

## 3.3 AIR QUALITY

This section includes a discussion of existing air quality conditions, a summary of applicable regulations, and an analysis of potential construction and operational air quality impacts caused by proposed development of the West Village Expansion component of the 2018 LRDP. Mitigation measures are recommended as necessary to reduce significant air quality impacts to the extent feasible.

Public comments related to air quality that were received during public review of the NOP included emissions associated with potential growth under the 2018 LRDP, including the West Village Expansion; construction emissions; toxic air contaminants from proposed uses; and consistency with regional air quality planning efforts. As they pertain to implementation of the West Village Expansion component of the 2018 LRDP, these impacts are described and addressed within this section.

### 3.3.1 Regulatory Setting

Plans, policies, regulations, and laws (applicable to and/or considered for the project) are provided in Volume 1 of this EIR. As the regulatory setting provided in Volume 1 considers potential development, including the project, within the entirety of the UC Davis campus as envisioned through the 2018 LRDP, no additional regulatory setting is provided for the project.

### 3.3.2 Environmental Setting

Refer to Section 3.3, “Air Quality,” in Volume 1 of this EIR for a discussion of the regional environmental setting for the UC Davis campus, including the West Village Expansion. Due to the regional nature of air quality conditions and the fact that the West Village Expansion site and remote parking area are located within the boundaries of the campus, the West Village Expansion has the same existing air quality characteristics as for the entire campus.

### 3.3.3 Environmental Impacts and Mitigation Measures

#### SIGNIFICANCE CRITERIA

Refer to Section 3.3, “Air Quality,” in Volume 1 of this EIR for a discussion of applicable Significance Criteria.

#### ANALYSIS METHODOLOGY

##### Construction

Construction-related emissions of criteria air pollutants and precursors were calculated using the California Emissions Estimator Model (CalEEMod) Version 2016.3.2 computer program (SCAQMD 2017), as recommended by Yolo Solano Air Quality Management District (YSAQMD). Modeling was based on project-specific information (e.g., land use types, traffic modelling, building sizes), where available, reasonable assumptions based on typical construction activities, and default values in CalEEMod that are based on the site’s location and land use type.

Construction of the West Village Expansion component is assumed to start in as early as August 2018 and last 24 months. Based on information provided in Chapter 2, “Project Description,” of this volume, the West Village Expansion component would construct sufficient apartment units to support 3,800 student beds along with one acre of park space, approximately 1,000 vehicle parking spaces (800 of which would be located within surface parking lots with solar panels), and 3,800 bicycle parking spaces. An additional acre of paved roadway is assumed to be constructed as part of the infrastructure required for the component. It is assumed that a car parking space would be enough for 21 bicycles, thus resulting in a total of 905 vehicle parking space equivalents to be constructed. Using CalEEMod default occupancy rates for mid-rise apartments and a total of 1,300 dwelling units (1,323,000 sf) is assumed to be constructed as part of the West Village Expansion. Approximately 900 spaces of the proposed 20.4-acre remote parking area would be available for parking demand associated with the West Village Expansion. Although other developments may use additional spaces within this parking area, the parking demand from the West Village Expansion is the primary reason for the construction and operation of the remote parking area. Thus, the construction and operation of the entire remote parking area is attributed to the West Village Expansion. For a detailed description of model input and output parameters, and assumptions, refer to Appendix C in Volume 1 of this EIR.

## Operation

Operation-related emissions of criteria air pollutants and precursors were calculated using CalEEMod Version 2016.3.2. Modeling was based on project-specific information (e.g., land use types, traffic modelling, building sizes), where available, reasonable assumptions based on typical construction activities, and default values in CalEEMod that are based on the site’s location and land use type. CalEEMod also accounts for policies that may affect operational emissions factors, such as state and federal vehicle emission standards. The first full year of operation of the West Village Expansion component is assumed to begin in 2021. For a detailed description of model input and output parameters, and assumptions, refer to Appendix C.

