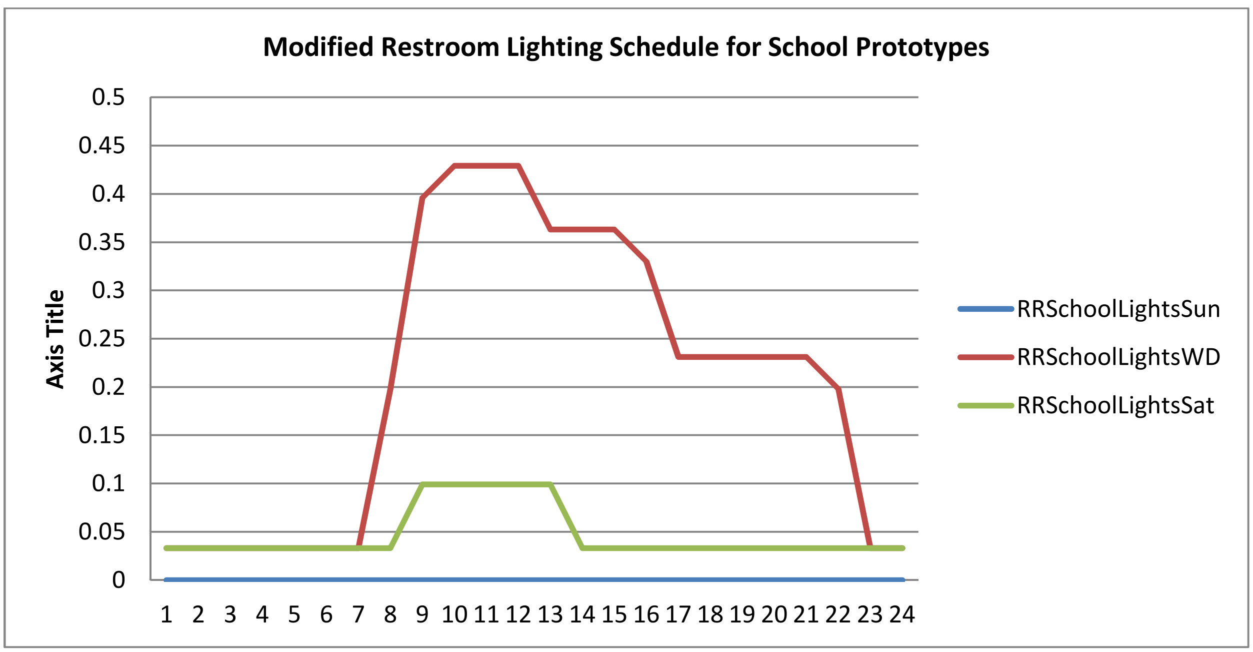

Figure 2 - Modified School Restroom Lighting Schedule

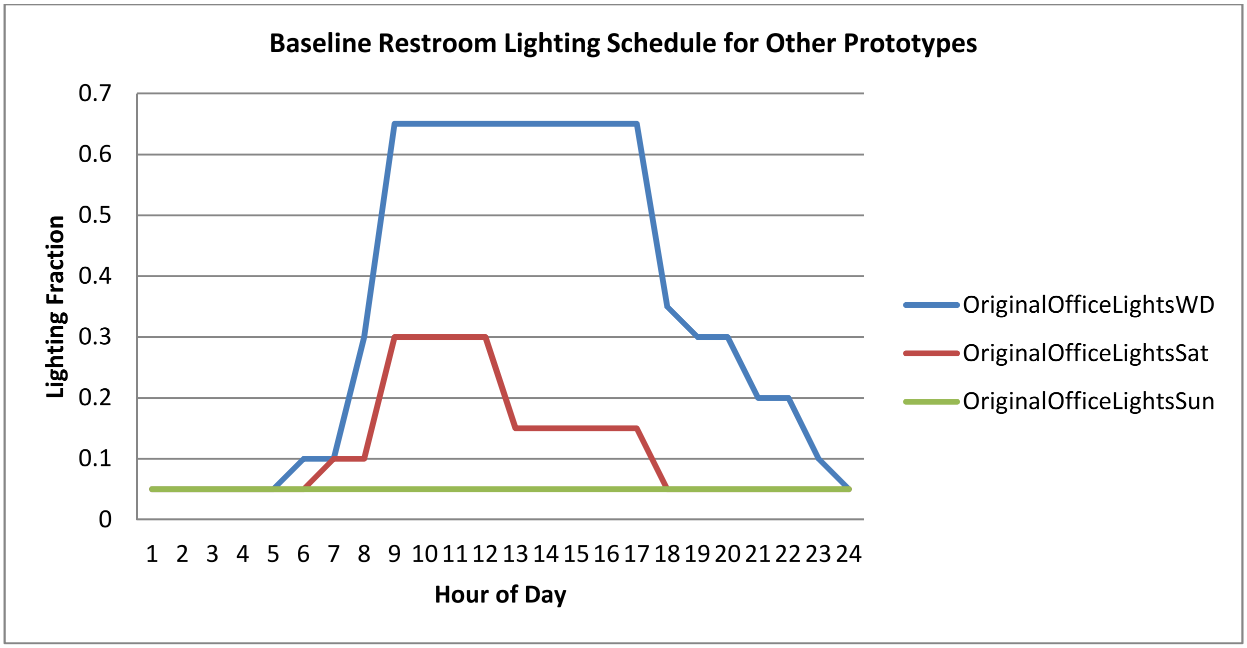

Figure 3 - Baseline Restroom Lighting Schedule for Other Prototypes

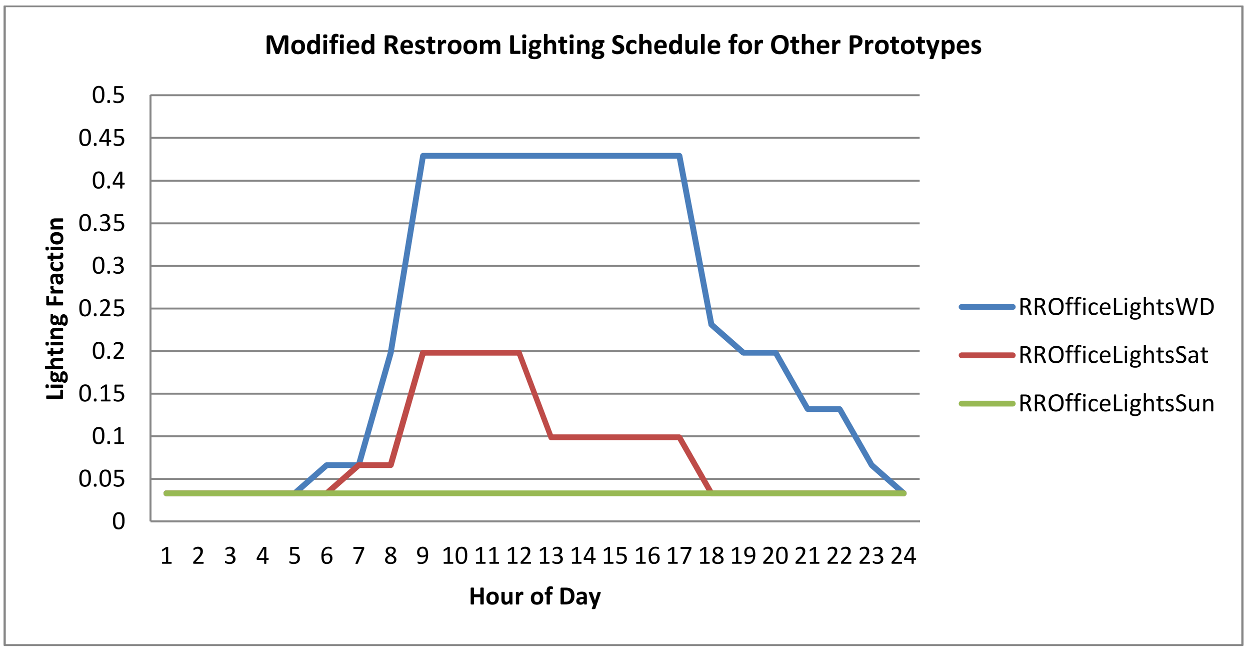

Figure 4 - Modified Restroom Lighting Schedule for Other Prototypes

3.7.2 Exterior Lighting

3. Outdoor Lighting Power Allowance – §100.1, §130.2, §140.7

CASE Measure ID: 2019-NR-LIGHT1-F

The 2019 Standards have revised lighting power allowance (LPA) values in Table 140.7-A. This measure was modeled using the EnergyPlus exterior light objects for lighting zones 2 and 3 (LZ2 and LZ3), lighting power allowance factors listed in Tables 140.7-A in the 2019 Standards, and weighting factors proposed by the CASE Team. This analysis focused on LZ2 and LZ3 since these two zones account for more than 90% of the total, as shown in Table 32. Please review Appendix 3: Outdoor LPA Calculation included with this report for details on total LPA's calculated for specific applications of exterior lighting.

Table 32 – Percent Construction by Lighting Zone

Lighting Zone	Percent of Land Mass (Source: 2010 US Census)	Percent of Construction Activity (Estimate)
LZ0	9%	0%
LZ1	1%	0.10%
LZ2	85%	9.90%
LZ3	5%	90%
LZ4	0%	0%

Outdoor lighting area assumptions for each prototype were based on Table 36 of the CASE report. Lighting power for each area category was based on Table 140.7-A and B of the Standards. Please refer to Appendix 3 for more details. The total outdoor lighting wattages are shown in Table 30. Based on the LPA factors, the calculated weighted LPA's for each prototype for 2016 Standards and 2019 Standards are listed for comparison in Table 33:

Table 33 – Outdoor Lighting Power by Building Prototype

	LZ2 Allowance		LZ3 Allowance	
	2016 (W)	**2019 (W)**	**2016 (W)**	**2019 (W)**
Small School	1,016	618	1,377	850
Small Office	622	366	740	489
Medium Office	1,738	1,146	2,121	1,410
Large Office	11,744	8,168	14,457	9,689
Medium Retail	2,579	1,752	3,425	2,298
Large Retail	20,280	14,340	27,543	18,646
Small Restaurant	748	384	987	542
Small Hotel	1,424	910	1,916	1,253
Warehouse	1,099	656	1,415	859
Large Apartment	1,255	764	1,620	990
Strip Mall	651	384	781	512
Large School	4,511	2,931	6,760	4,041
Small School SPVAC	1,016	618	1,377	850
Small School SPVHP	1,016	618	1,377	850

3.7.3 HVAC

4. Fan System Power – §140.4(c)

CASE Measure ID: 2019-NR-ASHRAE90.1F

The 2019 Standards have added new prescriptive requirements for fan power for systems with a total fan motor (nameplate) horsepower of 5 HP or more according to Tables 140.4-A, 140.4-B. This measure only applies to buildings that follow the prescriptive path since the baseline fan power per the 2016 performance approach rules were already at the same levels as the new changes in the 2019 prescriptive requirement. This measure was modeled by adjusting HVAC fan power in all prototypes with fan motor (nameplate) horsepower of 5 HP or more. The 2016 baseline fan power was set to 1.25 W/cfm for variable air volume (VAV) system types, and 0.80 W/cfm for constant air volume (CV) system types. The measure case was modeled with 1.03 W/cfm for VAV fans and 0.78 W/cfm for CV fans. The fan bhp is calculated per the 2019 Nonresidential ACM (NACM) rules as Equations 8 and 9:

For CAV:

$$\begin{aligned} \mathrm{BHP} &= 0.00094 \times \mathrm{CFM} + \mathrm{A} \\ &= 0.00094 \times \mathrm{CFM} + (0.9 \times \mathrm{CFM} \div 4131) \\ &= 0.001158 \times \mathrm{CFM} \end{aligned} \tag{8}$$

And for VAV:

$$\begin{aligned} \mathrm{BHP} &= 0.0013 \times \mathrm{CFM} + \mathrm{A} \\ &= 0.0013 \times \mathrm{CFM} + (0.9 \times \mathrm{CFM} \div 4131) \\ &= 0.001518 \times \mathrm{CFM} \end{aligned} \tag{9}$$

The intent of this measure is to align the prescriptive and performance requirements for fan power. To be conservative, the 2019-T24-CASE Report-Proposals Based on ASHRAE-90.1 assumed that only 25 percent of new construction follows a prescriptive compliance pathway. Similar assumptions were used to calculate statewide energy savings by applying measure savings to only 25% of the new construction building stock.

5. Equipment Efficiency – §110.2

CASE Measure ID: 2019-NR-ASHRAE90.1F

The 2019 Standards have revised equipment efficiency requirements for single zone packaged vertical air conditioners (SPVAC) and single zone packaged vertical heat pumps (SPVHP) less than 65,000 Btuh as reflected in Table 110.2-E of the 2019 Standards.

It is assumed that SPVAC and SPVHP systems account for 12% and 30% of all school buildings respectively. Since these systems are not part of any of the existing prototypes, variants of existing small school prototype were created. Two variants were created by changing the HVAC system of the Small School prototype to SPVAC and SPVHP. This measure was modeled and applying the efficiency requirements from Table 110.2-E to SPVAC and SPVHP systems less than 65,000 Btuh.

In addition, the 2019 Standards increased equipment part-load efficiency requirements for several different systems (Table 110.2-A, Table 110.2-B, Table 110.2-H, Table 110.2-I in the 2019 Standards). While this will reduce energy use, compliance software cannot model IEER properly. Therefore IEER efficiency improvements were not reflected in the impact analysis.

6. Demand Controlled Ventilation for Classrooms – §120.1(c)3

CASE Measure ID: 2019-NR-ASHRAE90.1F

The 2019 Standards have removed classroom spaces from the demand controlled ventilation (DCV) exemption requirement, in essence requiring DCV for classroom spaces with design occupancy level of 25 people, or 1000 square feet or greater area. This measure was modeled by specifying DCV in classroom spaces in the Small School and Large School prototypes.

7. Occupancy Sensor Ventilation – §120.1(c)5 and 120.2(e)3

CASE Measure ID: 2019-NR-ASHRAE90.1F

Occupancy sensor based ventilation control is required in enclosed office, conference and corridor space types per the 2019 Title 24 requirements. The occupancy sensor requirement also allows the ventilation thresholds to drop to zero during unoccupied hours of business hours in these space types. Previously ventilation was not allowed to go below minimum threshold levels at periods of non-occupancy during business hours.

This measure was modeled in the Small and Medium Office prototypes. The office prototypes consist of four perimeter zones and a core zone. For modeling this measure the core zone and north perimeter zones are assumed to be open offices, the East perimeter conference and South and West zones are assumed to be enclosed offices. The occupancy schedules of the conference and enclosed offices spaces were modified to represent a variable occupancy profile. The modified schedule developed by the CASE team to model this measure was aggressive resulting in over 50% reduction in FLH compared to ACM office schedule. For this analysis a new set of schedules that results in a weekly FLH about 25% less compared to the NACM schedule was created. This new schedule set is based on a typical week comprising of 5 unique WD schedules and a Sat and Sun schedule. The original ACM office occupancy schedule profile plot and a comparison of the modified office occupancy profile plot are shown in Figures below:

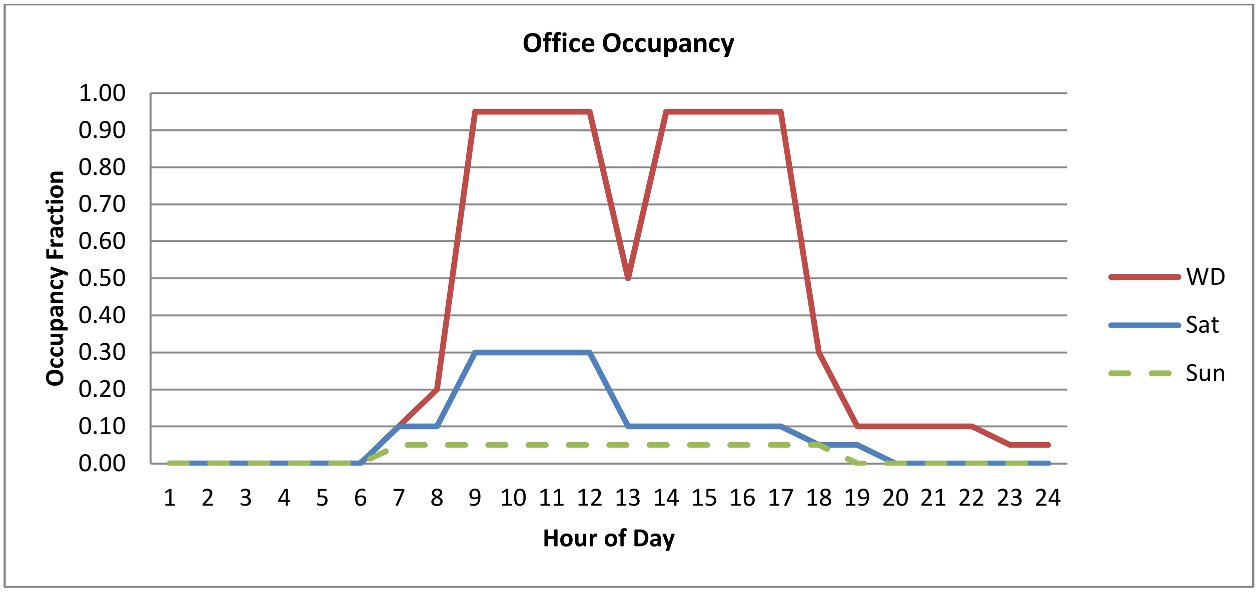

Figure 5 - NACM Office Occupancy Schedule

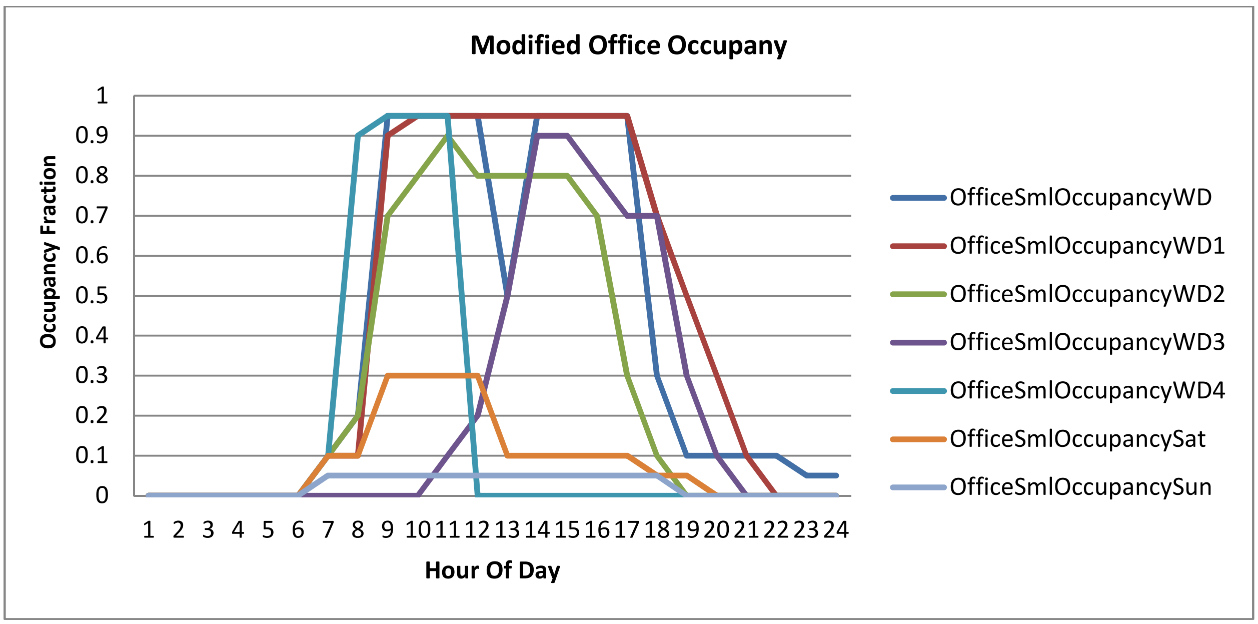

Figure 6 - Modified Office Occupancy schedule

Assembly schedules were also modified. The current NACM assembly schedule is not well suited for a conference space within a typical office building as the occupancy profile is based on a typical assembly building with heavier occupancy during weekends and weeknights.

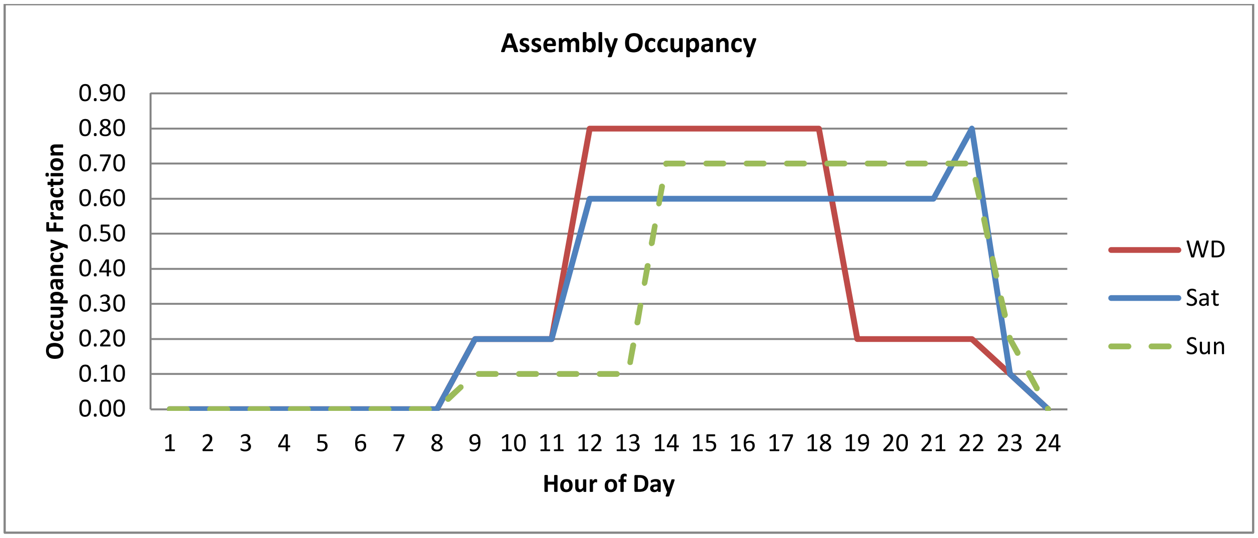

Figure 7 - NACM Assembly Occupancy Schedule

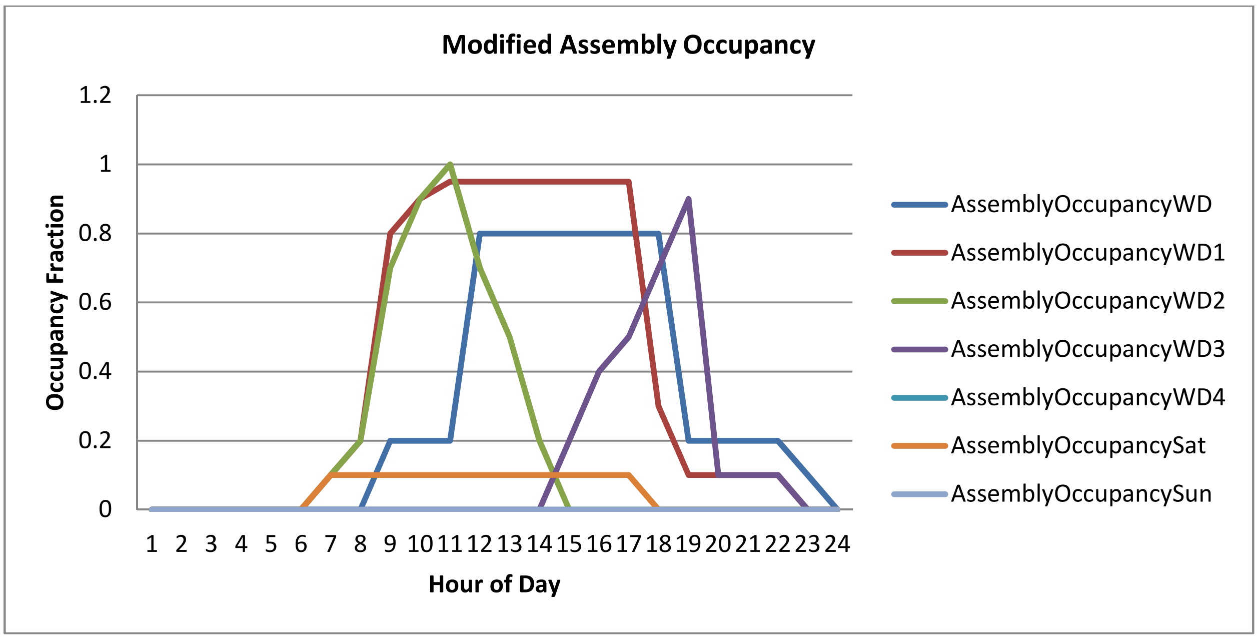

Figure 8 - Modified Assembly Occupancy Schedule for Conference Space

Corresponding thermostat and ventilation availability schedules were created based on the modified occupancy schedules see Appendix 4: Schedules for Occupancy Based Ventilation Control included with this report for more details. The measure was then modeled by applying the modified occupancy schedules in both baseline and measure cases and NACM schedules for thermostat set point and ventilation for the 2016 baseline case and modified versions for the measure case. The unit savings were then applied to small office and medium office within the large office construction forecast data to calculate statewide savings.