With respect to building energy, only natural gas use would result in direct on-site criteria air pollutants and precursor emissions. However, the West Village Expansion would not use natural gas in any of the planned residential land uses, consistent with the energy choices made at the current West Village development (UC Davis 2014). Although there may be emergency generators operated in the West Village Expansion, for the purposes of this analysis, there are not included in this calculation as these generators would be operated only in emergency conditions. No other stationary sources would be operated as part of the West Village Expansion component.

With respect to mobile sources, California Air Resources Board’s (CARB) Emission Factor model, EMFAC2017, was used to estimate annual and daily criteria air pollutant emissions from vehicle miles travelled (VMT) generated by the West Village Expansion, which was available from Fehr and Peers (Behrens, pers. comm., 2018). Fehr and Peers provided daily VMT by three vehicle categories (passenger and light duty trucks, trucks 2, and trucks 3) and by 5-mile-per-hour speed bins from 0 to 70 miles per hour. These VMT estimates were based on travel demand models and traffic counts within the campus cordon over a three-day mid-week average during fall of 2016. EMFAC2017 is CARB’s latest update to the EMFAC model series and considers effects of known policy implementation and economic forecasts, such as the implementation of the CAFE standards and Advanced Clean Cars program. The modeled emission factors reflect the county average vehicle mix and usage rates forecast for Yolo County in 2021, the first full year of operation of West Village Expansion. Daily VMT were adjusted to annual VMT using a conversion factor of 287 which accounts for UC Davis’s academic schedule, holidays, and enrollment levels during summer and regular academic quarters. See Appendix C for calculation details. See Section 3.16, “Transportation, Circulation, and Parking,” of this volume for additional analysis of VMT associated with the West Village Expansion.

Area sources, such as reactive organic gases (ROG) emissions from consumer products and reapplication of architectural coating, were based on CalEEMod defaults for the applied land uses. No fireplaces or woodstoves were assumed to be built with the West Village Expansion.

## ISSUES NOT EVALUATED FURTHER

The following impacts were identified as part of the analysis of the 2018 LRDP, and are either (1) adequately evaluated at the program level of analysis of the 2018 LRDP, or (2) not applicable to the West Village Expansion component.

### Substantial Pollutant Concentrations

Impacts related to substantial pollutant concentrations (carbon monoxide [CO] and toxic air contaminants [TACs]) during operation of land uses identified under the 2018 LRDP, including the West Village Expansion component, are evaluated in Volume 1 and determined to be less than significant. Analysis of localized CO impacts from all the traffic associated with the 2018 LRDP (2018 LRDP Impact 3.3-3) shows that the 2018 LRDP-related traffic would not result in a significant localized impact from CO emissions, therefore a project-level analysis of the same impact is not required. The West Village Expansion component would be residential in nature, and would not construct any new stationary sources, such as boilers and laboratories, that would generate substantial TACs. Although emergency generators could be operated, their use would be infrequent and only in emergency conditions and were included as part of the analysis provided in Volume 1. Furthermore, the West Village Expansion site would not be located proximate to I-80 or potential sources of substantial ultra-fine particulates (UFPs), and impacts related to health risks associated with UFPs would not occur as a result of implementation of the West Village Expansion component. As a result, additional and/or potentially significant impacts are not anticipated, and no additional project-level analysis is necessary. As a result, additional and/or potentially significant impacts are not anticipated, and no additional project-level analysis is necessary.

### Odors

Potential odor sources that would occur under the 2018 LRDP, including the West Village Expansion component, are sufficiently discussed at the plan-level in Volume 1. As a student housing development, no unique or substantial odors are anticipated as a result of implementation of the West Village Expansion component. As a result, additional and/or potentially significant impacts are not anticipated, and no additional project-level analysis is necessary.

## PROJECT-SPECIFIC IMPACTS AND MITIGATION MEASURES

### Impact 3.3-1: Construction-generated emissions of ROG, nitrogen oxides, respirable particulate matter, and fine particulate matter.

Construction-generated emissions would potentially exceed YSAQMD's significance thresholds during construction of the West Village Expansion component. Therefore, this impact would be **potentially significant**.

Construction of the West Village Expansion, including the remote parking area, would result in ROG, nitrogen oxides (NO<sub>x</sub>), respirable particulate matter (PM<sub>10</sub>), and fine particulate matter (PM<sub>2.5</sub>) emissions, primarily associated with the use of heavy construction equipment and painting/paving activities. Construction emissions are summarized in Table 3.3-1, below. Refer to Appendix C for a detailed summary of the modeling assumptions, inputs, and outputs.

**Table 3.3-1 Summary of Modeled Emissions of Criteria Air Pollutants and Precursors Associated with Project Construction Activities - Unmitigated**

Year of Construction	Annual Emissions		Maximum Daily Emissions	
	ROG (ton/year)	NO <sub>x</sub> (ton/year)	PM <sub>10</sub> (lb/day)	PM <sub>2.5</sub> (lb/day) <sup>a</sup>
2018	0.4	4.0	285	35 (4.6) <sup>b</sup>
2019	1.9	14.8	285	34 (4.0) <sup>b</sup>
2020	9.3	5.7	284	34 (4.0) <sup>b</sup>
YSAQMD Thresholds of Significance	10	10	80	NA
Exceed Threshold of Significance?	No	<b>Yes</b>	<b>Yes</b>	NA

Notes: Modeled values represent maximum daily and annual emissions that would occur over the duration of the construction period. See Appendix C for detail on model inputs, assumptions, and project specific modeling parameters.

ROG = reactive organic gases; NO<sub>x</sub> = oxides of nitrogen; PM<sub>10</sub> = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; PM<sub>2.5</sub> = respirable particulate matter with an aerodynamic diameter of 2.5 micrometers or less; lb/day = pounds per day; NA = not available; YSAQMD = Yolo Solano Air Quality Management District

<sup>a</sup> Although YSAQMD does not recommend PM<sub>2.5</sub> thresholds, estimates of PM<sub>2.5</sub> emissions, which are a subset of PM<sub>10</sub> emissions, are shown for information purposes only.

<sup>b</sup> Numbers in parenthesis represent the portion of PM<sub>2.5</sub> emissions from exhaust. Numbers not in parenthesis represent fugitive and exhaust emissions combined.

Source: Modeling conducted by Ascent Environmental in 2018

As shown in Table 3.3-1, construction of the West Village Expansion component would result an exceedance of NO<sub>x</sub> and PM<sub>10</sub> thresholds throughout the construction period. Construction activities would result in NO<sub>x</sub> and PM<sub>10</sub> emissions that are 50 to 100 percent over YSAQMD's threshold for NO<sub>x</sub> and PM<sub>10</sub>, respectively. Based on model outputs shown in Table 3.3-2, approximately 56 percent of NO<sub>x</sub> emissions generated during construction in 2019 are due to exhaust emissions from the usage of off-road construction equipment.

**Table 3.3-2 Sources of NO<sub>x</sub> Emissions Associated with Project Construction Activities - Unmitigated**

Year(s) of Construction	NO <sub>x</sub> (tons/year)			
	Off-Road	Vendor Trips	Worker Trips	Total
2018	3.7	0.3	0.0	4.0
2019	8.3	6.0	0.5	14.8
2020	3.4	2.1	0.2	5.7

Notes: Modeled values represent annual emissions that would occur over the duration of the construction period. Modeling calculated zero NO<sub>x</sub> emissions from hauling activities because no import nor export of soils is anticipated. See Appendix C for detail on model inputs, assumptions, and project specific modeling parameters. Values may not sum due to rounding.

NO<sub>x</sub> = oxides of nitrogen

Source: Modeling conducted by Ascent Environmental in 2018

Building construction activities would occur throughout the 24-month period, but is anticipated to occur throughout the 2019 calendar year. Compared to other phases such as grading, paving, and architectural coating, building construction is the most energy intensive phase which also results in higher daily emissions than in other phases. Thus, the increased NO<sub>x</sub> emissions in 2019 reflect the higher emission rates associated with building construction activity.