8. Cooling Tower Minimum Efficiency – §140.4

CASE Measure ID: 2019-NR-MECH1-F

The 2019 Standards have increased the prescriptive requirement for cooling tower efficiency for all cooling towers with a design condenser flow rate of 900 GPM or higher. This measure increases the prescriptive requirement from 42.1 GPM/HP to 60 GPM/HP for all cooling towers with a design condenser flow rate of 900 GPM or higher (300 chiller tons), according to Table 110.2-G of the standards. This measure was modeled by adjusting all prototypes that have a cooling tower with condenser flow rate above 900 GPM. The large office and high rise apartment prototypes were impacted by this measure. Similar to the fan power measure, this new requirement does not increase the stringency of the performance approach as the intent of this measure is to align the prescriptive and performance requirements for cooling towers. Hence for being conservative in the calculation of statewide energy savings the unit savings from this measure was applied to only 25% of the new construction large office and high-rise apartment and high- rise apartment portion of the college building stock.

3.7.4 Process

9. Variable Exhaust Flow Control – §140.9 and 141.1

CASE Measure ID: 2019-NR-MECH3-F

The 2019 Standards require that laboratories meet the discharge requirements in ANSI Z9.5 and to limit the power consumption of laboratory and process facility exhaust systems. Previously there were no requirements for the power demand of laboratory and process facility discharge exhaust systems in the state. This measure was modeled by setting the fume hoods to 0.65 W/CFM in the Medical Office/Lab prototype model. The baseline was modeled as a constant speed fan with 0.78 W/cfm. The unit savings were then applied to the Medium office/Lab portion of the college construction forecast data to calculate statewide savings.

10. High Efficiency Fume Hoods – §140.9

CASE Measure ID: 2019-NR-MECH4-F

The 2019 Standards have added a prescriptive requirement for sash opening controls for laboratory fume hoods that can automatically open and close to maintain the airflow. This measure was modeled by applying a constant exhaust air flow fraction of 0.9 in the baseline case and a variable exhaust flow fan schedule with occupied average exhaust flow fraction of 0.36 and unoccupied exhaust flow fraction of 0.12. This measure was applied to the Medium Office/lab prototype. The unit savings were then applied to the Medium office/Lab portion of the college construction forecast data to calculate statewide savings.

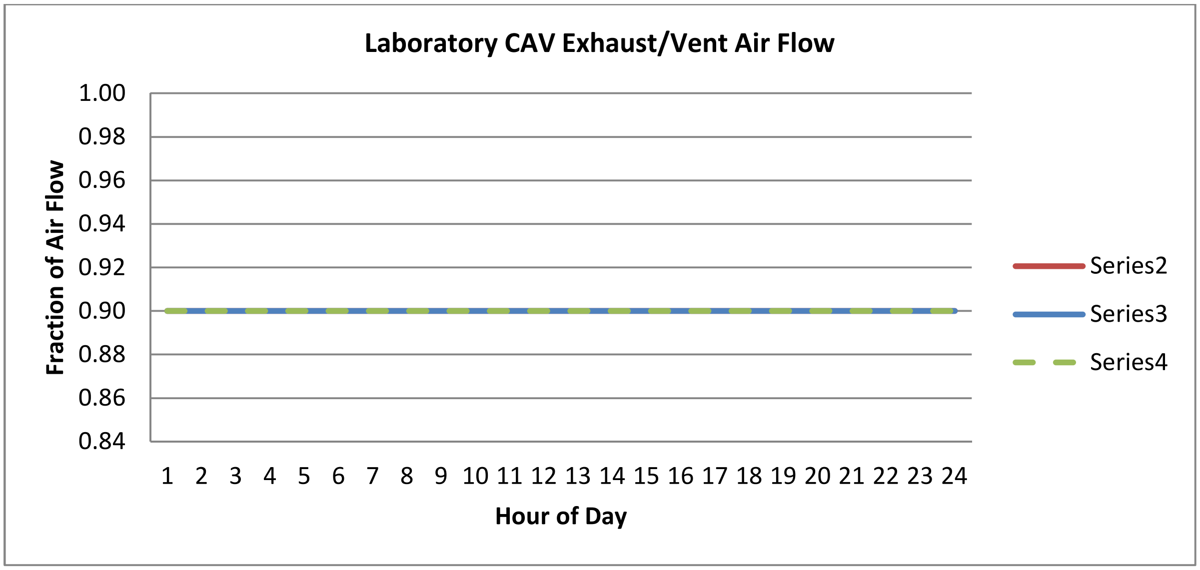

Figure 9 - Baseline CAV Exhaust Fan Schedule

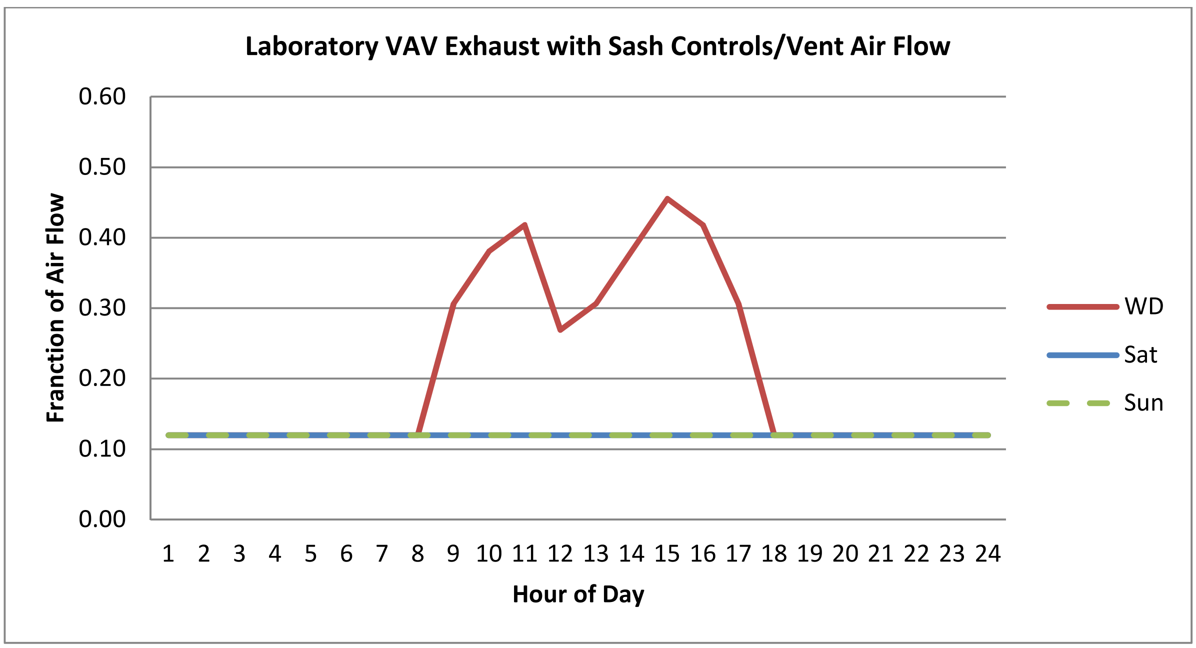

Figure 10 - VAV Exhaust Sash Control Ventilation Schedule

3.8 Measures with Savings from CASE Reports

A few of the measures included in this analysis will not be modeled using the building prototypes due to various reasons, including lack of interactive effects with other measures, complexity of modeling, unique assumptions applied in the CASE reports. For such measures, NORESCO extracted the estimated statewide savings directly from the CASE reports and added the CASE savings to the results of the impact analysis. The list of measures with savings extracted from the CASE reports is summarized below:

11. Indoor Lighting Controls: Manual ON Time-Switch – §130.1(c)5A, §130.1(c)5B

CASE Measure ID: 2019-NR-LIGHT4-F

For areas not required by §130.1(b) to have multi-level lighting controls, previous code cycles, inclusive of 2008-2016 code cycles, have allowed the use of automatic time-switch controls to comply with Title 24, Part 6 Shut-OFF requirements. Based on industry stakeholder feedback, changing the requirement to allow for lighting controls to be commissioned to manual ON could lead to significant energy savings by reducing the amount of time that nonresidential indoor lighting is turned ON when the space is not occupied. As a result, for areas not required by §130.1(b) to have multi-level lighting controls, the 2019 Standards have added an exception in §130.1(c) to allow lighting to be controlled by an occupancy sensor that automatically turns ON all lighting when the room is occupied (commissioned as manual ON).

This measure was not selected for modeling as spreadsheet calculation is deemed appropriate for this measure. The Statewide CASE Team estimated savings based on reasonable assumptions and spreadsheet calculations that alter the occupancy schedule and lighting load for building types and space types that will be affected by this measure. Additionally, the CASE Team applied an average time dependent valuation (TDV) factors to derive energy savings and peak demand reductions. For this impact analysis, the energy savings from the CASE report were incorporated into the final results. More details on the savings methodology can be found in the 2019-T24-CASE-Report-Indoor Lighting Controls Report.

12. Outdoor Lighting Controls, 50% Reduction After-Hours – §130.2

CASE Measure ID: 2019-NR-LIGHT3-F

As related to this automatic scheduling control, Section 130.2(c) of the 2016 Standards required that outdoor luminaires can be controlled independently and scheduled to be turned off during certain hours of the night. Through the adoption of the 2019 Standards, it is now required that automatic scheduling controls shall be capable of reducing the outdoor lighting power of each controlled luminaire by at least 50 percent and no more than 90 percent, and also separately capable of turning the lighting luminaire OFF, during scheduled unoccupied periods. The 2019 requirements align with ASHRAE 90.1. To meet this requirement, the outdoor lighting controls must be capable of reducing power between 50 percent and 90 percent. This measure can be accomplished by having two or more independently scheduled ON/OFF control channels or by dimming lighting according to a schedule, or some combination of the two.

This measure was not selected for modeling as spreadsheet calculation is deemed appropriate for this measure. The Statewide CASE Team estimated savings based on reasonable assumptions, relevant scenarios and spreadsheet calculations that represent the savings attributed to adding multi-level control capability to time-switch controlled lighting, for building types and space types that will be affected by this measure. Additionally, the CASE Team applied an average time dependent valuation (TDV) factors to derive energy savings and peak demand reductions. For this impact analysis, the energy savings from the CASE report were incorporated into the final results. More details on the savings methodology can be found in the 2019-T24-CASE-Report-Outdoor Lighting Controls Report.

13. Outdoor Lighting Controls, Remove 75 Watt Threshold for Bi-Level Motion Controlled Lighting – §130.2(c)3

CASE Measure ID: 2019-NR-LIGHT3-F

The 2019 Standards have removed the wattage threshold of 75 watts for spaces where bi-level motion sensing controls are required to reduce lighting power of each luminaire by at least 50 percent when no motion is detected in the area for longer than 15 minutes during normally occupied periods. The spaces affected include parking lots, gas station canopies, gas station hardscape and retail sales lots where luminaires are mounted lower than 24 feet. In addition, the scope for general hardscape lighting was reduced to cover only parking lots.

This measure was not selected for modeling as spreadsheet calculation is deemed appropriate for this measure. The Statewide CASE Team estimated the energy savings based on reasonable assumptions regarding space types and occupancy-based controls that would be impacted by the removal of the 75 watts threshold. Since this measure is not climate sensitive, the CASE Team applied statewide average TDV factors to derive energy savings and peak demand reductions. For this impact analysis, the energy savings from the CASE report were incorporated into the final results. More details on the savings methodology can be found in the 2019-T24-CASE-Report-Outdoor Lighting Controls Report.

14. Waterside Economizers – §140.4(e)

CASE Measure ID: 2019-NR-ASHRAE90.1F

The 2019 Standards have increased control and performance requirements for buildings with waterside economizers. The CASE report used an estimate that 3% of all large offices have a waterside economizer. The CASE Team calculated savings using a model with VAV systems without airside economizers. It is unclear how common this application of a waterside economizer is used, because airside economizers will generally be used for VAV systems. Waterside economizers are typically used when airside economizers are not feasible, such as when a dedicated outdoor air system (DOAS) is used to provide ventilation. The ductwork in a DOAS is typically sized to provide minimum required ventilation air and is therefore not capable of using an airside economizer. However, data on the number and type of projects using DOAS is not available in the CASE report, so it is not possible to calculate statewide savings for changes in waterside economizer system performance requirements for this scenario. Therefore, NORESCO has included the CASE report estimate of savings, as data was not available to calculate an alternative estimate. More details on the savings methodology can be found in the 2019-T24-CASE-Report-Proposals-Based-on-ASHRAE-90.1 Report.

15. Transfer Air for Exhaust Air Makeup – §140.4(o)

CASE Measure ID: 2019-NR-ASHRAE90.1F

This measure is a prescriptive requirement included in the 2019 Standards that expands the 2016 Title 24, Part 6 requirement for kitchen exhaust transfer air to other types of exhaust systems, such as toilet exhaust and lab exhaust. For spaces with high exhaust air makeup, the exhaust air systems are required to use available transfer air first to supply for exhaust air makeup. Transfer air for exhaust makeup, for spaces such as toilets and labs, has been commonly used in many designs for many years. This measure matches the same requirement that was added to ASHRAE 90.1 in 2013. Through this measure, the 2019 Standards will regulate systems that were not previously regulated, as there were previously no limitations on the amount of conditioned air that could be used to replace air being exhausted. According to the CASE report, the proposed code change will specifically require that spaces with exhaust requirements that are higher than the ventilation cfm or the cfm required to meet the heating or cooling load is made up with transfer air instead of 100 percent outside air or 100 percent supply air.

This measure was not selected for modeling due to simulation constraints and the minimal interactive effect between this measure and other measures included in this impact analysis. The Statewide CASE Team modeled the energy savings based on guidance from the Energy Commission on the type of prototype buildings affected and estimated savings using ASHRAE 90.1 prototypes for nonresidential buildings available in CBECC-Com. The medium office/laboratory prototype building was used, since this measure will directly affect laboratory buildings. For this impact analysis, the energy savings from the CASE report were incorporated into the final results. More details on the savings methodology can be found in the 2019-T24-CASE-Report-Proposals-Based-on-ASHRAE-90.1.

16. Economizer Fault Detection Diagnostics – §120.2(i) and 140.9(a)

CASE Measure ID: 2019-NR-MECH2-F

The 2019 Standards require automated economizer fault detection and diagnostics (FDD) controls for systems with built-up air handling units with design cooling capacity greater than 54,000 Bth/hr (4.5 tons) and equipped with an airside economizer. This requirement expands upon the existing mandatory code language in Section 120.2(i) which requires economizer FDD for nonresidential packaged and split air handling HVAC systems of the same specifications. As a result, the 2019 Standards will apply the FDD requirement to all air handlers, both packaged and built-up systems, greater than 54,000 Btu/hr in size and equipped with an air-side economizer.

According to the CASE report, this code change would require the detection and reporting of the following economizer faults listed in 120.2(i)7 for built-up systems as well as packaged systems:

- Air temperature sensor failure/fault
- Not economizing when it should
- Economizing when it should not
- Damper not modulating
- Excess outdoor air

This measure was not selected for modeling due to simulation constraints and the minimal interactive effect between this measure and other measures included in this impact analysis. In addition, there is little to no empirical data available on the probability of detecting faults, according to the investigation conducted by the CASE Team. Therefore, the CASE Team worked with leading FDD experts to develop a set of conservation assumptions for Fault Incidence Rates and FDD Benefit, as documented in Table 4 of the 2019-T24-CASE-Report-Economizer-FDD-for-Built-up-Air-Handlers. The savings in the CASE report were modeled based on these assumptions. For this impact analysis, the energy savings from the CASE report were incorporated into the final results. More details on the savings methodology can be found in the 2019-T24-CASE-Report-Economizer-FDD-for-Built-up-Air-Handlers.

17. Adiabatic Condensers – §120.6

CASE Measure ID: 2019-NR-MECH6-F

The 2019 Standards have added mandatory efficiency and control requirements for systems with adiabatic fan-powered condensers according to Table 120.6-B in the 2019 Standards. This requirement defines an adiabatic condenser as a refrigeration system component that condenses refrigerant vapor by rejecting heat to air mechanically circulated over its heat transfer surface, causing a temperature rise in the air, with the additional capability to utilize evaporative precooling of the entering air, for operation only during high ambient temperatures, and accomplished as part of a single factory-made and rated unit. In prior versions of Title 24, Part 6, adiabatic condensers were not mentioned in the code. The new mandatory requirements apply to refrigerated warehouses and commercial refrigeration.

This measure was not selected for modeling due to simulation constraints and the minimal interactive effect between this measure and other measures included in this impact analysis. The CASE Team leveraged DOE 2.2 modeling software to simulate the adiabatic condensers and compared current design practices to design practices that will comply with the proposed requirements. As there are no code requirements for adiabatic condensers, the CASE Team developed the adiabatic condenser scenario based on current design practices and code requirements applicable to air-cooled and evaporative cooled condensers. For this impact analysis, the energy savings from the CASE report were incorporated into the final results. More details on the savings methodology can be found in the 2019-T24-CASE-Report-Adiabatic-Condensers.

3.9 Analysis and Detailed Results

The efficiency measures listed above were applied to the Title 24-2016 baseline models in the order listed. Measures were added cumulatively. Table 34 through

Table 42 below show the savings for various measures or groups of measures. Table 43 shows the overall savings for all the new construction measures.

Table 34 – Non-residential Statewide First-Year Savings for New Construction Lighting Power Densities

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	7.0	0.4	0.5	-0.01	0.19
2	72.5	6.1	3.8	-0.05	1.63
3	368.2	31.8	18.6	-0.25	7.68
4	172.8	16.0	8.9	-0.10	3.80
5	32.8	2.8	1.7	-0.02	0.69
6	250.7	24.4	12.1	-0.10	5.10
7	189.3	19.4	9.3	-0.07	3.93
8	371.2	36.7	17.6	-0.14	7.71
9	485.4	48.2	22.6	-0.16	9.87
10	285.7	27.2	13.8	-0.11	6.16
11	54.2	4.6	3.0	-0.03	1.34
12	323.1	28.0	16.8	-0.20	7.24
13	113.4	10.0	6.2	-0.07	2.81
14	52.7	4.7	2.6	-0.03	1.20
15	45.9	4.9	2.2	-0.01	0.94
16	69.1	4.7	3.9	-0.07	1.65
Total	**2,893.9**	**270.0**	**143.7**	**-1.42**	**61.94**

Table 35 – Non-residential Statewide First-Year Savings for New Construction Lighting Controls, Occupant Sensing Controls in Restrooms

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	0.0	0.0	0.0	0.00	0.00
2	0.4	0.0	0.0	0.00	0.02
3	1.4	0.1	0.2	0.00	0.07
4	0.8	0.1	0.1	0.00	0.03
5	0.1	0.0	0.0	0.00	0.01
6	1.0	0.1	0.1	0.00	0.04
7	1.0	0.1	0.1	0.00	0.04
8	1.5	0.1	0.1	0.00	0.06
9	1.6	0.2	0.2	0.00	0.07
10	1.8	0.2	0.1	0.00	0.06
11	0.4	0.0	0.0	0.00	0.02
12	1.8	0.2	0.2	0.00	0.12
13	1.0	0.1	0.1	0.00	0.03
14	0.3	0.0	0.0	0.00	0.01
15	0.4	0.0	0.0	0.00	0.01
16	0.3	0.0	0.0	0.00	0.01
Total	**13.9**	**1.3**	**1.3**	**-0.02**	**0.60**

Table 36 – Non-residential Statewide First-Year Savings for New Construction Outdoor Lighting Power Allowance

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	2.6	0.3	0.1	0.00	0.04
2	23.8	3.2	1.1	0.02	0.50
3	125.7	17.4	5.2	0.08	2.15
4	56.2	7.7	2.5	0.03	1.21
5	10.8	1.4	0.5	0.01	0.19
6	92.7	12.9	3.8	0.04	1.73
7	59.9	7.9	2.6	0.02	1.27
8	134.4	19.1	5.5	0.06	2.68
9	165.2	23.4	6.8	0.08	3.52
10	94.8	12.1	4.1	0.04	2.21
11	18.2	2.3	0.9	0.01	0.49
12	110.5	14.9	4.8	0.07	2.56
13	38.3	4.9	1.8	0.02	1.03
14	18.3	2.4	0.8	0.01	0.43
15	15.3	1.9	0.7	0.00	0.37
16	26.8	3.4	1.1	0.02	0.50
Total	**383.0**	**47.2**	**17.4**	**0.0**	**5.4**

Table 37 – Non-residential Statewide First-Year Savings for Other New Construction Fan System Power

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	0.4	0.0	0.0	0.00	0.01
2	4.9	0.5	0.3	0.00	0.10
3	23.5	2.3	1.2	-0.01	0.45
4	11.9	1.2	0.6	0.00	0.24
5	2.0	0.2	0.1	0.00	0.04
6	21.3	2.3	1.0	0.00	0.37
7	12.7	1.3	0.6	0.00	0.26
8	34.5	3.6	1.5	0.00	0.73
9	41.6	4.4	1.8	-0.01	0.78
10	23.6	2.3	1.1	-0.01	0.46
11	4.0	0.4	0.2	0.00	0.09
12	26.8	2.4	1.2	-0.01	0.58
13	7.7	0.8	0.5	0.00	0.16
14	4.8	0.5	0.2	0.00	0.10
15	4.1	0.5	0.2	0.00	0.06
16	5.7	0.5	0.3	0.00	0.13
Total	**229.6**	**23.4**	**10.8**	**-0.06**	**4.55**

Table 38 – Non-residential Statewide First-Year Savings for Other New Construction Equipment Efficiency

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	0.2	0.0	0.0	0.00	0.00
2	1.3	0.1	0.0	0.00	0.01
3	2.5	0.3	0.0	0.00	0.01
4	2.7	0.2	0.0	0.00	0.03
5	0.3	0.0	0.0	0.00	0.00
6	2.4	0.2	0.0	0.00	0.02
7	2.1	0.2	0.0	0.00	0.02
8	4.8	0.4	0.0	0.00	0.04
9	6.2	0.5	0.0	0.00	0.06
10	8.8	0.7	0.1	0.00	0.08
11	2.7	0.2	0.0	0.00	0.03
12	9.4	0.8	0.1	0.00	0.10
13	5.4	0.5	0.0	0.00	0.06
14	1.8	0.2	0.0	0.00	0.02
15	2.6	0.2	0.0	0.00	0.03
16	1.4	0.2	0.0	0.00	0.01
Total	**54.4**	**4.7**	**0.4**	**0.00**	**0.51**