Based on model outputs shown in Table 3.3-3, approximately 98 percent of construction-related PM<sub>10</sub> emissions across all years of construction are due to fugitive dust generated from construction worker, vendor, and hauling vehicles travelling on unpaved roads on-site.

**Table 3.3-3 Sources of PM<sub>10</sub> Emissions Associated with Project Construction Activities - Unmitigated**

Year(s) of Construction	PM <sub>10</sub> (lb/day)		
	Fugitive Dust	Diesel Exhaust	Total
2018	204	3.2	208
2019	204	3.8	207
2020	204	2.4	207

Notes: Modeled values represent maximum daily emissions that would occur over the duration of the construction period. See Appendix C for detail on model inputs, assumptions, and project specific modeling parameters. Values may not sum due to rounding.

PM<sub>10</sub> = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; lb/day = pounds per day

Source: Modeling conducted by Ascent Environmental in 2017

The current West Village Expansion site is mostly undeveloped with about 5,300 feet of paved roadway within and bordering the area with any undeveloped area no further than 400 feet from the nearest paved roadway. Based on the relatively developed area surrounding the site, it is estimated that approximately one percent of roadways travelled on by construction workers, vendors, and haulers are unpaved. Despite the small percentage of unpaved roadways, the modeled frequency of worker, vendor, and hauling trips results in dust-related PM<sub>10</sub> emissions significantly exceeding 80 lb/day.

The West Village Expansion component would result in NO<sub>x</sub> and PM<sub>10</sub> emissions that exceed YSAMQD thresholds during construction; therefore, this impact would be **potentially significant**.

### **WVE Mitigation Measure 3.3-1: Reduce construction-generated emissions of ROG, NO<sub>x</sub>, and PM<sub>10</sub>.**

Implement 2018 LRDP Mitigation Measure 3.3-1.

Although prior to mitigation the West Village Expansion component would result in construction-related emissions that do not exceed ROG and NO<sub>x</sub> emissions thresholds, the implementation of 2018 LRDP Mitigation Measure 3.3-1 would further reduce ROG and NO<sub>x</sub> emissions along with PM<sub>10</sub> emissions under the construction engine and dust mitigation requirements. Engines with a minimum of a Tier 3 final rating or better are anticipated to decrease ROG, NO<sub>x</sub>, and PM emissions compared to the default engine rating which includes a mix of lower tiered engines.

#### **Significance after Mitigation**

Implementation of WVE Mitigation Measure 3.3-1 would ensure that all development under the 2018 LRDP would not generate emissions of ROG and PM<sub>10</sub> construction-related emissions that exceed YSAQMD significance criteria, but emissions of NO<sub>x</sub> would still exceed YSAQMD significance criteria. Table 3.3-4 shows the modeled emissions after mitigation. Though NO<sub>x</sub> emissions would only exceed YSAQMD thresholds in 2019, this analysis addresses the impact of the WVE in its entirety, including annual emissions in 2019 which is within the project's construction period. Therefore, this impact would be **significant and unavoidable** even with implementation of this mitigation measure.

**Table 3.3-4 Summary of Modeled Emissions of Criteria Air Pollutants and Precursors Associated with West Village Expansion Project Construction Activities - Mitigated**

Year(s) of Construction	Annual Emissions		Maximum Daily Emissions	
	ROG (ton/year)	NO <sub>x</sub> (ton/year)	PM <sub>10</sub> (lb/day)	PM <sub>2.5</sub> (lb/day) <sup>a</sup>
2018	0.1	2.2	22.1	7.4 (3.1) <sup>b</sup>
2019	1.1	12.1	22.0	7.3 (3.0) <sup>b</sup>
2020	4.7	4.9	21.9	7.2 (3.0) <sup>b</sup>
YSAQMD Thresholds of Significance	10	10	80	NA
Exceed Threshold of Significance?	No	<b>Yes</b>	No	NA

Notes: Modeled values represent maximum daily and annual emissions that would occur over the duration of the construction period. See Appendix C for detail on model inputs, assumptions, and project specific modeling parameters.