Table 39 – Non-residential Statewide First-Year Savings for Other New Construction Demand Controlled Ventilation for Classrooms

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	0.6	0.3	0.0	0.01	0.01
2	3.3	1.0	0.1	0.06	0.37
3	8.5	3.2	0.3	0.21	0.66
4	6.5	1.7	0.2	0.09	0.95
5	1.0	0.4	0.0	0.02	0.05
6	4.6	1.2	0.2	0.07	0.69
7	4.2	1.0	0.2	0.05	0.63
8	6.7	1.7	0.3	0.10	1.48
9	10.4	2.1	0.5	0.13	2.73
10	13.0	2.8	0.3	0.11	1.86
11	4.8	1.1	0.1	0.04	0.61
12	18.3	4.7	0.5	0.21	2.55
13	9.3	2.4	0.3	0.09	1.22
14	2.6	0.7	0.1	0.03	0.38
15	2.9	0.4	0.1	0.01	0.41
16	2.4	1.3	0.0	0.08	0.20
Total	**99.1**	**26.1**	**3.3**	**1.32**	**14.79**

Table 40 – Non-residential Statewide First-Year Savings for Other New Construction Occupancy Sensor Ventilation

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	1.1	0.3	0.0	0.00	0.01
2	22.2	5.1	0.5	0.03	0.29
3	145.7	34.6	3.3	0.23	1.91
4	52.3	12.3	1.2	0.08	0.62
5	9.6	2.3	0.2	0.02	0.12
6	102.1	23.3	2.5	0.15	1.38
7	53.7	11.6	1.3	0.07	0.72
8	150.6	34.9	3.9	0.22	1.82
9	191.0	43.8	4.9	0.27	2.28
10	50.1	11.6	1.2	0.07	0.61
11	9.2	2.1	0.2	0.01	0.12
12	96.2	22.0	2.2	0.14	1.12
13	16.5	3.8	0.4	0.02	0.21
14	10.8	2.4	0.3	0.02	0.14
15	6.0	1.3	0.2	0.01	0.08
16	23.8	5.7	0.6	0.04	0.33
Total	**940.9**	**217.1**	**23.1**	**1.38**	**11.76**

Table 41 – Non-residential Statewide First-Year Savings for Other New Construction Lab Process Load Measures

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	1.2	0.1	0.0	0.00	0.01
2	6.9	0.8	0.3	0.00	0.07
3	31.0	3.7	1.1	0.00	0.30
4	15.7	1.9	0.6	0.00	0.15
5	3.0	0.4	0.1	0.00	0.03
6	19.2	2.3	0.7	0.00	0.19
7	15.8	1.9	0.6	0.00	0.15
8	26.7	3.3	1.0	0.00	0.26
9	31.4	3.9	1.2	0.00	0.31
10	23.1	2.8	0.8	0.00	0.22
11	5.9	0.7	0.2	0.00	0.06
12	28.6	3.5	1.0	0.00	0.27
13	11.8	1.4	0.4	0.00	0.11
14	4.1	0.5	0.1	0.00	0.04
15	3.1	0.4	0.1	0.00	0.03
16	7.2	0.9	0.3	0.00	0.07
Total	**234.7**	**28.5**	**8.6**	**-0.01**	**2.27**

Table 42 – Non-residential Statewide First-Year Savings for Other New Construction Cooling Tower Efficiency

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	0.0	0.0	0.0	0.00	0.00
2	0.1	0.0	0.0	0.00	0.01
3	0.3	0.0	0.0	0.00	0.01
4	0.4	0.0	0.0	0.00	0.01
5	0.0	0.0	0.0	0.00	0.00
6	0.6	0.1	0.0	0.00	0.02
7	0.4	0.0	0.0	0.00	0.01
8	1.0	0.1	0.0	0.00	0.03
9	1.8	0.2	0.0	0.00	0.06
10	0.6	0.0	0.0	0.00	0.02
11	0.1	0.0	0.0	0.00	0.00
12	0.8	0.1	0.0	0.00	0.03
13	0.2	0.0	0.0	0.00	0.01
14	0.1	0.0	0.0	0.00	0.00
15	0.1	0.0	0.0	0.00	0.00
16	0.0	0.0	0.0	0.00	0.00
Total	**6.6**	**0.5**	**0.2**	**0.00**	**0.20**

Table 43 – Total Non-residential New Construction Statewide First-Year Savings

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	10.8	1.3	0.6	0.0	0.2
2	118.2	14.8	5.3	0.0	2.6
3	625.2	83.4	26.2	0.2	10.6
4	280.8	35.8	12.4	0.1	6.2
5	51.6	6.6	2.3	0.0	0.9
6	448.9	59.7	18.6	0.1	8.0
7	295.7	36.8	13.0	0.1	5.9
8	667.7	89.4	27.5	0.1	12.7
9	850.1	112.2	34.8	0.2	17.5
10	430.2	49.9	19.1	0.1	10.2
11	85.7	9.7	4.2	0.0	2.6
12	545.1	66.7	23.9	0.2	13.3
13	172.3	20.0	8.6	0.1	5.2
14	83.3	9.6	3.7	0.0	2.1
15	69.6	7.8	3.2	0.0	1.8
16	120.9	15.0	5.5	0.0	2.4
Total	**4,856.1**	**618.8**	**208.8**	**1.20**	**102.05**

4 NON-RESIDENTIAL INTERIOR LIGHTING ALTERATIONS

4.1 Standards Requirement

New lighting systems in existing buildings and modifications to existing lighting systems must meet the control and lighting power requirements of §130.1, and Table 140.6-C.

4.2 Methodology

The impact of new lighting systems in existing buildings is due to the difference between the 2016 and 2019 standards. Although the lighting systems being replaced are expected to have significantly higher energy consumption than those which are compliant with the 2016 standard, the savings claimed here are only the additional savings for improvements beyond those already required by the 2016 standard. The analysis was performed by comparing 2016 compliant buildings to the same buildings with 2019 compliant lighting systems. The results were weighted by the existing floor area in each climate zone, and buildings were classified as shown in Table 25.

Note that the analysis assumes minimal compliance with the standards. Section 141.0, specifically Table 141.0-E, provides exceptions to certain control requirements if the lighting power is less than 85% of the lighting power allowance specified in Section 140.6(c)2, Area Category Method. However, the assumption of this study is that minimal compliance is interpreted to mean that the lighting power is equal to the Area Category Method lighting power allowance, and so none of the exceptions apply. Also, the assumption is that lighting alterations meet the requirements of Section 141.0(b)Ji. Section 141.0(b)Jii compliance is not assumed as no information is available as to the characteristics of the existing luminaires being replaced. It was assumed that lighting systems are replaced every 15 years, meaning that 1/15th of the existing floor area were included in the analysis. Existing floor area data came from the Non-Residential Construction Forecast dataset, shown in Table 44. The High Rise Apartment areas were taken from the Multi-family household data in the 2020 Residential Forecast. It is assumed that 26% of the total multifamily household comprises of High Rise Residential units.

Table 44 – Existing Building Floor Area by Building Types and Climate Zone from the Non-Residential Construction Forecast (million ft²)

	California Climate Zone																
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**TOTAL**
Small Office	3	12	39	28	5	39	45	53	48	57	15	75	32	9	12	12	484
Restaurant	1	5	18	10	2	26	13	37	39	37	4	21	10	7	5	7	241
Retail	5	36	151	88	17	152	92	216	209	181	32	179	69	35	28	42	1532
Food	2	10	35	23	4	38	28	54	51	50	11	47	23	9	9	11	406
Warehouse	2	25	132	60	12	141	61	198	188	194	35	160	59	36	35	33	1372
Ref. Warehouse	0	2	9	5	1	6	1	8	6	4	4	12	10	1	1	2	72
School	4	20	77	45	9	67	44	94	84	87	22	92	49	16	14	18	741
College	2	11	45	25	5	38	24	52	55	36	9	42	18	6	4	11	382
Hospital	2	13	53	32	6	40	33	59	71	42	13	63	27	8	6	12	482
Hotel	2	13	61	29	6	42	39	60	59	41	7	47	15	7	7	9	443
Large Office	3	42	254	99	19	186	101	270	325	97	16	176	28	23	11	47	1695
Hi-Rise Res.	3	34	195	76	15	105	104	163	303	101	23	142	48	21	14	40	1387
TOTAL	28	223	1068	520	101	877	585	1265	1438	927	191	1056	389	180	146	243	9237

4.3 Analysis and Detailed Results

The changes to the lighting power density and restroom lighting control requirements were analyzed as described in Section 3. The results are shown below in Table 45.

Table 45 – Non-residential Statewide First-Year Savings for Lighting System and Restroom Control Alterations in Existing Buildings

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	25.6	1.5	1.7	0.0	0.7
2	236.5	20.1	12.9	-0.17	5.47
3	1,188.3	104.7	60.4	-0.77	24.85
4	560.0	52.5	30.2	-0.34	12.73
5	106.6	9.3	5.7	-0.07	2.34
6	963.7	95.7	48.9	-0.41	20.28
7	715.1	74.9	34.4	-0.24	14.29
8	1,425.8	144.0	70.4	-0.54	30.38
9	1,815.8	185.2	86.6	-0.60	37.13
10	1,012.4	97.9	49.2	-0.38	21.65
11	181.4	15.9	10.3	-0.11	4.54
12	1,045.6	92.3	55.5	-0.66	23.87
13	379.8	34.2	21.4	-0.23	9.51
14	188.8	17.0	9.5	-0.10	4.26
15	151.9	16.4	7.0	-0.03	3.02
16	246.7	17.0	13.8	-0.23	5.81
Total	**10,243.9**	**978.5**	**517.9**	**-4.92**	**220.81**

5 NON-RESIDENTIAL HVAC ALTERATIONS

5.1 Standards Requirement

The standards require that when HVAC equipment is replaced, the new units must meet the requirements of the standard for equivalent equipment being installed in new construction. The small packaged vertical heat pump and small packaged vertical air conditioners are impacted by this measure.

5.2 Methodology

The impact of HVAC equipment replacements in existing buildings is due to the difference between the 2016 and 2019 standards. Although the HVAC systems being replaced are expected to have significantly higher energy consumption than those which are compliant with the 2016 standard, the savings claimed here are only the additional savings for improvements beyond those already required by the 2019 standard. This was analyzed by comparing the 2016 compliant buildings that use SPVAC and SPVHP against the buildings with same systems with efficiencies that are compliant with the 2019 standard. The results were weighted by the existing floor area in each climate zone, with buildings classified as in Table 25. It was assumed that packaged units are replaced every 20 years, meaning that we used 1/20th of the existing floor area in the analysis. Existing floor area data came from the Non-Residential Construction Forecast dataset, shown in Table 23.

5.3 Analysis and Detailed Results

The HVAC alteration requirements were analyzed as described above. The results are shown below in Table 46.

Table 46 – Non-residential Statewide First-Year Savings for SPVAC and SPVHP HVAC Replacements on Existing Buildings

CZ	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
1	0.4	0.0	0.0	0.00	0.00
2	3.0	0.3	0.0	0.00	0.03
3	6.3	0.7	0.0	0.00	0.04
4	6.5	0.6	0.0	0.00	0.07
5	0.7	0.1	0.0	0.00	0.00
6	8.1	0.7	0.1	0.00	0.06
7	4.2	0.4	0.0	0.00	0.03
8	15.4	1.3	0.1	0.00	0.12
9	17.6	1.3	0.1	0.00	0.18
10	18.4	1.4	0.1	0.00	0.18
11	5.5	0.5	0.0	0.00	0.06
12	19.7	1.6	0.1	0.00	0.20
13	11.2	1.1	0.1	0.00	0.13
14	3.9	0.3	0.0	0.00	0.04
15	4.7	0.4	0.0	0.00	0.05
16	3.1	0.3	0.0	0.00	0.01
Total	**128.7**	**11.0**	**1.0**	**0.00**	**1.18**

6 NON-RESIDENTIAL OVERALL ENERGY SAVINGS

6.1 Non-residential Total Savings

The energy savings for each of the measures or groups of measures listed above in Tables 34 through 42 for New Constructions, and Tables 45 through 46 for Alterations, are listed in Table 47, which also shows the overall statewide energy impacts on non-residential buildings of the 2019 Standards. These savings have been adjusted to distribute interactive effects across all measures, as described by Equation 2.

Table 47 – Non-residential Statewide First-Year Savings for the 2016 Energy Standard

Measure or Group of Measures	TDV GBtu	Site GBtu	Elec GWh	Gas Mtherm	Demand MW
Indoor Lighting Power Densities	2,489	201	131	-0.27	45.2
Indoor Lighting Manual ON Time-Switch	26	1	0	0.00	0.0
Indoor Occupant Sensing Light Controls in Restrooms	12	1	1	0.00	0.4
Outdoor Lighting Controls - Scheduling Controls	55	8	2	0.00	0.0
Outdoor Lighting Controls - Bi-Level, Remove 75 Watt Threshold	80	10	3	0.00	0.2
Fan System Power	197	17	10	-0.01	3.3
Equipment Efficiency	47	3	0	0.00	0.4
Waterside Economizers	4	1	0	0.00	0.0
Transfer Air for Exhaust Air Makeup	18	5	0	0.03	0.9
Demand Controlled Ventilation for Classrooms	85	19	3	0.25	10.8
Occupant Sensor Ventilation Requirements	809	162	21	0.27	8.6
Cooling Tower Minimum Efficiency	6	0	0	0.00	0.1
Economizer Fault Detection Diagnostics	31	4	1	0.01	1.1
Variable Exhaust Flow Control and High Efficiency Fume Hoods	202	21	8	0.00	1.7
Adiabatic Condensers (Option B)	20	2	1	0.00	0.1
Outdoor Lighting Power Allowance	329	35	16	0.00	4.0
New Construction Total	4,410	492	197	0.27	76.6
Lighting Alterations	10,244	978	518	-4.92	220.8
Indoor Lighting Manual ON Time-Switch	79	4	1	0.00	0.0
Outdoor Lighting Controls - Scheduling Controls	160	23	7	0.00	0.0
Outdoor Lighting Controls - Bi-Level, Remove 75 Watt Threshold	235	30	9	0.00	0.1
HVAC Alterations	129	11	1	0.00	1.2
Alterations Total	10,847	1,046	536	-4.92	222.1
TOTAL	**15,258**	**1,538**	**733**	**-5**	**299**

7 POLLUTANT EMISSIONS

7.1 Emission Factors

The energy savings listed above will result in reduced emissions of pollutants into the atmosphere. These emissions reductions are based on reduced combustion of coal, oil and natural gas in power plants, and reduced combustion of natural gas on site. Table 48 lists emissions factors for four criteria pollutants (oxides of nitrogen, oxides of sulfur, carbon monoxide, and particulate matter smaller than 2.5 nM) plus CO_2 equivalents as provided by the California Energy Commission.

Table 48 – Emissions Factors for Electricity and Natural Gas

Source	Unit	NO_X	SO_X	CO	PM2.5	CO_2e
Electricity	Tons/GWh	0.0255	0.0035	0.0365	0.011	481.5
Natural Gas	Tons/Mtherm	4.4751	0.02856	1.904	0.3618	5712.92

7.2 Emission Impacts

The emission factors from above were applied to the statewide energy savings derived in this impact analysis. Table 49 lists the pollutant emissions that the 2019 Energy Standard will avoid.

Table 49 – Statewide First-Year Emissions Reductions for the 2019 Energy Standard (tons)

	Savings (tons)				
Measures	**NOx**	**SOx**	**CO**	**PM2.5**	**CO2e**
Indoor Lighting Power Densities	2.11	0.45	4.25	1.34	61,322
Indoor Lighting Manual ON Time-Switch	0.01	0.00	0.01	0.00	183
Indoor Occupant Sensing Light Controls in Restrooms	0.02	0.00	0.04	0.01	566
Outdoor Lighting Controls - Scheduling Controls	0.06	0.01	0.08	0.02	1,088
Outdoor Lighting Controls - Bi-Level, Remove 75 Watt Threshold	0.08	0.01	0.11	0.03	1,464
Fan System Power	0.20	0.03	0.34	0.10	4,671
Equipment Efficiency	0.01	0.00	0.01	0.00	178
Waterside Economizers	0.00	0.00	0.01	0.00	77
Transfer Air for Exhaust Air Makeup	0.15	0.00	0.08	0.02	377
Demand Controlled Ventilation for Classrooms	1.21	0.02	0.59	0.12	2,892
Occupant Sensor Ventilation Requirements	1.73	0.08	1.27	0.33	11,617
Cooling Tower Minimum Efficiency	0.00	0.00	0.01	0.00	67
Economizer Fault Detection Diagnostics	0.07	0.00	0.05	0.01	487
Variable Exhaust Flow Control and High Efficiency Fume Hoods	0.19	0.03	0.28	0.08	3,734
Adiabatic Condensers (Option B)	0.02	0.00	0.02	0.01	327
Outdoor Lighting Power Allowance	0.40	0.06	0.58	0.17	7,603
Non-residential New Construction Total	6.26	0.70	7.73	2.27	96,653
Lighting Alterations	-8.81	1.67	9.53	3.92	221,258
Indoor Lighting Manual ON Time-Switch	0.03	0.00	0.04	0.01	549
Outdoor Lighting Controls - Scheduling Controls	0.17	0.02	0.24	0.07	3,197
Outdoor Lighting Controls - Bi-Level, Remove 75 Watt Threshold	0.23	0.03	0.33	0.10	4,300

HVAC Alterations	0.02	0.00	0.04	0.01	464
Non-residential Alterations Total	-8.36	1.73	10.18	4.11	229,767
Non-residential Total	***-2.10***	***2.43***	***17.91***	***6.38***	***326,420***
Single-Family Newly Constructed Buildings and Alterations	69,919	4,422	60,308	16,302	312,062
Multi-Family Newly Constructed Buildings and Alterations	6,846	648	7,558	2,172	45,024
Residential Total	***76,765***	***5,070***	***67,866***	***18,474***	***357,086***
TOTAL	**76,763**	**5,072**	**67,884**	**18,480**	**683,506**

REFERENCES

1. Title 24, 2019 Statewide CASE Reports:
   http://title24stakeholders.com/2019casetopics/

2. Title 24, 2019 Energy Code Staff Supplements:
   http://www.energy.ca.gov/title24/2019standards/rulemaking/documents/code-staff-supplements/index.php

3. Title 24, Part 6, 2019 15-day Language (Multiple CEC Dockets):
   https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-BSTD-02

4. Title 24, Part 6, 2016
   http://www.energy.ca.gov/2015publications/CEC-400-2015-037/CEC-400-2015-037-CMF.pdf

5. Alternative Calculation Method Approval Manual (2019)
   https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=17-BSTD-02

APPENDICES

Appendix 1 – Prototype Model Description

Appendix 2 – Area Weighted LPD Calculation

Appendix 3 – Outdoor LPA Calculation

Appendix 4 – Schedules for Occupancy Based Ventilation Control

ATTACHMENT 2 - CALEEMOD REVISIONS
ANNUAL OUTPUT REPORT – WATER USAGE

Callan and E 14th Street Infill Checklist Project Operations

Alameda County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Bank (with Drive-Through)	2.52	1000sqft	0.00	2,515.00	0
Enclosed Parking with Elevator	87.26	1000sqft	0.00	87,257.00	0
Other Non-Asphalt Surfaces	5.16	1000sqft	0.12	5,156.00	0
Fast Food Restaurant w/o Drive Thru	1.55	1000sqft	0.00	1,547.00	0
Apartments Mid Rise	196.00	Dwelling Unit	1.52	170,098.00	561
Regional Shopping Center	1.60	1000sqft	0.00	1,598.00	0
Supermarket	23.21	1000sqft	0.00	23,208.00	0

1.2 Other Project Characteristics

Urbanization Urban **Wind Speed (m/s)** 2.2 **Precipitation Freq (Days)** 63

Climate Zone 5 **Operational Year** 2023

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MWhr) 154.28 **CH4 Intensity (lb/MWhr)** 0.014 **N2O Intensity (lb/MWhr)** 0.002

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Based on the 2019 EBCE Power Content Label

Land Use - based on info from applicant, assigning all lot acreage to residential

Construction Phase -

Vehicle Trips - based on data from applicant, see assumptions file

Vehicle Emission Factors - EMFAC 2017 adjustment

Woodstoves - no fireplaces

Area Coating - assumes int/ext painting of parking structure and only accounts for parking area to be striped

Energy Use - based on NORESCO reductions, see assumptions file

Water And Wastewater - assigning all water use to apartments land use, assumes all indoor water and 100% aerobic treatment.

Water Mitigation -

Fleet Mix - see adjusted fleet mix for residential in assump file

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Nonresidential_Exterior	14434	58063
tblAreaCoating	Area_Nonresidential_Interior	43302	174188
tblAreaCoating	Area_Parking	5545	5235
tblEnergyUse	T24E	426.45	417.92
tblEnergyUse	T24E	1.21	1.08
tblEnergyUse	T24E	3.92	3.50
tblEnergyUse	T24E	2.67	2.38
tblEnergyUse	T24E	2.24	2.00
tblEnergyUse	T24E	2.72	2.43
tblEnergyUse	T24NG	6,115.43	5,809.66
tblEnergyUse	T24NG	17.85	17.67
tblEnergyUse	T24NG	39.90	39.50
tblEnergyUse	T24NG	3.90	3.86
tblEnergyUse	T24NG	24.53	24.28

tblFireplaces	FireplaceDayYear	11.14	0.00
tblFireplaces	FireplaceHourDay	3.50	0.00
tblFireplaces	FireplaceWoodMass	228.80	0.00
tblFireplaces	NumberGas	29.40	0.00
tblFireplaces	NumberNoFireplace	7.84	0.00
tblFireplaces	NumberWood	33.32	0.00
tblFleetMix	HHD	0.05	5.0610e-003
tblFleetMix	LDA	0.56	0.68
tblFleetMix	LDT1	0.04	0.05
tblFleetMix	LDT2	0.19	0.23
tblFleetMix	LHD1	0.02	1.6840e-003
tblFleetMix	LHD2	5.1800e-003	5.6700e-004
tblFleetMix	MCY	5.4910e-003	7.1080e-003
tblFleetMix	MDV	0.11	0.02
tblFleetMix	MH	7.0400e-004	0.00
tblFleetMix	MHD	0.02	2.6880e-003
tblFleetMix	OBUS	2.2090e-003	0.00
tblFleetMix	SBUS	3.3400e-004	0.00
tblFleetMix	UBUS	2.4560e-003	0.00
tblLandUse	LandUseSquareFeet	2,520.00	2,515.00
tblLandUse	LandUseSquareFeet	87,260.00	87,257.00
tblLandUse	LandUseSquareFeet	5,160.00	5,156.00
tblLandUse	LandUseSquareFeet	1,550.00	1,547.00
tblLandUse	LandUseSquareFeet	196,000.00	170,098.00
tblLandUse	LandUseSquareFeet	1,600.00	1,598.00
tblLandUse	LandUseSquareFeet	23,210.00	23,208.00
tblLandUse	LotAcreage	0.06	0.00

tblLandUse	LotAcreage	2.00	0.00
tblLandUse	LotAcreage	0.04	0.00
tblLandUse	LotAcreage	5.16	1.52
tblLandUse	LotAcreage	0.04	0.00
tblLandUse	LotAcreage	0.53	0.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.014
tblProjectCharacteristics	CO2IntensityFactor	641.35	154.28
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.002
tblVehicleEF	HHD	0.62	0.02
tblVehicleEF	HHD	0.04	0.03
tblVehicleEF	HHD	0.08	0.00
tblVehicleEF	HHD	1.68	6.67
tblVehicleEF	HHD	0.78	0.34
tblVehicleEF	HHD	2.05	4.2510e-003
tblVehicleEF	HHD	4,767.28	1,103.40
tblVehicleEF	HHD	1,547.06	1,394.59
tblVehicleEF	HHD	6.46	0.05
tblVehicleEF	HHD	14.52	5.51
tblVehicleEF	HHD	2.04	2.58
tblVehicleEF	HHD	20.07	2.28
tblVehicleEF	HHD	6.5450e-003	2.4080e-003
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.04	0.04
tblVehicleEF	HHD	6.1300e-003	0.03
tblVehicleEF	HHD	5.2000e-005	0.00
tblVehicleEF	HHD	6.2620e-003	2.3040e-003
tblVehicleEF	HHD	0.03	0.03

tblVehicleEF	HHD	8.8970e-003	8.9230e-003
tblVehicleEF	HHD	5.8640e-003	0.02
tblVehicleEF	HHD	4.8000e-005	0.00
tblVehicleEF	HHD	4.8000e-005	2.0000e-006
tblVehicleEF	HHD	2.8330e-003	7.7000e-005
tblVehicleEF	HHD	0.44	0.45
tblVehicleEF	HHD	3.3000e-005	1.0000e-006
tblVehicleEF	HHD	0.09	0.02
tblVehicleEF	HHD	2.1500e-004	3.9700e-004
tblVehicleEF	HHD	0.05	1.0000e-006
tblVehicleEF	HHD	0.04	0.01
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	9.8000e-005	0.00
tblVehicleEF	HHD	4.8000e-005	2.0000e-006
tblVehicleEF	HHD	2.8330e-003	7.7000e-005
tblVehicleEF	HHD	0.51	0.52
tblVehicleEF	HHD	3.3000e-005	1.0000e-006
tblVehicleEF	HHD	0.14	0.06
tblVehicleEF	HHD	2.1500e-004	3.9700e-004
tblVehicleEF	HHD	0.06	1.0000e-006
tblVehicleEF	HHD	0.58	0.03
tblVehicleEF	HHD	0.04	0.03
tblVehicleEF	HHD	0.08	0.00
tblVehicleEF	HHD	1.22	6.58
tblVehicleEF	HHD	0.79	0.34
tblVehicleEF	HHD	1.87	3.8680e-003
tblVehicleEF	HHD	5,050.51	1,089.96

tblVehicleEF	HHD	1,547.06	1,394.59
tblVehicleEF	HHD	6.46	0.05
tblVehicleEF	HHD	14.99	5.25
tblVehicleEF	HHD	1.96	2.48
tblVehicleEF	HHD	20.06	2.28
tblVehicleEF	HHD	5.5180e-003	2.1170e-003
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.04	0.04
tblVehicleEF	HHD	6.1300e-003	0.03
tblVehicleEF	HHD	5.2000e-005	0.00
tblVehicleEF	HHD	5.2800e-003	2.0260e-003
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	8.8970e-003	8.9230e-003
tblVehicleEF	HHD	5.8640e-003	0.02
tblVehicleEF	HHD	4.8000e-005	0.00
tblVehicleEF	HHD	1.1600e-004	4.0000e-006
tblVehicleEF	HHD	3.0450e-003	8.4000e-005
tblVehicleEF	HHD	0.41	0.48
tblVehicleEF	HHD	7.1000e-005	2.0000e-006
tblVehicleEF	HHD	0.09	0.02
tblVehicleEF	HHD	2.0800e-004	3.8700e-004
tblVehicleEF	HHD	0.05	1.0000e-006
tblVehicleEF	HHD	0.05	0.01
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	9.5000e-005	0.00
tblVehicleEF	HHD	1.1600e-004	4.0000e-006
tblVehicleEF	HHD	3.0450e-003	8.4000e-005

tblVehicleEF	HHD	0.48	0.55
tblVehicleEF	HHD	7.1000e-005	2.0000e-006
tblVehicleEF	HHD	0.14	0.06
tblVehicleEF	HHD	2.0800e-004	3.8700e-004
tblVehicleEF	HHD	0.05	1.0000e-006
tblVehicleEF	HHD	0.67	0.02
tblVehicleEF	HHD	0.04	1.1080e-003
tblVehicleEF	HHD	0.09	0.00
tblVehicleEF	HHD	2.32	6.73
tblVehicleEF	HHD	0.78	0.25
tblVehicleEF	HHD	2.21	4.5730e-003
tblVehicleEF	HHD	4,376.16	1,111.96
tblVehicleEF	HHD	1,547.06	1,368.03
tblVehicleEF	HHD	6.46	0.05
tblVehicleEF	HHD	13.87	5.82
tblVehicleEF	HHD	2.07	2.61
tblVehicleEF	HHD	20.08	2.28
tblVehicleEF	HHD	7.9630e-003	2.7500e-003
tblVehicleEF	HHD	0.06	0.06
tblVehicleEF	HHD	0.04	0.04
tblVehicleEF	HHD	6.1300e-003	0.03
tblVehicleEF	HHD	5.2000e-005	0.00
tblVehicleEF	HHD	7.6190e-003	2.6310e-003
tblVehicleEF	HHD	0.03	0.03
tblVehicleEF	HHD	8.8970e-003	8.8450e-003
tblVehicleEF	HHD	5.8640e-003	0.02
tblVehicleEF	HHD	4.8000e-005	0.00

tblVehicleEF	HHD	2.3000e-005	1.0000e-006
tblVehicleEF	HHD	2.9280e-003	8.2000e-005
tblVehicleEF	HHD	0.47	0.41
tblVehicleEF	HHD	1.6000e-005	0.00
tblVehicleEF	HHD	0.09	0.02
tblVehicleEF	HHD	2.4000e-004	4.4100e-004
tblVehicleEF	HHD	0.05	1.0000e-006
tblVehicleEF	HHD	0.04	0.01
tblVehicleEF	HHD	0.01	0.01
tblVehicleEF	HHD	1.0100e-004	0.00
tblVehicleEF	HHD	2.3000e-005	1.0000e-006
tblVehicleEF	HHD	2.9280e-003	8.2000e-005
tblVehicleEF	HHD	0.55	0.47
tblVehicleEF	HHD	1.6000e-005	0.00
tblVehicleEF	HHD	0.14	0.03
tblVehicleEF	HHD	2.4000e-004	4.4100e-004
tblVehicleEF	HHD	0.06	1.0000e-006
tblVehicleEF	LDA	3.8970e-003	2.1170e-003
tblVehicleEF	LDA	5.6840e-003	0.05
tblVehicleEF	LDA	0.53	0.57
tblVehicleEF	LDA	1.25	2.24
tblVehicleEF	LDA	244.94	250.60
tblVehicleEF	LDA	56.21	53.04
tblVehicleEF	LDA	0.05	0.04
tblVehicleEF	LDA	0.07	0.19
tblVehicleEF	LDA	1.7490e-003	1.4460e-003
tblVehicleEF	LDA	2.2460e-003	1.7640e-003

tblVehicleEF	LDA	1.6120e-003	1.3330e-003
tblVehicleEF	LDA	2.0650e-003	1.6220e-003
tblVehicleEF	LDA	0.03	0.04
tblVehicleEF	LDA	0.11	0.10
tblVehicleEF	LDA	0.03	0.04
tblVehicleEF	LDA	9.8450e-003	8.2190e-003
tblVehicleEF	LDA	0.04	0.22
tblVehicleEF	LDA	0.08	0.23
tblVehicleEF	LDA	2.4520e-003	2.4480e-003
tblVehicleEF	LDA	5.8300e-004	5.1800e-004
tblVehicleEF	LDA	0.03	0.04
tblVehicleEF	LDA	0.11	0.10
tblVehicleEF	LDA	0.03	0.04
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.04	0.22
tblVehicleEF	LDA	0.08	0.25
tblVehicleEF	LDA	4.3500e-003	2.4010e-003
tblVehicleEF	LDA	4.6290e-003	0.04
tblVehicleEF	LDA	0.63	0.67
tblVehicleEF	LDA	0.96	1.72
tblVehicleEF	LDA	264.78	270.53
tblVehicleEF	LDA	56.21	52.05
tblVehicleEF	LDA	0.04	0.03
tblVehicleEF	LDA	0.06	0.16
tblVehicleEF	LDA	1.7490e-003	1.4460e-003
tblVehicleEF	LDA	2.2460e-003	1.7640e-003
tblVehicleEF	LDA	1.6120e-003	1.3330e-003

tblVehicleEF	LDA	2.0650e-003	1.6220e-003
tblVehicleEF	LDA	0.08	0.09
tblVehicleEF	LDA	0.12	0.11
tblVehicleEF	LDA	0.06	0.08
tblVehicleEF	LDA	0.01	9.1560e-003
tblVehicleEF	LDA	0.03	0.20
tblVehicleEF	LDA	0.06	0.19
tblVehicleEF	LDA	2.6520e-003	2.6430e-003
tblVehicleEF	LDA	5.7800e-004	5.0900e-004
tblVehicleEF	LDA	0.08	0.09
tblVehicleEF	LDA	0.12	0.11
tblVehicleEF	LDA	0.06	0.08
tblVehicleEF	LDA	0.02	0.01
tblVehicleEF	LDA	0.03	0.20
tblVehicleEF	LDA	0.07	0.20
tblVehicleEF	LDA	3.8110e-003	2.0450e-003
tblVehicleEF	LDA	6.4210e-003	0.06
tblVehicleEF	LDA	0.53	0.56
tblVehicleEF	LDA	1.46	2.63
tblVehicleEF	LDA	242.96	248.61
tblVehicleEF	LDA	56.21	53.75
tblVehicleEF	LDA	0.05	0.04
tblVehicleEF	LDA	0.08	0.20
tblVehicleEF	LDA	1.7490e-003	1.4460e-003
tblVehicleEF	LDA	2.2460e-003	1.7640e-003
tblVehicleEF	LDA	1.6120e-003	1.3330e-003
tblVehicleEF	LDA	2.0650e-003	1.6220e-003

tblVehicleEF	LDA	0.01	0.02
tblVehicleEF	LDA	0.11	0.10
tblVehicleEF	LDA	0.01	0.02
tblVehicleEF	LDA	9.6340e-003	8.0360e-003
tblVehicleEF	LDA	0.04	0.26
tblVehicleEF	LDA	0.09	0.26
tblVehicleEF	LDA	2.4320e-003	2.4290e-003
tblVehicleEF	LDA	5.8700e-004	5.2500e-004
tblVehicleEF	LDA	0.01	0.02
tblVehicleEF	LDA	0.11	0.10
tblVehicleEF	LDA	0.01	0.02
tblVehicleEF	LDA	0.01	0.01
tblVehicleEF	LDA	0.04	0.26
tblVehicleEF	LDA	0.09	0.28
tblVehicleEF	LDT1	8.0930e-003	4.2580e-003
tblVehicleEF	LDT1	0.01	0.07
tblVehicleEF	LDT1	0.99	0.93
tblVehicleEF	LDT1	2.67	2.45
tblVehicleEF	LDT1	300.74	299.24
tblVehicleEF	LDT1	69.06	64.04
tblVehicleEF	LDT1	0.10	0.08
tblVehicleEF	LDT1	0.15	0.25
tblVehicleEF	LDT1	2.2930e-003	1.8240e-003
tblVehicleEF	LDT1	3.0800e-003	2.3360e-003
tblVehicleEF	LDT1	2.1120e-003	1.6790e-003
tblVehicleEF	LDT1	2.8320e-003	2.1480e-003
tblVehicleEF	LDT1	0.08	0.08

tblVehicleEF	LDT1	0.24	0.18
tblVehicleEF	LDT1	0.07	0.07
tblVehicleEF	LDT1	0.02	0.02
tblVehicleEF	LDT1	0.15	0.65
tblVehicleEF	LDT1	0.18	0.34
tblVehicleEF	LDT1	3.0180e-003	2.9240e-003
tblVehicleEF	LDT1	7.3700e-004	6.2600e-004
tblVehicleEF	LDT1	0.08	0.08
tblVehicleEF	LDT1	0.24	0.18
tblVehicleEF	LDT1	0.07	0.07
tblVehicleEF	LDT1	0.03	0.03
tblVehicleEF	LDT1	0.15	0.65
tblVehicleEF	LDT1	0.19	0.37
tblVehicleEF	LDT1	8.9420e-003	4.7810e-003
tblVehicleEF	LDT1	0.01	0.06
tblVehicleEF	LDT1	1.15	1.08
tblVehicleEF	LDT1	2.04	1.87
tblVehicleEF	LDT1	324.25	319.79
tblVehicleEF	LDT1	69.06	62.89
tblVehicleEF	LDT1	0.09	0.07
tblVehicleEF	LDT1	0.13	0.22
tblVehicleEF	LDT1	2.2930e-003	1.8240e-003
tblVehicleEF	LDT1	3.0800e-003	2.3360e-003
tblVehicleEF	LDT1	2.1120e-003	1.6790e-003
tblVehicleEF	LDT1	2.8320e-003	2.1480e-003
tblVehicleEF	LDT1	0.21	0.21
tblVehicleEF	LDT1	0.27	0.20

tblVehicleEF	LDT1	0.16	0.16
tblVehicleEF	LDT1	0.02	0.02
tblVehicleEF	LDT1	0.14	0.60
tblVehicleEF	LDT1	0.14	0.28
tblVehicleEF	LDT1	3.2560e-003	3.1250e-003
tblVehicleEF	LDT1	7.2600e-004	6.1500e-004
tblVehicleEF	LDT1	0.21	0.21
tblVehicleEF	LDT1	0.27	0.20
tblVehicleEF	LDT1	0.16	0.16
tblVehicleEF	LDT1	0.03	0.03
tblVehicleEF	LDT1	0.14	0.60
tblVehicleEF	LDT1	0.16	0.30
tblVehicleEF	LDT1	7.9620e-003	4.1270e-003
tblVehicleEF	LDT1	0.01	0.08
tblVehicleEF	LDT1	0.99	0.92
tblVehicleEF	LDT1	3.13	2.87
tblVehicleEF	LDT1	298.39	297.20
tblVehicleEF	LDT1	69.06	64.87
tblVehicleEF	LDT1	0.11	0.09
tblVehicleEF	LDT1	0.16	0.27
tblVehicleEF	LDT1	2.2930e-003	1.8240e-003
tblVehicleEF	LDT1	3.0800e-003	2.3360e-003
tblVehicleEF	LDT1	2.1120e-003	1.6790e-003
tblVehicleEF	LDT1	2.8320e-003	2.1480e-003
tblVehicleEF	LDT1	0.03	0.03
tblVehicleEF	LDT1	0.26	0.19
tblVehicleEF	LDT1	0.03	0.04

tblVehicleEF	LDT1	0.02	0.02
tblVehicleEF	LDT1	0.18	0.80
tblVehicleEF	LDT1	0.20	0.39
tblVehicleEF	LDT1	2.9950e-003	2.9040e-003
tblVehicleEF	LDT1	7.4500e-004	6.3400e-004
tblVehicleEF	LDT1	0.03	0.03
tblVehicleEF	LDT1	0.26	0.19
tblVehicleEF	LDT1	0.03	0.04
tblVehicleEF	LDT1	0.03	0.03
tblVehicleEF	LDT1	0.18	0.80
tblVehicleEF	LDT1	0.22	0.42
tblVehicleEF	LDT2	5.0510e-003	3.2180e-003
tblVehicleEF	LDT2	6.9140e-003	0.07
tblVehicleEF	LDT2	0.66	0.75
tblVehicleEF	LDT2	1.52	2.87
tblVehicleEF	LDT2	339.26	321.37
tblVehicleEF	LDT2	77.68	69.31
tblVehicleEF	LDT2	0.07	0.07
tblVehicleEF	LDT2	0.11	0.28
tblVehicleEF	LDT2	1.7210e-003	1.4410e-003
tblVehicleEF	LDT2	2.3050e-003	1.7670e-003
tblVehicleEF	LDT2	1.5830e-003	1.3260e-003
tblVehicleEF	LDT2	2.1190e-003	1.6250e-003
tblVehicleEF	LDT2	0.04	0.06
tblVehicleEF	LDT2	0.11	0.13
tblVehicleEF	LDT2	0.04	0.06
tblVehicleEF	LDT2	0.01	0.01

tblVehicleEF	LDT2	0.06	0.44
tblVehicleEF	LDT2	0.09	0.32
tblVehicleEF	LDT2	3.3970e-003	3.1400e-003
tblVehicleEF	LDT2	8.0200e-004	6.7700e-004
tblVehicleEF	LDT2	0.04	0.06
tblVehicleEF	LDT2	0.11	0.13
tblVehicleEF	LDT2	0.04	0.06
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.06	0.44
tblVehicleEF	LDT2	0.10	0.35
tblVehicleEF	LDT2	5.6330e-003	3.6370e-003
tblVehicleEF	LDT2	5.6340e-003	0.06
tblVehicleEF	LDT2	0.78	0.89
tblVehicleEF	LDT2	1.17	2.19
tblVehicleEF	LDT2	366.22	341.41
tblVehicleEF	LDT2	77.68	68.02
tblVehicleEF	LDT2	0.06	0.06
tblVehicleEF	LDT2	0.10	0.25
tblVehicleEF	LDT2	1.7210e-003	1.4410e-003
tblVehicleEF	LDT2	2.3050e-003	1.7670e-003
tblVehicleEF	LDT2	1.5830e-003	1.3260e-003
tblVehicleEF	LDT2	2.1190e-003	1.6250e-003
tblVehicleEF	LDT2	0.09	0.14
tblVehicleEF	LDT2	0.12	0.14
tblVehicleEF	LDT2	0.08	0.13
tblVehicleEF	LDT2	0.01	0.01
tblVehicleEF	LDT2	0.06	0.40

tblVehicleEF	LDT2	0.08	0.26
tblVehicleEF	LDT2	3.6680e-003	3.3360e-003
tblVehicleEF	LDT2	7.9600e-004	6.6500e-004
tblVehicleEF	LDT2	0.09	0.14
tblVehicleEF	LDT2	0.12	0.14
tblVehicleEF	LDT2	0.08	0.13
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.06	0.40
tblVehicleEF	LDT2	0.08	0.29
tblVehicleEF	LDT2	4.9370e-003	3.1100e-003
tblVehicleEF	LDT2	7.8080e-003	0.08
tblVehicleEF	LDT2	0.65	0.75
tblVehicleEF	LDT2	1.77	3.36
tblVehicleEF	LDT2	336.57	319.38
tblVehicleEF	LDT2	77.68	70.24
tblVehicleEF	LDT2	0.08	0.07
tblVehicleEF	LDT2	0.12	0.31
tblVehicleEF	LDT2	1.7210e-003	1.4410e-003
tblVehicleEF	LDT2	2.3050e-003	1.7670e-003
tblVehicleEF	LDT2	1.5830e-003	1.3260e-003
tblVehicleEF	LDT2	2.1190e-003	1.6250e-003
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.11	0.13
tblVehicleEF	LDT2	0.02	0.03
tblVehicleEF	LDT2	0.01	0.01
tblVehicleEF	LDT2	0.08	0.53
tblVehicleEF	LDT2	0.11	0.36

tblVehicleEF	LDT2	3.3700e-003	3.1210e-003
tblVehicleEF	LDT2	8.0700e-004	6.8600e-004
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.11	0.13
tblVehicleEF	LDT2	0.02	0.03
tblVehicleEF	LDT2	0.02	0.02
tblVehicleEF	LDT2	0.08	0.53
tblVehicleEF	LDT2	0.12	0.40
tblVehicleEF	LHD1	5.4470e-003	5.3750e-003
tblVehicleEF	LHD1	0.02	8.9070e-003
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	0.15	0.19
tblVehicleEF	LHD1	1.08	0.81
tblVehicleEF	LHD1	2.63	1.12
tblVehicleEF	LHD1	9.01	8.94
tblVehicleEF	LHD1	694.94	806.45
tblVehicleEF	LHD1	32.75	12.21
tblVehicleEF	LHD1	0.07	0.06
tblVehicleEF	LHD1	1.26	0.76
tblVehicleEF	LHD1	1.04	0.34
tblVehicleEF	LHD1	8.7000e-004	7.9200e-004
tblVehicleEF	LHD1	0.01	9.6770e-003
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	9.3800e-004	2.6000e-004
tblVehicleEF	LHD1	8.3200e-004	7.5800e-004
tblVehicleEF	LHD1	2.5100e-003	2.4190e-003
tblVehicleEF	LHD1	0.02	9.8820e-003

tblVehicleEF	LHD1	8.6300e-004	2.3900e-004
tblVehicleEF	LHD1	2.3470e-003	1.8480e-003
tblVehicleEF	LHD1	0.10	0.08
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	1.3470e-003	1.0560e-003
tblVehicleEF	LHD1	0.12	0.09
tblVehicleEF	LHD1	0.30	0.55
tblVehicleEF	LHD1	0.27	0.08
tblVehicleEF	LHD1	9.0000e-005	8.7000e-005
tblVehicleEF	LHD1	6.8250e-003	7.8810e-003
tblVehicleEF	LHD1	3.7700e-004	1.2100e-004
tblVehicleEF	LHD1	2.3470e-003	1.8480e-003
tblVehicleEF	LHD1	0.10	0.08
tblVehicleEF	LHD1	0.02	0.03
tblVehicleEF	LHD1	1.3470e-003	1.0560e-003
tblVehicleEF	LHD1	0.15	0.12
tblVehicleEF	LHD1	0.30	0.55
tblVehicleEF	LHD1	0.29	0.09
tblVehicleEF	LHD1	5.4470e-003	5.3920e-003
tblVehicleEF	LHD1	0.02	9.1610e-003
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	0.15	0.19
tblVehicleEF	LHD1	1.10	0.83
tblVehicleEF	LHD1	2.41	1.03
tblVehicleEF	LHD1	9.01	8.94
tblVehicleEF	LHD1	694.94	806.49
tblVehicleEF	LHD1	32.75	12.05

tblVehicleEF	LHD1	0.07	0.06
tblVehicleEF	LHD1	1.20	0.72
tblVehicleEF	LHD1	0.96	0.31
tblVehicleEF	LHD1	8.7000e-004	7.9200e-004
tblVehicleEF	LHD1	0.01	9.6770e-003
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	9.3800e-004	2.6000e-004
tblVehicleEF	LHD1	8.3200e-004	7.5800e-004
tblVehicleEF	LHD1	2.5100e-003	2.4190e-003
tblVehicleEF	LHD1	0.02	9.8820e-003
tblVehicleEF	LHD1	8.6300e-004	2.3900e-004
tblVehicleEF	LHD1	5.7580e-003	4.5640e-003
tblVehicleEF	LHD1	0.12	0.09
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	2.8690e-003	2.2700e-003
tblVehicleEF	LHD1	0.13	0.10
tblVehicleEF	LHD1	0.29	0.53
tblVehicleEF	LHD1	0.25	0.07
tblVehicleEF	LHD1	9.0000e-005	8.7000e-005
tblVehicleEF	LHD1	6.8250e-003	7.8810e-003
tblVehicleEF	LHD1	3.7300e-004	1.1900e-004
tblVehicleEF	LHD1	5.7580e-003	4.5640e-003
tblVehicleEF	LHD1	0.12	0.09
tblVehicleEF	LHD1	0.02	0.03
tblVehicleEF	LHD1	2.8690e-003	2.2700e-003
tblVehicleEF	LHD1	0.16	0.12
tblVehicleEF	LHD1	0.29	0.53

tblVehicleEF	LHD1	0.27	0.08
tblVehicleEF	LHD1	5.4470e-003	5.3620e-003
tblVehicleEF	LHD1	0.02	8.7280e-003
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	0.15	0.19
tblVehicleEF	LHD1	1.06	0.79
tblVehicleEF	LHD1	2.83	1.20
tblVehicleEF	LHD1	9.01	8.94
tblVehicleEF	LHD1	694.94	806.42
tblVehicleEF	LHD1	32.75	12.35
tblVehicleEF	LHD1	0.07	0.06
tblVehicleEF	LHD1	1.29	0.77
tblVehicleEF	LHD1	1.11	0.36
tblVehicleEF	LHD1	8.7000e-004	7.9200e-004
tblVehicleEF	LHD1	0.01	9.6770e-003
tblVehicleEF	LHD1	0.02	0.01
tblVehicleEF	LHD1	9.3800e-004	2.6000e-004
tblVehicleEF	LHD1	8.3200e-004	7.5800e-004
tblVehicleEF	LHD1	2.5100e-003	2.4190e-003
tblVehicleEF	LHD1	0.02	9.8820e-003
tblVehicleEF	LHD1	8.6300e-004	2.3900e-004
tblVehicleEF	LHD1	9.7500e-004	7.5700e-004
tblVehicleEF	LHD1	0.11	0.09
tblVehicleEF	LHD1	0.02	0.02
tblVehicleEF	LHD1	6.5800e-004	5.0900e-004
tblVehicleEF	LHD1	0.12	0.09
tblVehicleEF	LHD1	0.34	0.61

tblVehicleEF	LHD1	0.28	0.08
tblVehicleEF	LHD1	9.0000e-005	8.7000e-005
tblVehicleEF	LHD1	6.8240e-003	7.8800e-003
tblVehicleEF	LHD1	3.8100e-004	1.2200e-004
tblVehicleEF	LHD1	9.7500e-004	7.5700e-004
tblVehicleEF	LHD1	0.11	0.09
tblVehicleEF	LHD1	0.02	0.03
tblVehicleEF	LHD1	6.5800e-004	5.0900e-004
tblVehicleEF	LHD1	0.15	0.11
tblVehicleEF	LHD1	0.34	0.61
tblVehicleEF	LHD1	0.31	0.09
tblVehicleEF	LHD2	3.6270e-003	3.6920e-003
tblVehicleEF	LHD2	8.0300e-003	7.1740e-003
tblVehicleEF	LHD2	7.5680e-003	9.9610e-003
tblVehicleEF	LHD2	0.13	0.15
tblVehicleEF	LHD2	0.58	0.63
tblVehicleEF	LHD2	1.26	0.72
tblVehicleEF	LHD2	13.84	13.61
tblVehicleEF	LHD2	714.57	797.43
tblVehicleEF	LHD2	25.84	9.13
tblVehicleEF	LHD2	0.10	0.09
tblVehicleEF	LHD2	0.78	0.86
tblVehicleEF	LHD2	0.51	0.22
tblVehicleEF	LHD2	1.2000e-003	1.2930e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	4.1700e-004	1.4400e-004

tblVehicleEF	LHD2	1.1480e-003	1.2380e-003
tblVehicleEF	LHD2	2.6730e-003	2.6420e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	3.8400e-004	1.3200e-004
tblVehicleEF	LHD2	8.1400e-004	1.0880e-003
tblVehicleEF	LHD2	0.03	0.05
tblVehicleEF	LHD2	0.01	0.02
tblVehicleEF	LHD2	4.9300e-004	6.3200e-004
tblVehicleEF	LHD2	0.11	0.11
tblVehicleEF	LHD2	0.07	0.32
tblVehicleEF	LHD2	0.10	0.05
tblVehicleEF	LHD2	1.3500e-004	1.3000e-004
tblVehicleEF	LHD2	6.9560e-003	7.7200e-003
tblVehicleEF	LHD2	2.8100e-004	9.0000e-005
tblVehicleEF	LHD2	8.1400e-004	1.0880e-003
tblVehicleEF	LHD2	0.03	0.05
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	4.9300e-004	6.3200e-004
tblVehicleEF	LHD2	0.12	0.13
tblVehicleEF	LHD2	0.07	0.32
tblVehicleEF	LHD2	0.11	0.05
tblVehicleEF	LHD2	3.6270e-003	3.7030e-003
tblVehicleEF	LHD2	8.1720e-003	7.2800e-003
tblVehicleEF	LHD2	7.1120e-003	9.3460e-003
tblVehicleEF	LHD2	0.13	0.15
tblVehicleEF	LHD2	0.59	0.64
tblVehicleEF	LHD2	1.16	0.67

tblVehicleEF	LHD2	13.84	13.61
tblVehicleEF	LHD2	714.57	797.45
tblVehicleEF	LHD2	25.84	9.03
tblVehicleEF	LHD2	0.10	0.09
tblVehicleEF	LHD2	0.75	0.82
tblVehicleEF	LHD2	0.48	0.21
tblVehicleEF	LHD2	1.2000e-003	1.2930e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	4.1700e-004	1.4400e-004
tblVehicleEF	LHD2	1.1480e-003	1.2380e-003
tblVehicleEF	LHD2	2.6730e-003	2.6420e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	3.8400e-004	1.3200e-004
tblVehicleEF	LHD2	1.9850e-003	2.6790e-003
tblVehicleEF	LHD2	0.04	0.05
tblVehicleEF	LHD2	0.01	0.02
tblVehicleEF	LHD2	1.0480e-003	1.3570e-003
tblVehicleEF	LHD2	0.11	0.11
tblVehicleEF	LHD2	0.07	0.30
tblVehicleEF	LHD2	0.10	0.05
tblVehicleEF	LHD2	1.3500e-004	1.3000e-004
tblVehicleEF	LHD2	6.9560e-003	7.7200e-003
tblVehicleEF	LHD2	2.7900e-004	8.9000e-005
tblVehicleEF	LHD2	1.9850e-003	2.6790e-003
tblVehicleEF	LHD2	0.04	0.05
tblVehicleEF	LHD2	0.02	0.02

tblVehicleEF	LHD2	1.0480e-003	1.3570e-003
tblVehicleEF	LHD2	0.12	0.13
tblVehicleEF	LHD2	0.07	0.30
tblVehicleEF	LHD2	0.11	0.05
tblVehicleEF	LHD2	3.6270e-003	3.6830e-003
tblVehicleEF	LHD2	7.9290e-003	7.0980e-003
tblVehicleEF	LHD2	7.9280e-003	0.01
tblVehicleEF	LHD2	0.13	0.15
tblVehicleEF	LHD2	0.58	0.63
tblVehicleEF	LHD2	1.35	0.77
tblVehicleEF	LHD2	13.84	13.61
tblVehicleEF	LHD2	714.57	797.42
tblVehicleEF	LHD2	25.84	9.22
tblVehicleEF	LHD2	0.10	0.09
tblVehicleEF	LHD2	0.80	0.88
tblVehicleEF	LHD2	0.54	0.24
tblVehicleEF	LHD2	1.2000e-003	1.2930e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	4.1700e-004	1.4400e-004
tblVehicleEF	LHD2	1.1480e-003	1.2380e-003
tblVehicleEF	LHD2	2.6730e-003	2.6420e-003
tblVehicleEF	LHD2	0.01	0.01
tblVehicleEF	LHD2	3.8400e-004	1.3200e-004
tblVehicleEF	LHD2	3.5500e-004	4.6000e-004
tblVehicleEF	LHD2	0.04	0.05
tblVehicleEF	LHD2	0.01	0.02

tblVehicleEF	LHD2	2.4500e-004	3.1200e-004
tblVehicleEF	LHD2	0.11	0.11
tblVehicleEF	LHD2	0.08	0.35
tblVehicleEF	LHD2	0.11	0.05
tblVehicleEF	LHD2	1.3500e-004	1.3000e-004
tblVehicleEF	LHD2	6.9560e-003	7.7200e-003
tblVehicleEF	LHD2	2.8300e-004	9.1000e-005
tblVehicleEF	LHD2	3.5500e-004	4.6000e-004
tblVehicleEF	LHD2	0.04	0.05
tblVehicleEF	LHD2	0.02	0.02
tblVehicleEF	LHD2	2.4500e-004	3.1200e-004
tblVehicleEF	LHD2	0.12	0.13
tblVehicleEF	LHD2	0.08	0.35
tblVehicleEF	LHD2	0.12	0.06
tblVehicleEF	MCY	0.46	0.34
tblVehicleEF	MCY	0.17	0.26
tblVehicleEF	MCY	20.03	20.15
tblVehicleEF	MCY	10.24	9.10
tblVehicleEF	MCY	174.71	215.41
tblVehicleEF	MCY	45.85	61.83
tblVehicleEF	MCY	1.17	1.17
tblVehicleEF	MCY	0.32	0.27
tblVehicleEF	MCY	2.1220e-003	2.0690e-003
tblVehicleEF	MCY	3.9700e-003	3.1980e-003
tblVehicleEF	MCY	1.9850e-003	1.9350e-003
tblVehicleEF	MCY	3.7430e-003	3.0120e-003
tblVehicleEF	MCY	0.81	0.80

tblVehicleEF	MCY	0.74	0.73
tblVehicleEF	MCY	0.50	0.50
tblVehicleEF	MCY	2.33	2.34
tblVehicleEF	MCY	0.60	2.18
tblVehicleEF	MCY	2.26	1.99
tblVehicleEF	MCY	2.1430e-003	2.1320e-003
tblVehicleEF	MCY	6.9300e-004	6.1200e-004
tblVehicleEF	MCY	0.81	0.80
tblVehicleEF	MCY	0.74	0.73
tblVehicleEF	MCY	0.50	0.50
tblVehicleEF	MCY	2.88	2.89
tblVehicleEF	MCY	0.60	2.18
tblVehicleEF	MCY	2.46	2.17
tblVehicleEF	MCY	0.45	0.33
tblVehicleEF	MCY	0.14	0.21
tblVehicleEF	MCY	18.97	19.08
tblVehicleEF	MCY	8.85	7.79
tblVehicleEF	MCY	174.71	213.35
tblVehicleEF	MCY	45.85	58.50
tblVehicleEF	MCY	1.02	1.02
tblVehicleEF	MCY	0.29	0.25
tblVehicleEF	MCY	2.1220e-003	2.0690e-003
tblVehicleEF	MCY	3.9700e-003	3.1980e-003
tblVehicleEF	MCY	1.9850e-003	1.9350e-003
tblVehicleEF	MCY	3.7430e-003	3.0120e-003
tblVehicleEF	MCY	2.35	2.34
tblVehicleEF	MCY	0.98	0.97

tblVehicleEF	MCY	1.45	1.43
tblVehicleEF	MCY	2.23	2.24
tblVehicleEF	MCY	0.56	2.03
tblVehicleEF	MCY	1.85	1.62
tblVehicleEF	MCY	2.1230e-003	2.1110e-003
tblVehicleEF	MCY	6.5700e-004	5.7900e-004
tblVehicleEF	MCY	2.35	2.34
tblVehicleEF	MCY	0.98	0.97
tblVehicleEF	MCY	1.45	1.43
tblVehicleEF	MCY	2.76	2.77
tblVehicleEF	MCY	0.56	2.03
tblVehicleEF	MCY	2.01	1.76
tblVehicleEF	MCY	0.48	0.35
tblVehicleEF	MCY	0.19	0.30
tblVehicleEF	MCY	21.70	21.83
tblVehicleEF	MCY	11.67	10.43
tblVehicleEF	MCY	174.71	218.44
tblVehicleEF	MCY	45.85	65.04
tblVehicleEF	MCY	1.25	1.25
tblVehicleEF	MCY	0.34	0.29
tblVehicleEF	MCY	2.1220e-003	2.0690e-003
tblVehicleEF	MCY	3.9700e-003	3.1980e-003
tblVehicleEF	MCY	1.9850e-003	1.9350e-003
tblVehicleEF	MCY	3.7430e-003	3.0120e-003
tblVehicleEF	MCY	0.21	0.21
tblVehicleEF	MCY	0.89	0.86
tblVehicleEF	MCY	0.17	0.18

tblVehicleEF	MCY	2.43	2.44
tblVehicleEF	MCY	0.71	2.58
tblVehicleEF	MCY	2.62	2.33
tblVehicleEF	MCY	2.1730e-003	2.1620e-003
tblVehicleEF	MCY	7.2700e-004	6.4400e-004
tblVehicleEF	MCY	0.21	0.21
tblVehicleEF	MCY	0.89	0.86
tblVehicleEF	MCY	0.17	0.18
tblVehicleEF	MCY	3.00	3.01
tblVehicleEF	MCY	0.71	2.58
tblVehicleEF	MCY	2.85	2.53
tblVehicleEF	MDV	9.7550e-003	3.8520e-003
tblVehicleEF	MDV	0.02	0.08
tblVehicleEF	MDV	1.05	0.83
tblVehicleEF	MDV	2.91	3.26
tblVehicleEF	MDV	457.07	386.66
tblVehicleEF	MDV	102.80	83.08
tblVehicleEF	MDV	0.13	0.08
tblVehicleEF	MDV	0.25	0.34
tblVehicleEF	MDV	1.8870e-003	1.5670e-003
tblVehicleEF	MDV	2.5190e-003	1.9600e-003
tblVehicleEF	MDV	1.7400e-003	1.4460e-003
tblVehicleEF	MDV	2.3160e-003	1.8020e-003
tblVehicleEF	MDV	0.06	0.07
tblVehicleEF	MDV	0.17	0.14
tblVehicleEF	MDV	0.06	0.07
tblVehicleEF	MDV	0.02	0.02

tblVehicleEF	MDV	0.10	0.47
tblVehicleEF	MDV	0.22	0.41
tblVehicleEF	MDV	4.5760e-003	3.7760e-003
tblVehicleEF	MDV	1.0790e-003	8.1200e-004
tblVehicleEF	MDV	0.06	0.07
tblVehicleEF	MDV	0.17	0.14
tblVehicleEF	MDV	0.06	0.07
tblVehicleEF	MDV	0.04	0.02
tblVehicleEF	MDV	0.10	0.47
tblVehicleEF	MDV	0.24	0.45
tblVehicleEF	MDV	0.01	4.3470e-003
tblVehicleEF	MDV	0.01	0.07
tblVehicleEF	MDV	1.23	0.97
tblVehicleEF	MDV	2.23	2.48
tblVehicleEF	MDV	492.38	406.93
tblVehicleEF	MDV	102.80	81.57
tblVehicleEF	MDV	0.12	0.07
tblVehicleEF	MDV	0.22	0.30
tblVehicleEF	MDV	1.8870e-003	1.5670e-003
tblVehicleEF	MDV	2.5190e-003	1.9600e-003
tblVehicleEF	MDV	1.7400e-003	1.4460e-003
tblVehicleEF	MDV	2.3160e-003	1.8020e-003
tblVehicleEF	MDV	0.14	0.16
tblVehicleEF	MDV	0.19	0.16
tblVehicleEF	MDV	0.13	0.15
tblVehicleEF	MDV	0.03	0.02
tblVehicleEF	MDV	0.09	0.43

tblVehicleEF	MDV	0.18	0.33
tblVehicleEF	MDV	4.9310e-003	3.9740e-003
tblVehicleEF	MDV	1.0670e-003	7.9700e-004
tblVehicleEF	MDV	0.14	0.16
tblVehicleEF	MDV	0.19	0.16
tblVehicleEF	MDV	0.13	0.15
tblVehicleEF	MDV	0.04	0.03
tblVehicleEF	MDV	0.09	0.43
tblVehicleEF	MDV	0.20	0.36
tblVehicleEF	MDV	9.5770e-003	3.7330e-003
tblVehicleEF	MDV	0.02	0.09
tblVehicleEF	MDV	1.04	0.82
tblVehicleEF	MDV	3.40	3.83
tblVehicleEF	MDV	453.54	384.64
tblVehicleEF	MDV	102.80	84.17
tblVehicleEF	MDV	0.15	0.09
tblVehicleEF	MDV	0.28	0.37
tblVehicleEF	MDV	1.8870e-003	1.5670e-003
tblVehicleEF	MDV	2.5190e-003	1.9600e-003
tblVehicleEF	MDV	1.7400e-003	1.4460e-003
tblVehicleEF	MDV	2.3160e-003	1.8020e-003
tblVehicleEF	MDV	0.02	0.03
tblVehicleEF	MDV	0.18	0.15
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.02	0.02
tblVehicleEF	MDV	0.12	0.56
tblVehicleEF	MDV	0.25	0.46

tblVehicleEF	MDV	4.5400e-003	3.7560e-003
tblVehicleEF	MDV	1.0880e-003	8.2300e-004
tblVehicleEF	MDV	0.02	0.03
tblVehicleEF	MDV	0.18	0.15
tblVehicleEF	MDV	0.03	0.03
tblVehicleEF	MDV	0.03	0.02
tblVehicleEF	MDV	0.12	0.57
tblVehicleEF	MDV	0.27	0.50
tblVehicleEF	MH	0.03	4.6780e-003
tblVehicleEF	MH	0.03	0.00
tblVehicleEF	MH	2.15	0.35
tblVehicleEF	MH	5.90	0.00
tblVehicleEF	MH	1,214.25	1,001.70
tblVehicleEF	MH	59.49	0.00
tblVehicleEF	MH	1.30	3.86
tblVehicleEF	MH	0.86	0.00
tblVehicleEF	MH	0.01	0.02
tblVehicleEF	MH	0.02	0.08
tblVehicleEF	MH	1.1590e-003	0.00
tblVehicleEF	MH	3.2120e-003	4.0000e-003
tblVehicleEF	MH	0.02	0.08
tblVehicleEF	MH	1.0660e-003	0.00
tblVehicleEF	MH	0.75	0.00
tblVehicleEF	MH	0.07	0.00
tblVehicleEF	MH	0.29	0.00
tblVehicleEF	MH	0.10	0.10
tblVehicleEF	MH	0.02	0.00

tblVehicleEF	MH	0.34	0.00
tblVehicleEF	MH	0.01	9.4700e-003
tblVehicleEF	MH	6.9800e-004	0.00
tblVehicleEF	MH	0.75	0.00
tblVehicleEF	MH	0.07	0.00
tblVehicleEF	MH	0.29	0.00
tblVehicleEF	MH	0.13	0.11
tblVehicleEF	MH	0.02	0.00
tblVehicleEF	MH	0.37	0.00
tblVehicleEF	MH	0.03	4.6780e-003
tblVehicleEF	MH	0.02	0.00
tblVehicleEF	MH	2.25	0.35
tblVehicleEF	MH	5.31	0.00
tblVehicleEF	MH	1,214.25	1,001.70
tblVehicleEF	MH	59.49	0.00
tblVehicleEF	MH	1.21	3.71
tblVehicleEF	MH	0.79	0.00
tblVehicleEF	MH	0.01	0.02
tblVehicleEF	MH	0.02	0.08
tblVehicleEF	MH	1.1590e-003	0.00
tblVehicleEF	MH	3.2120e-003	4.0000e-003
tblVehicleEF	MH	0.02	0.08
tblVehicleEF	MH	1.0660e-003	0.00
tblVehicleEF	MH	1.86	0.00
tblVehicleEF	MH	0.08	0.00
tblVehicleEF	MH	0.62	0.00
tblVehicleEF	MH	0.10	0.10

tblVehicleEF	MH	0.02	0.00
tblVehicleEF	MH	0.31	0.00
tblVehicleEF	MH	0.01	9.4700e-003
tblVehicleEF	MH	6.8700e-004	0.00
tblVehicleEF	MH	1.86	0.00
tblVehicleEF	MH	0.08	0.00
tblVehicleEF	MH	0.62	0.00
tblVehicleEF	MH	0.14	0.11
tblVehicleEF	MH	0.02	0.00
tblVehicleEF	MH	0.34	0.00
tblVehicleEF	MH	0.03	4.6780e-003
tblVehicleEF	MH	0.03	0.00
tblVehicleEF	MH	2.08	0.35
tblVehicleEF	MH	6.40	0.00
tblVehicleEF	MH	1,214.25	1,001.70
tblVehicleEF	MH	59.49	0.00
tblVehicleEF	MH	1.34	3.92
tblVehicleEF	MH	0.91	0.00
tblVehicleEF	MH	0.01	0.02
tblVehicleEF	MH	0.02	0.08
tblVehicleEF	MH	1.1590e-003	0.00
tblVehicleEF	MH	3.2120e-003	4.0000e-003
tblVehicleEF	MH	0.02	0.08
tblVehicleEF	MH	1.0660e-003	0.00
tblVehicleEF	MH	0.29	0.00
tblVehicleEF	MH	0.09	0.00
tblVehicleEF	MH	0.14	0.00

tblVehicleEF	MH	0.09	0.10
tblVehicleEF	MH	0.02	0.00
tblVehicleEF	MH	0.36	0.00
tblVehicleEF	MH	0.01	9.4700e-003
tblVehicleEF	MH	7.0600e-004	0.00
tblVehicleEF	MH	0.29	0.00
tblVehicleEF	MH	0.09	0.00
tblVehicleEF	MH	0.14	0.00
tblVehicleEF	MH	0.13	0.11
tblVehicleEF	MH	0.02	0.00
tblVehicleEF	MH	0.39	0.00
tblVehicleEF	MHD	0.02	2.7380e-003
tblVehicleEF	MHD	3.7500e-003	1.5030e-003
tblVehicleEF	MHD	0.05	7.1960e-003
tblVehicleEF	MHD	0.29	0.36
tblVehicleEF	MHD	0.32	0.22
tblVehicleEF	MHD	4.66	0.85
tblVehicleEF	MHD	166.31	73.92
tblVehicleEF	MHD	1,184.93	1,059.43
tblVehicleEF	MHD	46.12	7.10
tblVehicleEF	MHD	0.46	0.43
tblVehicleEF	MHD	1.12	1.43
tblVehicleEF	MHD	12.97	1.81
tblVehicleEF	MHD	1.2900e-004	3.5500e-004
tblVehicleEF	MHD	3.0820e-003	6.8020e-003
tblVehicleEF	MHD	6.6500e-004	8.1000e-005
tblVehicleEF	MHD	1.2300e-004	3.4000e-004

tblVehicleEF	MHD	2.9450e-003	6.5030e-003
tblVehicleEF	MHD	6.1100e-004	7.5000e-005
tblVehicleEF	MHD	6.8000e-004	2.7800e-004
tblVehicleEF	MHD	0.04	0.01
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	3.9700e-004	1.6300e-004
tblVehicleEF	MHD	0.04	0.01
tblVehicleEF	MHD	0.01	0.09
tblVehicleEF	MHD	0.28	0.04
tblVehicleEF	MHD	1.5960e-003	7.0100e-004
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	5.4300e-004	7.0000e-005
tblVehicleEF	MHD	6.8000e-004	2.7800e-004
tblVehicleEF	MHD	0.04	0.01
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	3.9700e-004	1.6300e-004
tblVehicleEF	MHD	0.05	0.02
tblVehicleEF	MHD	0.01	0.09
tblVehicleEF	MHD	0.31	0.04
tblVehicleEF	MHD	0.01	2.5890e-003
tblVehicleEF	MHD	3.8260e-003	1.5450e-003
tblVehicleEF	MHD	0.05	6.7290e-003
tblVehicleEF	MHD	0.20	0.31
tblVehicleEF	MHD	0.32	0.22
tblVehicleEF	MHD	4.24	0.77
tblVehicleEF	MHD	176.30	73.80
tblVehicleEF	MHD	1,184.93	1,059.44

tblVehicleEF	MHD	46.12	6.97
tblVehicleEF	MHD	0.48	0.42
tblVehicleEF	MHD	1.07	1.37
tblVehicleEF	MHD	12.91	1.81
tblVehicleEF	MHD	1.0800e-004	3.0300e-004
tblVehicleEF	MHD	3.0820e-003	6.8020e-003
tblVehicleEF	MHD	6.6500e-004	8.1000e-005
tblVehicleEF	MHD	1.0400e-004	2.9000e-004
tblVehicleEF	MHD	2.9450e-003	6.5030e-003
tblVehicleEF	MHD	6.1100e-004	7.5000e-005
tblVehicleEF	MHD	1.7170e-003	6.9900e-004
tblVehicleEF	MHD	0.04	0.02
tblVehicleEF	MHD	0.02	0.01
tblVehicleEF	MHD	8.8800e-004	3.6300e-004
tblVehicleEF	MHD	0.04	0.02
tblVehicleEF	MHD	0.01	0.08
tblVehicleEF	MHD	0.26	0.04
tblVehicleEF	MHD	1.6900e-003	6.9900e-004
tblVehicleEF	MHD	0.01	0.01
tblVehicleEF	MHD	5.3600e-004	6.9000e-005
tblVehicleEF	MHD	1.7170e-003	6.9900e-004
tblVehicleEF	MHD	0.04	0.02
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	8.8800e-004	3.6300e-004
tblVehicleEF	MHD	0.05	0.02
tblVehicleEF	MHD	0.01	0.08
tblVehicleEF	MHD	0.29	0.04

tblVehicleEF	MHD	0.02	2.8830e-003
tblVehicleEF	MHD	3.6990e-003	1.4730e-003
tblVehicleEF	MHD	0.05	7.5440e-003
tblVehicleEF	MHD	0.38	0.41
tblVehicleEF	MHD	0.32	0.21
tblVehicleEF	MHD	5.02	0.91
tblVehicleEF	MHD	152.80	74.18
tblVehicleEF	MHD	1,184.93	1,059.43
tblVehicleEF	MHD	46.12	7.21
tblVehicleEF	MHD	0.44	0.44
tblVehicleEF	MHD	1.14	1.45
tblVehicleEF	MHD	13.01	1.82
tblVehicleEF	MHD	1.5700e-004	4.2700e-004
tblVehicleEF	MHD	3.0820e-003	6.8020e-003
tblVehicleEF	MHD	6.6500e-004	8.1000e-005
tblVehicleEF	MHD	1.5000e-004	4.0900e-004
tblVehicleEF	MHD	2.9450e-003	6.5030e-003
tblVehicleEF	MHD	6.1100e-004	7.5000e-005
tblVehicleEF	MHD	2.7800e-004	1.1500e-004
tblVehicleEF	MHD	0.04	0.02
tblVehicleEF	MHD	0.02	0.02
tblVehicleEF	MHD	1.8800e-004	7.8000e-005
tblVehicleEF	MHD	0.04	0.01
tblVehicleEF	MHD	0.02	0.10
tblVehicleEF	MHD	0.29	0.04
tblVehicleEF	MHD	1.4680e-003	7.0300e-004
tblVehicleEF	MHD	0.01	0.01

tblVehicleEF	MHD	5.4900e-004	7.1000e-005
tblVehicleEF	MHD	2.7800e-004	1.1500e-004
tblVehicleEF	MHD	0.04	0.02
tblVehicleEF	MHD	0.03	0.02
tblVehicleEF	MHD	1.8800e-004	7.8000e-005
tblVehicleEF	MHD	0.05	0.02
tblVehicleEF	MHD	0.02	0.10
tblVehicleEF	MHD	0.32	0.04
tblVehicleEF	OBUS	0.01	8.4730e-003
tblVehicleEF	OBUS	8.2390e-003	7.2810e-003
tblVehicleEF	OBUS	0.03	0.02
tblVehicleEF	OBUS	0.24	0.58
tblVehicleEF	OBUS	0.56	0.81
tblVehicleEF	OBUS	5.79	2.54
tblVehicleEF	OBUS	108.13	82.95
tblVehicleEF	OBUS	1,293.96	1,469.46
tblVehicleEF	OBUS	66.33	19.88
tblVehicleEF	OBUS	0.23	0.32
tblVehicleEF	OBUS	0.91	1.23
tblVehicleEF	OBUS	3.06	0.80
tblVehicleEF	OBUS	2.1000e-005	1.0600e-004
tblVehicleEF	OBUS	2.6580e-003	6.8520e-003
tblVehicleEF	OBUS	8.5400e-004	1.9300e-004
tblVehicleEF	OBUS	2.0000e-005	1.0200e-004
tblVehicleEF	OBUS	2.5240e-003	6.5370e-003
tblVehicleEF	OBUS	7.8500e-004	1.7800e-004
tblVehicleEF	OBUS	1.2020e-003	1.4590e-003

tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.03	0.05
tblVehicleEF	OBUS	5.6300e-004	6.8900e-004
tblVehicleEF	OBUS	0.05	0.04
tblVehicleEF	OBUS	0.04	0.27
tblVehicleEF	OBUS	0.35	0.12
tblVehicleEF	OBUS	1.0430e-003	7.9000e-004
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	7.6500e-004	1.9700e-004
tblVehicleEF	OBUS	1.2020e-003	1.4590e-003
tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.05	0.07
tblVehicleEF	OBUS	5.6300e-004	6.8900e-004
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	0.04	0.27
tblVehicleEF	OBUS	0.39	0.13
tblVehicleEF	OBUS	0.01	8.5640e-003
tblVehicleEF	OBUS	8.5090e-003	7.5600e-003
tblVehicleEF	OBUS	0.03	0.02
tblVehicleEF	OBUS	0.24	0.57
tblVehicleEF	OBUS	0.57	0.84
tblVehicleEF	OBUS	5.23	2.30
tblVehicleEF	OBUS	113.59	82.03
tblVehicleEF	OBUS	1,293.96	1,469.51
tblVehicleEF	OBUS	66.33	19.46
tblVehicleEF	OBUS	0.24	0.30
tblVehicleEF	OBUS	0.86	1.17

tblVehicleEF	OBUS	2.99	0.78
tblVehicleEF	OBUS	1.8000e-005	9.4000e-005
tblVehicleEF	OBUS	2.6580e-003	6.8520e-003
tblVehicleEF	OBUS	8.5400e-004	1.9300e-004
tblVehicleEF	OBUS	1.7000e-005	9.0000e-005
tblVehicleEF	OBUS	2.5240e-003	6.5370e-003
tblVehicleEF	OBUS	7.8500e-004	1.7800e-004
tblVehicleEF	OBUS	2.9030e-003	3.4900e-003
tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.03	0.05
tblVehicleEF	OBUS	1.2270e-003	1.4710e-003
tblVehicleEF	OBUS	0.05	0.04
tblVehicleEF	OBUS	0.03	0.26
tblVehicleEF	OBUS	0.33	0.11
tblVehicleEF	OBUS	1.0950e-003	7.8100e-004
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	7.5500e-004	1.9300e-004
tblVehicleEF	OBUS	2.9030e-003	3.4900e-003
tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.04	0.07
tblVehicleEF	OBUS	1.2270e-003	1.4710e-003
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	0.03	0.26
tblVehicleEF	OBUS	0.36	0.12
tblVehicleEF	OBUS	0.01	8.3670e-003
tblVehicleEF	OBUS	8.0560e-003	7.0900e-003
tblVehicleEF	OBUS	0.03	0.02

tblVehicleEF	OBUS	0.25	0.58
tblVehicleEF	OBUS	0.55	0.79
tblVehicleEF	OBUS	6.23	2.74
tblVehicleEF	OBUS	100.59	84.24
tblVehicleEF	OBUS	1,293.96	1,469.42
tblVehicleEF	OBUS	66.33	20.21
tblVehicleEF	OBUS	0.22	0.34
tblVehicleEF	OBUS	0.93	1.26
tblVehicleEF	OBUS	3.12	0.82
tblVehicleEF	OBUS	2.6000e-005	1.2200e-004
tblVehicleEF	OBUS	2.6580e-003	6.8520e-003
tblVehicleEF	OBUS	8.5400e-004	1.9300e-004
tblVehicleEF	OBUS	2.5000e-005	1.1700e-004
tblVehicleEF	OBUS	2.5240e-003	6.5370e-003
tblVehicleEF	OBUS	7.8500e-004	1.7800e-004
tblVehicleEF	OBUS	5.5600e-004	6.8200e-004
tblVehicleEF	OBUS	0.02	0.02
tblVehicleEF	OBUS	0.03	0.05
tblVehicleEF	OBUS	2.9000e-004	3.5600e-004
tblVehicleEF	OBUS	0.05	0.04
tblVehicleEF	OBUS	0.04	0.29
tblVehicleEF	OBUS	0.37	0.12
tblVehicleEF	OBUS	9.7100e-004	8.0200e-004
tblVehicleEF	OBUS	0.01	0.01
tblVehicleEF	OBUS	7.7200e-004	2.0000e-004
tblVehicleEF	OBUS	5.5600e-004	6.8200e-004
tblVehicleEF	OBUS	0.02	0.02

tblVehicleEF	OBUS	0.05	0.06
tblVehicleEF	OBUS	2.9000e-004	3.5600e-004
tblVehicleEF	OBUS	0.06	0.06
tblVehicleEF	OBUS	0.04	0.29
tblVehicleEF	OBUS	0.41	0.14
tblVehicleEF	SBUS	0.84	0.07
tblVehicleEF	SBUS	0.02	4.4000e-003
tblVehicleEF	SBUS	0.07	5.8300e-003
tblVehicleEF	SBUS	10.65	2.77
tblVehicleEF	SBUS	1.01	0.35
tblVehicleEF	SBUS	11.22	0.85
tblVehicleEF	SBUS	974.60	342.95
tblVehicleEF	SBUS	934.35	997.56
tblVehicleEF	SBUS	72.90	4.89
tblVehicleEF	SBUS	6.31	2.88
tblVehicleEF	SBUS	2.72	3.57
tblVehicleEF	SBUS	9.19	1.11
tblVehicleEF	SBUS	5.9520e-003	2.9750e-003
tblVehicleEF	SBUS	9.7910e-003	0.01
tblVehicleEF	SBUS	0.01	0.02
tblVehicleEF	SBUS	1.2910e-003	6.9000e-005
tblVehicleEF	SBUS	5.6940e-003	2.8460e-003
tblVehicleEF	SBUS	2.4480e-003	2.6500e-003
tblVehicleEF	SBUS	0.01	0.02
tblVehicleEF	SBUS	1.1870e-003	6.3000e-005
tblVehicleEF	SBUS	2.9140e-003	3.2800e-004
tblVehicleEF	SBUS	0.03	3.2320e-003

tblVehicleEF	SBUS	1.28	0.31
tblVehicleEF	SBUS	1.3900e-003	1.5600e-004
tblVehicleEF	SBUS	0.09	0.06
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.55	0.03
tblVehicleEF	SBUS	9.6730e-003	3.2700e-003
tblVehicleEF	SBUS	9.0870e-003	9.5530e-003
tblVehicleEF	SBUS	9.2200e-004	4.8000e-005
tblVehicleEF	SBUS	2.9140e-003	3.2800e-004
tblVehicleEF	SBUS	0.03	3.2320e-003
tblVehicleEF	SBUS	1.85	0.44
tblVehicleEF	SBUS	1.3900e-003	1.5600e-004
tblVehicleEF	SBUS	0.12	0.07
tblVehicleEF	SBUS	0.02	0.02
tblVehicleEF	SBUS	0.60	0.04
tblVehicleEF	SBUS	0.84	0.07
tblVehicleEF	SBUS	0.02	4.4790e-003
tblVehicleEF	SBUS	0.06	4.8180e-003
tblVehicleEF	SBUS	10.58	2.74
tblVehicleEF	SBUS	1.05	0.36
tblVehicleEF	SBUS	8.01	0.60
tblVehicleEF	SBUS	1,011.14	348.64
tblVehicleEF	SBUS	934.35	997.58
tblVehicleEF	SBUS	72.90	4.49
tblVehicleEF	SBUS	6.50	2.92
tblVehicleEF	SBUS	2.60	3.42
tblVehicleEF	SBUS	9.13	1.10

tblVehicleEF	SBUS	5.0170e-003	2.5170e-003
tblVehicleEF	SBUS	9.7910e-003	0.01
tblVehicleEF	SBUS	0.01	0.02
tblVehicleEF	SBUS	1.2910e-003	6.9000e-005
tblVehicleEF	SBUS	4.8000e-003	2.4080e-003
tblVehicleEF	SBUS	2.4480e-003	2.6500e-003
tblVehicleEF	SBUS	0.01	0.02
tblVehicleEF	SBUS	1.1870e-003	6.3000e-005
tblVehicleEF	SBUS	7.0300e-003	8.1200e-004
tblVehicleEF	SBUS	0.03	3.4020e-003
tblVehicleEF	SBUS	1.27	0.31
tblVehicleEF	SBUS	3.0460e-003	3.5900e-004
tblVehicleEF	SBUS	0.09	0.06
tblVehicleEF	SBUS	0.01	0.02
tblVehicleEF	SBUS	0.45	0.03
tblVehicleEF	SBUS	0.01	3.3230e-003
tblVehicleEF	SBUS	9.0870e-003	9.5530e-003
tblVehicleEF	SBUS	8.6800e-004	4.4000e-005
tblVehicleEF	SBUS	7.0300e-003	8.1200e-004
tblVehicleEF	SBUS	0.03	3.4020e-003
tblVehicleEF	SBUS	1.85	0.44
tblVehicleEF	SBUS	3.0460e-003	3.5900e-004
tblVehicleEF	SBUS	0.12	0.07
tblVehicleEF	SBUS	0.01	0.02
tblVehicleEF	SBUS	0.50	0.03
tblVehicleEF	SBUS	0.85	0.07
tblVehicleEF	SBUS	0.02	4.3440e-003

tblVehicleEF	SBUS	0.08	6.5990e-003
tblVehicleEF	SBUS	10.76	2.82
tblVehicleEF	SBUS	0.99	0.34
tblVehicleEF	SBUS	13.97	1.06
tblVehicleEF	SBUS	924.14	335.10
tblVehicleEF	SBUS	934.35	997.55
tblVehicleEF	SBUS	72.90	5.24
tblVehicleEF	SBUS	6.03	2.82
tblVehicleEF	SBUS	2.78	3.64
tblVehicleEF	SBUS	9.24	1.11
tblVehicleEF	SBUS	7.2420e-003	3.6080e-003
tblVehicleEF	SBUS	9.7910e-003	0.01
tblVehicleEF	SBUS	0.01	0.02
tblVehicleEF	SBUS	1.2910e-003	6.9000e-005
tblVehicleEF	SBUS	6.9290e-003	3.4510e-003
tblVehicleEF	SBUS	2.4480e-003	2.6500e-003
tblVehicleEF	SBUS	0.01	0.02
tblVehicleEF	SBUS	1.1870e-003	6.3000e-005
tblVehicleEF	SBUS	1.3760e-003	1.4800e-004
tblVehicleEF	SBUS	0.03	3.3060e-003
tblVehicleEF	SBUS	1.28	0.31
tblVehicleEF	SBUS	7.2200e-004	7.8000e-005
tblVehicleEF	SBUS	0.09	0.06
tblVehicleEF	SBUS	0.02	0.03
tblVehicleEF	SBUS	0.62	0.04
tblVehicleEF	SBUS	9.1910e-003	3.1950e-003
tblVehicleEF	SBUS	9.0860e-003	9.5530e-003

tblVehicleEF	SBUS	9.6800e-004	5.2000e-005
tblVehicleEF	SBUS	1.3760e-003	1.4800e-004
tblVehicleEF	SBUS	0.03	3.3060e-003
tblVehicleEF	SBUS	1.86	0.44
tblVehicleEF	SBUS	7.2200e-004	7.8000e-005
tblVehicleEF	SBUS	0.11	0.07
tblVehicleEF	SBUS	0.02	0.03
tblVehicleEF	SBUS	0.68	0.04
tblVehicleEF	UBUS	0.27	1.03
tblVehicleEF	UBUS	0.04	1.0300e-003
tblVehicleEF	UBUS	6.51	7.45
tblVehicleEF	UBUS	7.42	0.07
tblVehicleEF	UBUS	2,210.19	1,639.89
tblVehicleEF	UBUS	75.27	0.84
tblVehicleEF	UBUS	15.33	1.12
tblVehicleEF	UBUS	16.64	8.7750e-003
tblVehicleEF	UBUS	0.66	0.07
tblVehicleEF	UBUS	0.01	0.03
tblVehicleEF	UBUS	0.32	5.6470e-003
tblVehicleEF	UBUS	8.7700e-004	6.0000e-006
tblVehicleEF	UBUS	0.28	0.03
tblVehicleEF	UBUS	3.0000e-003	7.9020e-003
tblVehicleEF	UBUS	0.30	5.4020e-003
tblVehicleEF	UBUS	8.0700e-004	6.0000e-006
tblVehicleEF	UBUS	2.2740e-003	1.2700e-004
tblVehicleEF	UBUS	0.05	6.9100e-004
tblVehicleEF	UBUS	1.1250e-003	3.1000e-005

tblVehicleEF	UBUS	0.79	0.01
tblVehicleEF	UBUS	0.01	4.1210e-003
tblVehicleEF	UBUS	0.56	4.4800e-003
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	8.8600e-004	8.0000e-006
tblVehicleEF	UBUS	2.2740e-003	1.2700e-004
tblVehicleEF	UBUS	0.05	6.9100e-004
tblVehicleEF	UBUS	1.1250e-003	3.1000e-005
tblVehicleEF	UBUS	1.12	1.05
tblVehicleEF	UBUS	0.01	4.1210e-003
tblVehicleEF	UBUS	0.61	4.9060e-003
tblVehicleEF	UBUS	0.27	1.03
tblVehicleEF	UBUS	0.04	9.0700e-004
tblVehicleEF	UBUS	6.56	7.45
tblVehicleEF	UBUS	5.80	0.06
tblVehicleEF	UBUS	2,210.19	1,639.89
tblVehicleEF	UBUS	75.27	0.81
tblVehicleEF	UBUS	14.70	1.12
tblVehicleEF	UBUS	16.56	8.1020e-003
tblVehicleEF	UBUS	0.66	0.07
tblVehicleEF	UBUS	0.01	0.03
tblVehicleEF	UBUS	0.32	5.6470e-003
tblVehicleEF	UBUS	8.7700e-004	6.0000e-006
tblVehicleEF	UBUS	0.28	0.03
tblVehicleEF	UBUS	3.0000e-003	7.9020e-003
tblVehicleEF	UBUS	0.30	5.4020e-003
tblVehicleEF	UBUS	8.0700e-004	6.0000e-006

tblVehicleEF	UBUS	5.7800e-003	3.0700e-004
tblVehicleEF	UBUS	0.05	7.6900e-004
tblVehicleEF	UBUS	2.4730e-003	6.7000e-005
tblVehicleEF	UBUS	0.79	0.01
tblVehicleEF	UBUS	0.01	3.7140e-003
tblVehicleEF	UBUS	0.48	3.9140e-003
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	8.5800e-004	8.0000e-006
tblVehicleEF	UBUS	5.7800e-003	3.0700e-004
tblVehicleEF	UBUS	0.05	7.6900e-004
tblVehicleEF	UBUS	2.4730e-003	6.7000e-005
tblVehicleEF	UBUS	1.13	1.05
tblVehicleEF	UBUS	0.01	3.7140e-003
tblVehicleEF	UBUS	0.53	4.2850e-003
tblVehicleEF	UBUS	0.26	1.03
tblVehicleEF	UBUS	0.05	1.1230e-003
tblVehicleEF	UBUS	6.47	7.45
tblVehicleEF	UBUS	8.79	0.09
tblVehicleEF	UBUS	2,210.19	1,639.89
tblVehicleEF	UBUS	75.27	0.86
tblVehicleEF	UBUS	15.58	1.12
tblVehicleEF	UBUS	16.69	9.2760e-003
tblVehicleEF	UBUS	0.66	0.07
tblVehicleEF	UBUS	0.01	0.03
tblVehicleEF	UBUS	0.32	5.6470e-003
tblVehicleEF	UBUS	8.7700e-004	6.0000e-006
tblVehicleEF	UBUS	0.28	0.03

tblVehicleEF	UBUS	3.0000e-003	7.9020e-003
tblVehicleEF	UBUS	0.30	5.4020e-003
tblVehicleEF	UBUS	8.0700e-004	6.0000e-006
tblVehicleEF	UBUS	8.8500e-004	6.2000e-005
tblVehicleEF	UBUS	0.06	7.1600e-004
tblVehicleEF	UBUS	5.3400e-004	1.7000e-005
tblVehicleEF	UBUS	0.78	0.01
tblVehicleEF	UBUS	0.01	5.1510e-003
tblVehicleEF	UBUS	0.62	4.9100e-003
tblVehicleEF	UBUS	0.02	0.01
tblVehicleEF	UBUS	9.1000e-004	9.0000e-006
tblVehicleEF	UBUS	8.8500e-004	6.2000e-005
tblVehicleEF	UBUS	0.06	7.1600e-004
tblVehicleEF	UBUS	5.3400e-004	1.7000e-005
tblVehicleEF	UBUS	1.12	1.05
tblVehicleEF	UBUS	0.01	5.1510e-003
tblVehicleEF	UBUS	0.68	5.3760e-003
tblVehicleTrips	DV_TP	11.00	0.00
tblVehicleTrips	DV_TP	26.00	0.00
tblVehicleTrips	DV_TP	37.00	0.00
tblVehicleTrips	DV_TP	35.00	0.00
tblVehicleTrips	DV_TP	30.00	0.00
tblVehicleTrips	PB_TP	3.00	0.00
tblVehicleTrips	PB_TP	47.00	0.00
tblVehicleTrips	PB_TP	12.00	0.00
tblVehicleTrips	PB_TP	11.00	0.00
tblVehicleTrips	PB_TP	36.00	0.00

tblVehicleTrips	PR_TP	86.00	100.00
tblVehicleTrips	PR_TP	27.00	100.00
tblVehicleTrips	PR_TP	0.00	100.00
tblVehicleTrips	PR_TP	51.00	100.00
tblVehicleTrips	PR_TP	0.00	100.00
tblVehicleTrips	PR_TP	54.00	100.00
tblVehicleTrips	PR_TP	34.00	100.00
tblVehicleTrips	ST_TR	6.39	3.21
tblVehicleTrips	ST_TR	86.32	87.08
tblVehicleTrips	ST_TR	696.00	616.76
tblVehicleTrips	ST_TR	49.97	44.87
tblVehicleTrips	ST_TR	177.59	159.99
tblVehicleTrips	SU_TR	5.86	3.21
tblVehicleTrips	SU_TR	31.90	87.08
tblVehicleTrips	SU_TR	500.00	364.94
tblVehicleTrips	SU_TR	25.24	21.10
tblVehicleTrips	SU_TR	166.44	154.79
tblVehicleTrips	WD_TR	6.65	3.21
tblVehicleTrips	WD_TR	148.15	87.08
tblVehicleTrips	WD_TR	716.00	697.67
tblVehicleTrips	WD_TR	42.70	36.50
tblVehicleTrips	WD_TR	102.24	127.96
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00

tblWater	AerobicPercent	87.46	100.00
tblWater	AerobicPercent	87.46	100.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	AnaerobicandFacultativeLagoonsPercent	2.21	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWater	SepticTankPercent	10.33	0.00
tblWoodstoves	NumberCatalytic	3.92	0.00
tblWoodstoves	NumberNoncatalytic	3.92	0.00
tblWoodstoves	WoodstoveDayYear	14.12	0.00
tblWoodstoves	WoodstoveWoodMass	582.40	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.0204	0.1973	0.1480	2.5000e-004	1.0300e-003	0.0104	0.0114	2.7000e-004	9.7200e-003	9.9900e-003	0.0000	21.9534	21.9534	5.4100e-003	0.0000	22.0886
Maximum	**0.0204**	**0.1973**	**0.1480**	**2.5000e-004**	**1.0300e-003**	**0.0104**	**0.0114**	**2.7000e-004**	**9.7200e-003**	**9.9900e-003**	**0.0000**	**21.9534**	**21.9534**	**5.4100e-003**	**0.0000**	**22.0886**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.0204	0.1973	0.1480	2.5000e-004	1.0300e-003	0.0104	0.0114	2.7000e-004	9.7200e-003	9.9900e-003	0.0000	21.9533	21.9533	5.4100e-003	0.0000	22.0886
Maximum	**0.0204**	**0.1973**	**0.1480**	**2.5000e-004**	**1.0300e-003**	**0.0104**	**0.0114**	**2.7000e-004**	**9.7200e-003**	**9.9900e-003**	**0.0000**	**21.9533**	**21.9533**	**5.4100e-003**	**0.0000**	**22.0886**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**7-1-2021**	**9-30-2021**	0.2176	0.2176
		Highest	0.2176	0.2176

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.0091	0.0168	1.4568	8.0000e-005		8.0600e-003	8.0600e-003		8.0600e-003	8.0600e-003	0.0000	2.3794	2.3794	2.2900e-003	0.0000	2.4367
Energy	0.0153	0.1342	0.0812	8.3000e-004		0.0106	0.0106		0.0106	0.0106	0.0000	308.2252	308.2252	0.0171	4.8100e-003	310.0865
Mobile	1.9922	4.3527	16.6828	0.0541	5.0577	0.0460	5.1037	1.3546	0.0432	1.3978	0.0000	5,088.4297	5,088.4297	0.2124	0.0000	5,093.7401
Waste						0.0000	0.0000		0.0000	0.0000	49.3146	0.0000	49.3146	2.9144	0.0000	122.1749
Water						0.0000	0.0000		0.0000	0.0000	5.7741	8.2135	13.9876	0.0206	0.0127	18.2767
Total	**3.0166**	**4.5037**	**18.2208**	**0.0550**	**5.0577**	**0.0647**	**5.1223**	**1.3546**	**0.0618**	**1.4165**	**55.0887**	**5,407.2478**	**5,462.3365**	**3.1669**	**0.0175**	**5,546.7149**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.0091	0.0168	1.4568	8.0000e-005		8.0600e-003	8.0600e-003		8.0600e-003	8.0600e-003	0.0000	2.3794	2.3794	2.2900e-003	0.0000	2.4367
Energy	0.0153	0.1342	0.0812	8.3000e-004		0.0106	0.0106		0.0106	0.0106	0.0000	308.2252	308.2252	0.0171	4.8100e-003	310.0865
Mobile	1.9922	4.3527	16.6828	0.0541	5.0577	0.0460	5.1037	1.3546	0.0432	1.3978	0.0000	5,088.4297	5,088.4297	0.2124	0.0000	5,093.7401
Waste						0.0000	0.0000		0.0000	0.0000	49.3146	0.0000	49.3146	2.9144	0.0000	122.1749
Water						0.0000	0.0000		0.0000	0.0000	4.6193	6.8535	11.4727	0.0165	0.0101	14.9058
Total	**3.0166**	**4.5037**	**18.2208**	**0.0550**	**5.0577**	**0.0647**	**5.1223**	**1.3546**	**0.0618**	**1.4165**	**53.9339**	**5,405.8878**	**5,459.8216**	**3.1628**	**0.0149**	**5,543.3439**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.10**	**0.03**	**0.05**	**0.13**	**14.48**	**0.06**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	7/1/2021	7/28/2021	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0.12

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	5	13.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0199	0.1970	0.1449	2.4000e-004		0.0104	0.0104		9.7100e-003	9.7100e-003	0.0000	21.0713	21.0713	5.3900e-003	0.0000	21.2060
Total	**0.0199**	**0.1970**	**0.1449**	**2.4000e-004**		**0.0104**	**0.0104**		**9.7100e-003**	**9.7100e-003**	**0.0000**	**21.0713**	**21.0713**	**5.3900e-003**	**0.0000**	**21.2060**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.2000e-004	3.0000e-004	3.1000e-003	1.0000e-005	1.0300e-003	1.0000e-005	1.0300e-003	2.7000e-004	1.0000e-005	2.8000e-004	0.0000	0.8820	0.8820	2.0000e-005	0.0000	0.8825
Total	**4.2000e-004**	**3.0000e-004**	**3.1000e-003**	**1.0000e-005**	**1.0300e-003**	**1.0000e-005**	**1.0300e-003**	**2.7000e-004**	**1.0000e-005**	**2.8000e-004**	**0.0000**	**0.8820**	**0.8820**	**2.0000e-005**	**0.0000**	**0.8825**

3.2 Demolition - 2021

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0199	0.1970	0.1449	2.4000e-004		0.0104	0.0104		9.7100e-003	9.7100e-003	0.0000	21.0713	21.0713	5.3900e-003	0.0000	21.2060
Total	**0.0199**	**0.1970**	**0.1449**	**2.4000e-004**		**0.0104**	**0.0104**		**9.7100e-003**	**9.7100e-003**	**0.0000**	**21.0713**	**21.0713**	**5.3900e-003**	**0.0000**	**21.2060**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.2000e-004	3.0000e-004	3.1000e-003	1.0000e-005	1.0300e-003	1.0000e-005	1.0300e-003	2.7000e-004	1.0000e-005	2.8000e-004	0.0000	0.8820	0.8820	2.0000e-005	0.0000	0.8825
Total	**4.2000e-004**	**3.0000e-004**	**3.1000e-003**	**1.0000e-005**	**1.0300e-003**	**1.0000e-005**	**1.0300e-003**	**2.7000e-004**	**1.0000e-005**	**2.8000e-004**	**0.0000**	**0.8820**	**0.8820**	**2.0000e-005**	**0.0000**	**0.8825**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.9922	4.3527	16.6828	0.0541	5.0577	0.0460	5.1037	1.3546	0.0432	1.3978	0.0000	5,088.4297	5,088.4297	0.2124	0.0000	5,093.7401
Unmitigated	1.9922	4.3527	16.6828	0.0541	5.0577	0.0460	5.1037	1.3546	0.0432	1.3978	0.0000	5,088.4297	5,088.4297	0.2124	0.0000	5,093.7401

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Apartments Mid Rise	629.16	629.16	629.16	1,636,536	1,636,536
Bank (with Drive-Through)	219.44	219.44	219.44	594,698	594,698
Enclosed Parking with Elevator	0.00	0.00	0.00		
Fast Food Restaurant w/o Drive Thru	1,081.39	955.98	565.66	2,641,977	2,641,977
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Regional Shopping Center	58.40	71.79	33.76	158,324	158,324
Supermarket	2,969.95	3,713.37	3592.68	8,575,093	8,575,093
Total	4,958.34	5,589.74	5,040.69	13,606,628	13,606,628

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Apartments Mid Rise	10.80	4.80	5.70	31.00	15.00	54.00	100	0	0
Bank (with Drive-Through)	9.50	7.30	7.30	6.60	74.40	19.00	100	0	0
Enclosed Parking with Elevator	9.50	7.30	7.30	0.00	0.00	0.00	100	0	0
Fast Food Restaurant w/o Drive	9.50	7.30	7.30	1.50	79.50	19.00	100	0	0
Other Non-Asphalt Surfaces	9.50	7.30	7.30	0.00	0.00	0.00	100	0	0
Regional Shopping Center	9.50	7.30	7.30	16.30	64.70	19.00	100	0	0
Supermarket	9.50	7.30	7.30	6.50	74.50	19.00	100	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Apartments Mid Rise	0.683985	0.047050	0.231856	0.020000	0.001684	0.000567	0.002688	0.005061	0.000000	0.000000	0.007108	0.000000	0.000000
Bank (with Drive-Through)	0.561348	0.038614	0.190285	0.107199	0.015389	0.005180	0.024554	0.046236	0.002209	0.002456	0.005491	0.000334	0.000704
Enclosed Parking with Elevator	0.561348	0.038614	0.190285	0.107199	0.015389	0.005180	0.024554	0.046236	0.002209	0.002456	0.005491	0.000334	0.000704
Fast Food Restaurant w/o Drive Thru	0.561348	0.038614	0.190285	0.107199	0.015389	0.005180	0.024554	0.046236	0.002209	0.002456	0.005491	0.000334	0.000704
Other Non-Asphalt Surfaces	0.561348	0.038614	0.190285	0.107199	0.015389	0.005180	0.024554	0.046236	0.002209	0.002456	0.005491	0.000334	0.000704
Regional Shopping Center	0.561348	0.038614	0.190285	0.107199	0.015389	0.005180	0.024554	0.046236	0.002209	0.002456	0.005491	0.000334	0.000704
Supermarket	0.561348	0.038614	0.190285	0.107199	0.015389	0.005180	0.024554	0.046236	0.002209	0.002456	0.005491	0.000334	0.000704

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	156.8071	156.8071	0.0142	2.0300e-003	157.7686
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	156.8071	156.8071	0.0142	2.0300e-003	157.7686
NaturalGas Mitigated	0.0153	0.1342	0.0812	8.3000e-004		0.0106	0.0106		0.0106	0.0106	0.0000	151.4180	151.4180	2.9000e-003	2.7800e-003	152.3179
NaturalGas Unmitigated	0.0153	0.1342	0.0812	8.3000e-004		0.0106	0.0106		0.0106	0.0106	0.0000	151.4180	151.4180	2.9000e-003	2.7800e-003	152.3179

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Mid Rise	1.65123e+006	8.9000e-003	0.0761	0.0324	4.9000e-004		6.1500e-003	6.1500e-003		6.1500e-003	6.1500e-003	0.0000	88.1161	88.1161	1.6900e-003	1.6200e-003	88.6397
Bank (with Drive-Through)	61793.6	3.3000e-004	3.0300e-003	2.5400e-003	2.0000e-005		2.3000e-004	2.3000e-004		2.3000e-004	2.3000e-004	0.0000	3.2975	3.2975	6.0000e-005	6.0000e-005	3.3171
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Fast Food Restaurant w/o Drive Thru	259153	1.4000e-003	0.0127	0.0107	8.0000e-005		9.7000e-004	9.7000e-004		9.7000e-004	9.7000e-004	0.0000	13.8294	13.8294	2.7000e-004	2.5000e-004	13.9116
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	7286.88	4.0000e-005	3.6000e-004	3.0000e-004	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.3889	0.3889	1.0000e-005	1.0000e-005	0.3912
Supermarket	858000	4.6300e-003	0.0421	0.0353	2.5000e-004		3.2000e-003	3.2000e-003		3.2000e-003	3.2000e-003	0.0000	45.7861	45.7861	8.8000e-004	8.4000e-004	46.0582
Total		**0.0153**	**0.1342**	**0.0812**	**8.4000e-004**		**0.0106**	**0.0106**		**0.0106**	**0.0106**	**0.0000**	**151.4180**	**151.4180**	**2.9100e-003**	**2.7800e-003**	**152.3179**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Apartments Mid Rise	1.65123e+006	8.9000e-003	0.0761	0.0324	4.9000e-004		6.1500e-003	6.1500e-003		6.1500e-003	6.1500e-003	0.0000	88.1161	88.1161	1.6900e-003	1.6200e-003	88.6397
Bank (with Drive-Through)	61793.6	3.3000e-004	3.0300e-003	2.5400e-003	2.0000e-005		2.3000e-004	2.3000e-004		2.3000e-004	2.3000e-004	0.0000	3.2975	3.2975	6.0000e-005	6.0000e-005	3.3171
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Fast Food Restaurant w/o Drive Thru	259153	1.4000e-003	0.0127	0.0107	8.0000e-005		9.7000e-004	9.7000e-004		9.7000e-004	9.7000e-004	0.0000	13.8294	13.8294	2.7000e-004	2.5000e-004	13.9116
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	7286.88	4.0000e-005	3.6000e-004	3.0000e-004	0.0000		3.0000e-005	3.0000e-005		3.0000e-005	3.0000e-005	0.0000	0.3889	0.3889	1.0000e-005	1.0000e-005	0.3912
Supermarket	858000	4.6300e-003	0.0421	0.0353	2.5000e-004		3.2000e-003	3.2000e-003		3.2000e-003	3.2000e-003	0.0000	45.7861	45.7861	8.8000e-004	8.4000e-004	46.0582
Total		**0.0153**	**0.1342**	**0.0812**	**8.4000e-004**		**0.0106**	**0.0106**		**0.0106**	**0.0106**	**0.0000**	**151.4180**	**151.4180**	**2.9100e-003**	**2.7800e-003**	**152.3179**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Mid Rise	825838	57.7924	5.2400e-003	7.5000e-004	58.1467
Bank (with Drive-Through)	18686.5	1.3077	1.2000e-004	2.0000e-005	1.3157
Enclosed Parking with Elevator	474678	33.2181	3.0100e-003	4.3000e-004	33.4218
Fast Food Restaurant w/o Drive Thru	44383.4	3.1060	2.8000e-004	4.0000e-005	3.1250
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	16363.5	1.1451	1.0000e-004	1.0000e-005	1.1521
Supermarket	860785	60.2379	5.4700e-003	7.8000e-004	60.6073
Total		**156.8071**	**0.0142**	**2.0300e-003**	**157.7686**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Apartments Mid Rise	825838	57.7924	5.2400e-003	7.5000e-004	58.1467
Bank (with Drive-Through)	18686.5	1.3077	1.2000e-004	2.0000e-005	1.3157
Enclosed Parking with Elevator	474678	33.2181	3.0100e-003	4.3000e-004	33.4218
Fast Food Restaurant w/o Drive Thru	44383.4	3.1060	2.8000e-004	4.0000e-005	3.1250
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	16363.5	1.1451	1.0000e-004	1.0000e-005	1.1521
Supermarket	860785	60.2379	5.4700e-003	7.8000e-004	60.6073
Total		**156.8071**	**0.0142**	**2.0300e-003**	**157.7686**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.0091	0.0168	1.4568	8.0000e-005		8.0600e-003	8.0600e-003		8.0600e-003	8.0600e-003	0.0000	2.3794	2.3794	2.2900e-003	0.0000	2.4367
Unmitigated	1.0091	0.0168	1.4568	8.0000e-005		8.0600e-003	8.0600e-003		8.0600e-003	8.0600e-003	0.0000	2.3794	2.3794	2.2900e-003	0.0000	2.4367

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1821					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.7830					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0440	0.0168	1.4568	8.0000e-005		8.0600e-003	8.0600e-003		8.0600e-003	8.0600e-003	0.0000	2.3794	2.3794	2.2900e-003	0.0000	2.4367
Total	**1.0091**	**0.0168**	**1.4568**	**8.0000e-005**		**8.0600e-003**	**8.0600e-003**		**8.0600e-003**	**8.0600e-003**	**0.0000**	**2.3794**	**2.3794**	**2.2900e-003**	**0.0000**	**2.4367**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1821					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.7830					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0440	0.0168	1.4568	8.0000e-005		8.0600e-003	8.0600e-003		8.0600e-003	8.0600e-003	0.0000	2.3794	2.3794	2.2900e-003	0.0000	2.4367
Total	**1.0091**	**0.0168**	**1.4568**	**8.0000e-005**		**8.0600e-003**	**8.0600e-003**		**8.0600e-003**	**8.0600e-003**	**0.0000**	**2.3794**	**2.3794**	**2.2900e-003**	**0.0000**	**2.4367**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	11.4727	0.0165	0.0101	14.9058
Unmitigated	13.9876	0.0206	0.0127	18.2767

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Mid Rise	12.7702 / 8.05077	11.3256	0.0162	9.9100e-003	14.6841
Bank (with Drive-Through)	0.0998498 / 0.0611982	0.0881	1.3000e-004	8.0000e-005	0.1144
Enclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Fast Food Restaurant w/o Drive Thru	0.470477 / 0.0300305	0.3520	5.9000e-004	3.6000e-004	0.4753
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	0.118516 / 0.0726389	0.1046	1.5000e-004	9.0000e-005	0.1358
Supermarket	2.86106 / 0.0884863	2.1173	3.5800e-003	2.2200e-003	2.8672
Total		**13.9876**	**0.0206**	**0.0127**	**18.2767**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Apartments Mid Rise	10.2162 / 7.55967	9.3346	0.0130	7.9300e-003	12.0230
Bank (with Drive-Through)	0.0798798 / 0.0574651	0.0726	1.0000e-004	6.0000e-005	0.0936
Enclosed Parking with Elevator	0 / 0	0.0000	0.0000	0.0000	0.0000
Fast Food Restaurant w/o Drive Thru	0.376382 / 0.0281986	0.2826	4.7000e-004	2.9000e-004	0.3813
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	0.0948128 / 0.0682079	0.0862	1.2000e-004	7.0000e-005	0.1111
Supermarket	2.28884 / 0.0830886	1.6969	2.8700e-003	1.7700e-003	2.2968
Total		**11.4727**	**0.0165**	**0.0101**	**14.9058**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	49.3146	2.9144	0.0000	122.1749
Unmitigated	49.3146	2.9144	0.0000	122.1749

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Apartments Mid Rise	90.16	18.3017	1.0816	0.0000	45.3416
Bank (with Drive-Through)	2.35	0.4770	0.0282	0.0000	1.1818
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Fast Food Restaurant w/o Drive Thru	17.85	3.6234	0.2141	0.0000	8.9768
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	1.68	0.3410	0.0202	0.0000	0.8449
Supermarket	130.9	26.5715	1.5703	0.0000	65.8298
Total		**49.3146**	**2.9144**	**0.0000**	**122.1749**

8.2 Waste by Land Use

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Apartments Mid Rise	90.16	18.3017	1.0816	0.0000	45.3416
Bank (with Drive-Through)	2.35	0.4770	0.0282	0.0000	1.1818
Enclosed Parking with Elevator	0	0.0000	0.0000	0.0000	0.0000
Fast Food Restaurant w/o Drive Thru	17.85	3.6234	0.2141	0.0000	8.9768
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	1.68	0.3410	0.0202	0.0000	0.8449
Supermarket	130.9	26.5715	1.5703	0.0000	65.8298
Total		**49.3146**	**2.9144**	**0.0000**	**122.1749**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

ATTACHMENT 3 – AIR QUALITY AND GHG EMISSIONS WORKBOOK: COSL-04.1 ASSUMPTIONS

Table of Contents

CalEEMod Inputs - Callan and E 14th Street Infill Checklist Project, Construction

Name: Callan and E 14th Street Infill Checklist Project
Project Number: COSL-04.1
Project Location: northeast corner of Callan and E14th Street
County: Alameda County
Climate Zone: 5
Land Use Setting: Urban
Operational Year: 2023
Utility Company: PG&E - East Bay Community Energy CCA
Air Basin: San Francisco Bay Area Air Basin (SFBAAB)
Air District: BAAQMD

Project Site Acreage	1.64
Disturbed Site Acreage	1.64

Project Components			
Demolition		**SQFT**	**Tons of Debris**
Building Demolition		31,335	1,441
Basement Demolition		8,000	368
Asphalt Demolition		40,103	594
New Construction	**Number of Units**	**SQFT**	**Acres of Building Footprint**
Residential Area			
Residential	196	127,743	0.00
Utilities		612	0.00
Amenities		4,240	0.00
Circulation/Miscellaneous		21,526	0.00
Podium Courtyard		13,847	0.00
Dog Area		1,197	0.00
Private Balconies & Roof Deck		4,897	0.00
Level 1 Utilities		3,898	0.09
Level 1 Amenities		1,653	0.04
Level 1 Circulation/Miscellaneous		4,758	0.11
Level 2 Utilities		1,467	0.00
Level 2 Circulation/Miscellaneous		4,201	0.00
Total Residential*		**170,098**	**0.24**
Retail Area			
Retail 1: Grocery Store		23,208	0.53
Retail 2: Bank		2,515	0.06
Retail 3: Shopping Center		1,598	0.04
Retail 4: Coffee Shop		1,547	0.04
Total Retail		**28,868**	**0.66**
Parking Garage		86,439	0.62
Bicycle Parking		818	0.00
Total Parking		**87,257**	**0.62**
Concrete Sidewalk		5,156	0.12
	TOTAL	**286,223**	**1.64**

*does not include the area for courtyard, dog area, private balconies and roof deck

CalEEMod Land Use Inputs

Land Use Type	Land Use Subtype	Unit Amount	Size Metric	Lot Acreage	Land Use Square Feet
Residential	Apartment (Mid-Rise)	196	DU	1.52	170,098
Retail	Supermarket	23.208	1000 sqft	0.00	23,208
Commercial	Bank (with Drive Thru)	2.515	1000 sqft	0.00	2,515
Retail	Regional Shopping Center	1.598	1000 sqft	0.00	1,598
Recreational	Fast Food without Drive Through	1.547	1000 sqft	0.00	1,547
Parking	Other Non-Asphalt Surfaces	5.156	1000 sqft	0.12	5,156
Parking	Enclosed Parking with Elevator	87.257	1000 sqft	0.00	87,257
				1.64	

Demolition

Component	Amount to be Demolished (Tons)	Haul Truck Capacity (tons)	Haul Distance (miles)	Total Trip Ends	Duration (days)	Trip Ends/ day
Building	1,809	20	20	181	36	5
Asphalt	594	20	20	60	36	2
Total	2,404			241		

Soil Haul

Construction Activities	Haul Volume (CY)	Haul Truck Capacity (cy)	Haul Distance (miles)	No. of total one-way haul (trip ends)	Duration (days)	Trip Ends/day
Site Preparation - export	177	16	20	22	4	6
TOTAL	**177**			**22**		6

Architectural Coating

Percentage of Proposed Buildings' Interior Painted:	100%	
Percentage of Proposed Buildings' Exterior Painted:	100%	
BAAQMD Regulation 8, Rule 3		
Interior Paint VOC content:	100	grams per liter
Exterior Paing VOC content:	150	grams per liter

Structures	Land Use Square Feet	CalEEMod Factor[2]	Total Paintable Surface Area	Paintable Interior Area[1]	Paintable Exterior Area[1]
RESIDENTIAL					
Apartments (Mid-Rise)	170,098	2.7	459,265	344,448	114,816
			459,265	344,448	114,816
NONRESIDENTIAL					
Retail	28,868	2.0	57,736	43,302	14,434
Parking Structure	87,257	2.0	174,514	130,886	43,629
			174,514	174,188	58,063
Parking Structure	87,257	6%	5,235	-	5,235
			5,235		5,235

[1]CalEEMod methodology calculates the paintable interior and exterior areas by multiplying the total paintable surface area by 75 and 25 percent, respectively.

[2]The program assumes the total surface for painting equals 2.7 times the floor square footage for residential and 2 times that for nonresidential square footage defined by the user. Architectural coatings for the parking lot is based on CalEEMod methodology applied to a surface parking lot (i.e., striping), in which 6% of surface area is painted.

BAAQMD Construction BMPs

Replace Ground Cover	PM10:	5	% Reduction
Replace Ground Cover	PM2.5:	5	% Reduction
	PM25:	5	% Reduction
Water Exposed Area	Frequency:	2	per day

	PM10:	55	% Reduction
	PM25:	55	% Reduction
Unpaved Roads	Vehicle Speed:	15	mph
	Clean Paved Road	9	% PM Reduction

Construction Activities and Schedule Assumptions: Callan and E 14th Street Infill Checklist Project

* normalized durations based 20 months of construction, starting July 1, 2021, provided by the Applicant

CalEEMod Defaults

		Construction Schedule		
Construction Activities	**Phase Type**	**Start Date**	**End Date**	**CalEEMod Duration (Workday)**
Demolition	Demolition	7/1/2021	7/28/2021	20
Site Preparation	Site Preparation	7/29/2021	7/30/2021	2
Grading	Grading	7/31/2021	8/5/2021	4
Building Construction	Building Construction	8/6/2021	5/12/2022	200
Paving	Paving	5/13/2022	5/26/2022	10
Architectural Coating	Architectural Coating	5/27/2022	6/9/2022	10

Normalization Calculations *

CalEEMod Defaults Construction Duration	
343	days of construction
0.94	years of construction
11.28	months of construction

Assumed Construction Duration	
7/1/2021	3/1/2023
608	days
19.99	months
Norm Factor: 1.77	

		Construction Schedule		
Construction Activities	**Phase Type**	**Start Date**	**End Date**	**Duration**
Demolition	Demolition	7/1/2021	8/19/2021	36
Demolition Debris Haul	*Demolition*	*7/1/2021*	*8/19/2021*	*36*
Site Preparation	Site Preparation	8/20/2021	8/25/2021	4
Site Preparation Soil Haul	*Site Preparation*	*8/20/2021*	*8/25/2021*	*4*
Grading	Grading	8/26/2021	9/5/2021	7
Building Construction	Building Construction	9/6/2021	1/12/2023	354
Paving	Paving	1/13/2023	2/6/2023	17
Architectural Coating	Architectural Coating	2/7/2023	3/1/2023	17

CalEEMod Construction Off-Road Equipment Inputs

**Based on CalEEMod defaults, assumed equipment would not be shared for most conservative results*

General Construction Hours: btwn 7:00 AM to 4:00 PM (with 1 hr break), Mon-Fri

Construction Equipment Details					
Equipment	**# of Equipment**	**hr/day**	**hp**	**load factor***	**total trips**
Demolition					
Concrete/Industrial Saws	1	8	81	0.73	
Rubber Tired Dozers	1	8	247	0.4	
Tractors/Loaders/Backhoes	3	8	97	0.37	
Worker Trips					13
Vendor Trips					0
Hauling Trips					0
Water Trucks					2
Demolition Debris Haul					
no additional equipment required for Demolition Debris Haul					
Worker Trips					0
Vendor Trips					0
Hauling Trips					241
Site Preparation					
Graders	1	8	187	0.41	
Rubber Tired Dozers	1	7	247	0.4	
Tractors/Loaders/Backhoes	1	8	97	0.37	
Worker Trips					8
Vendor Trips					0
Hauling Trips					0
Water Trucks					2
Site Preparation Soil Haul					
no additional equipment required for Site Preparation Soil Haul					
Worker Trips					0
Vendor Trips					0
Hauling Trips					22
Grading					
Graders	1	6	187	0.41	
Rubber Tired Dozers	1	6	247	0.4	
Tractors/Loaders/Backhoes	1	7	97	0.37	
Worker Trips					8
Vendor Trips					0
Hauling Trips					0
Water Trucks					2
Building Construction					
Cranes*	1	1	231	0.29	
Forklifts	1	6	89	0.2	
Generator Sets	1	8	84	0.74	
Tractors/Loaders/Backhoes	1	6	97	0.37	
Welders**	3	1	46	0.45	
Worker Trips					189
Vendor Trips					41
Hauling Trips					0

* The crane would be used on site only for a portion of the total building construction duration. The crane is anticipated to be used fewer than 354 hours (1 hour for each day of building construction) per piece of equipment.

** Use of welders would be predominately used during the initial framing; and therefore, the hours of operation of the duration were reduced to one hour per day per welder to reflect the average duration for the entire 20 month construction building phase

Paving					
Cement and Mortar Mixers	1	6	9	0.56	
Pavers	1	6	130	0.42	
Paving Equipment	1	8	132	0.36	
Rollers	1	7	80	0.38	
Tractors/Loaders/Backhoes	1	8	97	0.37	
Worker Trips					13
Vendor Trips					0
Hauling Trips					0

Architectural Coating (surface lots, etc…)					
Air Compressors	1	6	78	0.48	
Worker Trips					38
Vendor Trips					0
Hauling Trips					0

Demo Haul Trip Calculation

*Conversion factors**

0.046	ton/SF
1.2641662	tons/cy
20	tons
15.82070459	CY
0.791035229	CY/ton

Building	BSF Demo	Tons/SF	Tons	Haul Truck (CY)	Haul Truck (Ton)	Round Trips	Total Trip Ends
Building Demo	31,335	0.046	1441.41	16	20.00	72	144
Basement Demo	8,000	0.046	368	16	20.00	18	37
Total	**39,335**		**1,809**			**90**	**181**

*CalEEMod User's Guide Version 2016.3.2, Appendix A

Pavement Volume to Weight Conversion

Component	Total SF of Area[1]	Assumed Thickness (foot)[2]	Debris Volume (cu. ft)	Weight of Crushed Asphalt (lbs/cf)[3]	AC Mass (lbs)	AC Mass (tons)
Asphalt Demo	40,103	0.333	13,368	89	1,188,249	594.12
Total	40,103					594

[1] Based on aerial image of existing project site.

[2] Pavements and Surface Materials. Nonpoint Education for Municipal Officials, Technical Paper Number 8. University of Connecticut Cooperative Extension System, 1999.

[3] https://www.calrecycle.ca.gov/swfacilities/cdi/Tools/Calculations

Construction Trips Worksheet

Phase Name	Worker Trip Ends Per Day	Vendor Trip Ends Per Day	Haul Truck Trip Ends Per Day	Total Haul Truck Trip Ends	Start Date	End Date	Workdays
Demolition	13	2	0	0	7/1/2021	8/19/2021	36
Demolition Debris Haul	0	0	7	241	*7/1/2021*	*8/19/2021*	*36*
Site Preparation	8	2	0	0	8/20/2021	8/25/2021	4
Site Preparation Soil Haul	0	0	6	22	*8/20/2021*	*8/25/2021*	*4*
Grading	8	2	0	0	8/26/2021	9/5/2021	7
Building Construction	189	41	0	0	9/6/2021	1/12/2023	354
Paving	13	0	0	0	1/13/2023	2/6/2023	17
Architectural Coating	38	0	0	0	2/7/2023	3/1/2023	17

Construction Activity (Overlapping)	Worker Trip Ends Per Day	Vendor Trip Ends Per Day	Haul Truck Trip Ends Per Day	Total Trip Ends Per Day	Start Date	End Date	Workdays
Demolition and Demolition Debris Haul	13	2	7	22	7/1/2021	8/19/2021	36
Site Preparation and Soil Haul	8	2	6	16	8/20/2021	8/25/2021	4
Grading	8	2	0	10	8/26/2021	9/5/2021	7
Building Construction	189	41	0	230	9/6/2021	1/12/2023	354
Paving	13	0	0	13	1/13/2023	2/6/2023	17
Architectural Coating	38	0	0	38	2/7/2023	3/1/2023	17
Maximum Daily Trips	**189**	**41**	**7**	**230**			

CalEEMod Inputs - Callan and E 14th Street Infill Checklist Project, Operations

Name:	Callan and E 14th Street Infill Checklist Project
Project Number:	COSL-04.1
Project Location:	northeast corner of Callan and E14th Street
County:	Alameda County
Climate Zone:	5
Land Use Setting:	Urban
Operational Year:	2023
Utility Company:	PG&E - East Bay Community Energy CCA
Air Basin:	San Francisco Bay Area Air Basin (SFBAAB)
Air District:	BAAQMD

CalEEMod Land Use Inputs

Land Use Type*	Land Use Subtype	Unit Amount	Size Metric	Lot Acreage	Land Use Square Feet
Residential*	Apartment (Mid-Rise)	196.000	DU	1.52	170,098
Retail	Supermarket	23.208	1000 sqft	0.00	23,208
Commercial	Bank (with Drive Thru)	2.515	1000 sqft	0.00	2,515
Retail	Regional Shopping Center	1.598	1000 sqft	0.00	1,598
Recreational	Fast Food without Drive Through	1.547	1000 sqft	0.00	1,547
Parking	Other Non-Asphalt Surfaces	5.156	1000 sqft	0.12	5,156
Parking	Enclosed Parking with Elevator	87.257	1000 sqft	0.00	87,257
				1.64	

*does not include the area for courtyard, dog area, private balconies and roof deck

Trips Information

Land Use Type	Average Weekday Trips	CalEEMod Trip Rate	Saturday Trips	CalEEMod Trip Rate	Sunday Trips*	CalEEMod Trip Rate
Residential [a]	628	**3.2053**	628	**3.2053**	628	**3.2053**
Total Residential	**628**		**628**		**628**	
Supermarket [b]	2,970	**127.9643**	3,713	**159.9943**	3,592	**154.7943**
Bank [c]	219	**87.0775**	219	**87.0775**	219	**87.0775**
Shopping Center	58	**36.4984**	72	**44.8684**	34	**21.1000**
Coffee Shop	1,079	**697.6657**	954	**616.7557**	565	**364.9357**
Total Retail	**4,326**		**4,958**		**4,410**	
Total Project Trips	**4,955**		**5,586**		**5,038**	

Source: CHS Consulting. 2021. 1188 East 14th Street Mixed Use Development Transportation Impact Study

Notes:
[a] Residential Saturday and Sunday trips are assumed to be similar to average weekday trips.
[b] To show net number of trips, existing vehicle trips were subtracted from the supermarket trips
[c] Bank Saturday and Sunday trips were assumed to be similar to average weekday trips.

	Trip Type Percentages		
	Primary	**Diverted**	**Passby**
Apartments Mid Rise	86%	11%	3%
Bank (with Drive-Through)	27%	26%	47%
Enclosed Parking with Elevator	0%	0%	0%
Fast Food Restaurant w/o Drive Thru	51%	37%	12%
Other Non-Asphalt Surfaces	0%	0%	0%
Regional Shopping Center	54%	35%	11%
Supermarket	34%	30%	36%
Adjusted Trip Type Percentages	**100%**	**0%**	**0%**

Water Use CalEEMod

Land Use	Total (gal/day)[2]	Total (gal/yr)
Apartments Mid Rise [1]	33,400.00	12,191,000.00
TOTAL	33,400.00	12,191,000.00

*Assumes 100% aerobic treatment.

1 assigning all water use to apartments land use

[2] Based on UWMP average daily per capita water use of 55 gpcd for residential indoor demand and 52 gpcd for commercial indoor. Assumes all water use is indoor water.

Solid Waste CalEEMod Defaults*

Land Use	Total Solid Waste (tons/yr)
Apartments Mid Rise	90.16
Bank (with Drive-Through)	2.35
Enclosed Parking with Elevator	0.00
Fast Food Restaurant w/o Drive Thru	17.85
Other Non-Asphalt Surfaces	0.00
Regional Shopping Center	1.68
Supermarket	130.90
TOTAL	242.94

Electricity (Buildings)

Multifamily Residential Additional Electricity Reductions[2]	**2.0%**	more efficient than 2016 Title 24 electricity rates
Multifamily Residential Additional Natural Gas Reductions[2]	**5%**	more efficient than 2016 Title 24 natural gas rates
Non-residential Additional Electricity Reductions[2]	**10.7%**	more efficient than 2016 Title 24 electricity rates
Non-residential Additional Natural Gas Reductions[2]	**1%**	more efficient than 2016 Title 24 natural gas rates

Sources:

[1] California Energy Commission (CEC). 2018. 2019 Building Energy and Efficiency Standards Frequently Asked Questions. Accessed on April 3, 2019. http://www.energy.ca.gov/title24/2019standards/documents/2018_Title_24_2019_Building_Standards_FAQ.pdf

[2] NORESCO. 2018. 2019 Update to the California Energy Efficiency Standards for Residential and Non-Residential Buildings

Default CalEEMod Energy Use

Land Use Subtype	Title-24 Electricity Energy Intensity (kWhr/size/year)*	Nontitle-24 Electricity Energy Intensity (kWhr/size/year)	Lighting Energy Intensity (KWhr/size/year)	Title-24 Natural Gas Energy Intensity (KBTU/size/year)*	Nontitle-24 Natural Gas Energy Intensity (KBTU/size/year)
Apartments Mid Rise	**426.45**	3,054.10	741.44	**6,115.43**	2,615.00
Bank (with Drive-Through)	**1.21**	3.36	2.99	**17.85**	6.90
Enclosed Parking with Elevator	**3.92**	0.19	1.75	**0.00**	0.00
Fast Food Restaurant w/o Drive Thru	**2.67**	20.97	5.34	**39.90**	128.02
Other Non-Asphalt Surfaces	**0.00**	0.00	0.00	**0.00**	0.00
Regional Shopping Center	**2.24**	3.36	4.88	**3.90**	0.70
Supermarket	**2.72**	27.24	7.42	**24.53**	12.69

Adjusted CalEEMod Energy Use

Land Use Subtype	Title-24 Electricity Energy Intensity (kWhr/size/year)*	Nontitle-24 Electricity Energy Intensity (kWhr/size/year)	Lighting Energy Intensity (KWhr/size/year)	Title-24 Natural Gas Energy Intensity (KBTU/size/year)*	Nontitle-24 Natural Gas Energy Intensity (KBTU/size/year)
Apartments Mid Rise	**417.92**	3,054.10	741.44	**5,809.66**	2,615.00
Bank (with Drive-Through)	**1.08**	3.36	2.99	**17.67**	6.90
Enclosed Parking with Elevator	**3.50**	0.19	1.75	**0.00**	0.00
Fast Food Restaurant w/o Drive Thru	**2.38**	20.97	5.34	**39.50**	128.02
Other Non-Asphalt Surfaces	**0.00**	0.00	0.00	**0.00**	0.00
Regional Shopping Center	**2.00**	3.36	4.88	**3.86**	0.70
Supermarket	**2.43**	27.24	7.42	**24.28**	12.69

Architectural Coating

Percentage of Proposed Buildings' Interior Painted:	100%	
Percentage of Proposed Buildings' Exterior Painted:	100%	

BAAQMD Regulation 8, Rule 3

Interior Paint VOC content:	100	grams per liter
Exterior Paing VOC content:	150	grams per liter

Structures	Land Use Square Feet	CalEEMod Factor[2]	Total Paintable Surface Area	Paintable Interior Area[1]	Paintable Exterior Area[1]
RESIDENTIAL					
Apartments (Mid-Rise)	170,098	2.7	459,265	344,448	114,816
			459,265	344,448	114,816
NONRESIDENTIAL					
Retail	28,868	2.0	57,736	43,302	14,434
Parking Structure	87,257	2.0	174,514	130,886	43,629
			174,514	174,188	58,063
Parking Structure	87,257	6%	5,235	-	5,235
			5,235		5,235

[1]CalEEMod methodology calculates the paintable interior and exterior areas by multiplying the total paintable surface area by 75 and 25 percent, respectively.

[2] The program assumes the total surface for painting equals 2.7 times the floor square footage for residential and 2 times that for nonresidential square footage defined by the user. Architectural coatings for the parking lot is based on CalEEMod methodology applied to a surface parking lot (i.e., striping), in which 6% of surface area is painted.

Water Efficiency Requirements under the Water Efficient Landscape Ordinance (WELO) and Title 24 for Low-Flow Plumbing Fixtures

Install Low-Flow Bathroom Faucets
Install Low-Flow Kitchen Faucets
Install Low-Flow Toilet
Install Low-Flow Shower-Head
Use Water-Efficient Irrigation Systems

EBCE Carbon Intensity Factors

CO2[1]	154.28	pounds per megawatt hour
CH4	0.01445414	pound per megawatt hour
N2O	0.001697195	pound per megawatt hour

[1]Based on CO2e intensity factor for EBCE (Bright Choice). EBCE. 2020. 2019 Power Content Label.
https://res.cloudinary.com/diactiwk7/image/upload/v1605298637/ebce_PCL_103020_digital_zt17hp.pdf. Accessed January 27, 2021

Changes to the CalEEMod Defaults - Residential Fleet Mix 2023

Trips 628

Default	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH	
FleetMix (Model Default)	0.561348	0.038614	0.190285	0.107199	0.015389	0.00518	0.024554	0.046236	0.002209	0.002456	0.005491	0.000334	0.000704	100%
Trips	353	24	120	67	10	3	15	29	1	2	3	0	0	628
Percent	80%			11%	10%									100%
without buses/MH	0.561348	0.038614	0.190285	0.107199	0.015389	0.005180	0.024554	0.046236	0	0	0.005491	0	0	99%
Percent	80%			11%	9%									99%
Adjusted without buses/MH	0.561348	0.038614	0.190285	0.107199	0.016350	0.005503	0.026087	0.049122	0.000000	0.000000	0.005834	0.000000	0.000000	
Percent adjusted	80%			11%	10%									100%
Assumed Mix	97.0%			2.00%	1.00%									100%
adjusted with Assumed	0.683985	0.047050	0.231856	0.020000	0.001684	0.000567	0.002688	0.005061	0.000000	0.000000	0.007108	0.000000	0.000000	100%
Percent Check:	97%			2%	1%									
Trips	430	30	146	13	1	0	2	3	0	0	4	0	0	628

Other/Unspecified Sources Emissions Factor Calculations

$MTCO_2e/MWh$[1]: 0.428

[1] *https://ww2.arb.ca.gov/sites/default/files/classic/regact/2018/ghg2018/isor.pdf*

$MTCO_2e/kWh$ 0.00042800

		Percentage of Total	$MTCO_2e$
CO_2	83.1	99.32%	0.000425
CH_4	0.27	0.32%	0.000001
N_2O	0.3	0.36%	0.000002
Total	**83.67**		

GWP	Emissions Factor (MT/gas)
1	0.00042508
28	0.00000005
265	0.00000001

East Bay Clean Energy Carbon Intensity Factor Calculator

The project team calculated a custom electricity emissions factor for East Bay Community Energy (EBCE) by consulting the most recent data from the US EPA's Emissions & Generation Resource Integrated Database (eGRID). This database includes records of GHG emissions and power generation by all power plants in the United States. Using this information, the team determined the electricity emissions factor for all power plants within California by fuel source, since it is not feasible to identify the specific power plants that supply EBCE. The team consulted EBCE's Power Mix, which identifies the percent of EBCE's electricity generated by various fuel sources. Using the average emissions factor for power plants by fuel source, in combination with EBCE's specific fuel mix, the team was able to calculate an emissions factor that accurately reflects EBCE's particular sources of electricity.

Source: EBCE. 2020. 2019 Power Content Label.
https://res.cloudinary.com/diactiwk7/image/upload/v1605298637/ebce_PCL_103020_digital_zt17hp.pdf. Accessed January 27, 2021

$MTCO_2e$

			$MTCO_2e$/kWh
Source	**Percent**	**Adjusted percent**	**Emission factor**
Coal	0.00%	0.00%	0.00052518
Large hydro	25.30%	25.25%	0.00000000
Natural gas	0.10%	0.10%	0.00040027
Nuclear	1.50%	1.50%	0.00000000
Oil	0.00%	0.00%	0.00061190
Other/unspecified	13.30%	13.27%	0.00042800
Biomass	3.60%	3.59%	0.00006741
Geothermal	12.30%	12.28%	0.00008747
Small hydro	4.90%	4.89%	0.00000000
Solar	3.50%	3.49%	0.00000000
Wind	35.70%	35.63%	0.00000000
	100.20%	100.00%	

	MTCO2e/kWh
Emission factor	**0.000070370**
Calculation check	0.000070370

MTCO2e/MWh
0.0703696528
lbsCO2e/MWh
155.137

East Bay Clean Energy Carbon Intensity Factor Calculator

The project team calculated a custom electricity emissions factor for East Bay Community Energy (EBCE) by consulting the most recent data from the US EPA's Emissions & Generation Resource Integrated Database (eGRID). This database includes records of GHG emissions and power generation by all power plants in the United States. Using this information, the team determined the electricity emissions factor for all power plants within California by fuel source, since it is not feasible to identify the specific power plants that supply EBCE. The team consulted EBCE's Power Mix, which identifies the percent of EBCE's electricity generated by various fuel sources. Using the average emissions factor for power plants by fuel source, in combination with EBCE's specific fuel mix, the team was able to calculate an emissions factor that accurately reflects EBCE's particular sources of electricity.

$MTCO_2$

			$MTCO_2$/kWh
Source	**Percent**	**Adjusted percent**	**Emission factor**
Coal	0.00%	0.00%	0.000525182
Large hydro	25.30%	25.25%	0
Natural gas	0.10%	0.10%	0.000400274
Nuclear	1.50%	1.50%	0
Oil	0.00%	0.00%	0.0006119
Other/unspecified	13.30%	13.27%	0.000425084
Biomass	3.60%	3.59%	6.7393E-05
Geothermal	12.30%	12.28%	8.74747E-05
Small hydro	4.90%	4.89%	0
Solar	3.50%	3.49%	0
Wind	35.70%	35.63%	0
	100.20%	100.00%	

	MTCO2/kWh
Emission factor	**0.0000699821**

MTCO2/MWh
0.069982054496
lbsCO2/MWh
154.282

East Bay Clean Energy Carbon Intensity Factor Calculator

The project team calculated a custom electricity emissions factor for East Bay Community Energy (EBCE) by consulting the most recent data from the US EPA's Emissions & Generation Resource Integrated Database (eGRID). This database includes records of GHG emissions and power generation by all power plants in the United States. Using this information, the team determined the electricity emissions factor for all power plants within California by fuel source, since it is not feasible to identify the specific power plants that supply EBCE. The team consulted EBCE's Power Mix, which identifies the percent of EBCE's electricity generated by various fuel sources. Using the average emissions factor for power plants by fuel source, in combination with EBCE's specific fuel mix, the team was able to calculate an emissions factor that accurately reflects EBCE's particular sources of electricity.

$MTCH_4$

			$MTCO_4$/kWh
Source	**Percent**	**Adjusted percent**	**Emission factor**
Coal	0.00%	0.00%	5.89676E-12
Large hydro	25.30%	25.25%	0
Natural gas	0.10%	0.10%	7.52558E-12
Nuclear	1.50%	1.50%	0
Oil	0.00%	0.00%	2.00932E-11
Other/unspecified	13.30%	13.27%	4.93264E-08
Biomass	3.60%	3.59%	2.51224E-10
Geothermal	12.30%	12.28%	0
Small hydro	4.90%	4.89%	0
Solar	3.50%	3.49%	0
Wind	35.70%	35.63%	0
	100.20%	100.00%	

	MTCH4/kWh
Emission factor	**0.000000006556**

MTCH4/MWh
0.0000065563547842
lbsCH4/MWh
0.014454

East Bay Clean Energy Carbon Intensity Factor Calculator

The project team calculated a custom electricity emissions factor for East Bay Community Energy (EBCE) by consulting the most recent data from the US EPA's Emissions & Generation Resource Integrated Database (eGRID). This database includes records of GHG emissions and power generation by all power plants in the United States. Using this information, the team determined the electricity emissions factor for all power plants within California by fuel source, since it is not feasible to identify the specific power plants that supply EBCE. The team consulted EBCE's Power Mix, which identifies the percent of EBCE's electricity generated by various fuel sources. Using the average emissions factor for power plants by fuel source, in combination with EBCE's specific fuel mix, the team was able to calculate an emissions factor that accurately reflects EBCE's particular sources of electricity.

MTN_2O

			MTN_2O/kWh
Source	**Percent**	**Adjusted percent**	**Emission factor**
Coal	0.00%	0.00%	8.61834E-12
Large hydro	25.30%	25.25%	0
Natural gas	0.10%	0.10%	8.14808E-13
Nuclear	1.50%	1.50%	0
Oil	0.00%	0.00%	3.97229E-12
Other/unspecified	13.30%	13.27%	5.79094E-09
Biomass	3.60%	3.59%	3.29476E-11
Geothermal	12.30%	12.28%	0
Small hydro	4.90%	4.89%	0
Solar	3.50%	3.49%	0
Wind	35.70%	35.63%	0
	100.20%	100.00%	

	MTN2O/kWh
Emission factor	**0.000000001**

MTN2O/MWh
0.00000076984282129
lbsN2O/MWh
0.00169720

Emission Factor Calculator

Select GWPs	AR4

CO_2	1
CH_4	25
N_2O	298

Fuel type	MWh generated	lbs CO_2/kWh	lbs CH_4/kWh	lbs N_2O/kWh	lbs CO_2e/kWh	$MTCO_2e$/kWh
Biomass	4,754,601	0.148575	0.000001	0.000000	0.148610	0.000067
Coal	325,958	1.157816	0.000000	0.000000	1.157822	0.000525
Gas	84,035,036	0.882443	0.000000	0.000000	0.882444	0.000400
Geothermal	11,104,158	0.192847	0.000000	0.000000	0.192847	0.000087
Hydro	25,140,892	0.000000	0.000000	0.000000	0.000000	-
Nuclear	18,907,578	0.000000	0.000000	0.000000	0.000000	-
Oil	120,698	1.348996	0.000000	0.000000	1.349000	0.000612
Solar	17,486,623	0.009991	0.000000	0.000000	0.009991	0.000005
Wind	11,337,510	0.000000	0.000000	0.000000	0.000000	-
Other	5,422,246					0.000428

Global Warming Potentials (GWP) and Conversion Factors

	AR2	AR4	AR5
CO_2	1	1	1
CH_4	21	25	28
N_2O	310	298	265

kWh per MWh	1,000
kWh per GWh	1,000,000
lbs per MT	2204.6