ROG=reactive organic gases; NO<sub>x</sub>=oxides of nitrogen; PM<sub>10</sub>=respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; PM<sub>2.5</sub>=respirable particulate matter with an aerodynamic diameter of 2.5 micrometers or less; lb/day=pounds per day; NA=not available; YSAQMD=Yolo Solano Air Quality Management District

<sup>a</sup> Although YSAQMD does not recommend PM<sub>2.5</sub> thresholds, estimates of PM<sub>2.5</sub> emissions, which are a subset of PM<sub>10</sub> emissions, are shown for information purposes only.

<sup>b</sup> Numbers in parenthesis represent the portion of PM<sub>2.5</sub> emissions from exhaust. Numbers not in parenthesis represent fugitive and exhaust emissions combined.

Source: Modeling conducted by Ascent Environmental in 2018

### Impact 3.3-2: Operational emissions of criteria air pollutants and precursor emissions.

Routine activities at the West Village Expansion site would result in increased operational emissions of criteria air pollutants, but would not exceed YSAQMD thresholds. This impact would be **less than significant**.

Operational emissions from overall implementation of the 2018 LRDP, including the emissions from the West Village Expansion are included in 2018 LRDP Impact 3.3-2, which concluded that even with implementation of 2018 LRDP Mitigation Measure 3.3-2, overall plan-related emissions that may occur through implementation of the 2018 LRDP would remain a significant and unavoidable impact. The following describes the emission contribution of just the West Village Expansion component to determine whether project specific mitigation measures could reduce criteria pollutant emission levels.

Sources of criteria pollutants associated with the West Village Expansion include motor vehicles, area sources such as water and space heating, landscaping equipment, and consumer product use. Emissions from each of these sources were calculated using the methods detailed under Analysis Methodology above. Table 3.3-5 summarizes the modeled operation-related emissions of criteria air pollutants and precursors under buildout conditions of the West Village Expansion component in 2021.

**Table 3.3-5 Summary of Modeled Emissions of Criteria Air Pollutants and Precursors Associated with West Village Expansion Project Operation – Unmitigated (2021)**

Emissions Source	Annual Emissions		Maximum Daily Emissions	
	ROG (tpy)	NO <sub>x</sub> (tpy)	PM <sub>10</sub> (lb/day)	PM <sub>2.5</sub> (lb/day) <sup>a</sup>
Area Sources <sup>b</sup>	6.4	0.1	0.6	0.6
Mobile	3.2	4.7	4.6	2.1
Total	9.6	4.8	5.2	2.7

**Table 3.3-5 Summary of Modeled Emissions of Criteria Air Pollutants and Precursors Associated with West Village Expansion Project Operation – Unmitigated (2021)**

Emissions Source	Annual Emissions		Maximum Daily Emissions	
	ROG (tpy)	NO <sub>x</sub> (tpy)	PM <sub>10</sub> (lb/day)	PM <sub>2.5</sub> (lb/day) <sup>a</sup>
YSAQMD Thresholds of Significance	10	10	80	NA
Exceed Threshold of Significance?	No	No	No	NA

Note: Summation may not equal totals because of rounding.

ROG = reactive organic gases; NO<sub>x</sub> = oxides of nitrogen; PM<sub>10</sub> = respirable particulate matter with an aerodynamic diameter of 10 micrometers or less; PM<sub>2.5</sub> = respirable particulate matter with an aerodynamic diameter of 2.5 micrometers or less; tpy = tons per year; lbs/day = pounds per day; NA = not available; YSAQMD = Yolo County Air Quality Management District

<sup>a</sup> Although YSAQMD does not recommend PM<sub>2.5</sub> thresholds, estimates of PM<sub>2.5</sub> emissions, which are a subset of PM<sub>10</sub> emissions, are shown for information purposes only.

<sup>b</sup> Includes architectural coating, consumer products, and landscaping emissions.

Source: Data provided by Ascent Environmental in 2018 based on modeling using CalEEMod v. 2016.3.2, VMT data provided by Fehr and Peers in 2018, and emission factors from EMFAC2017

As the Table 3.3-5 shows, NO<sub>x</sub>, ROG, and PM<sub>10</sub> emissions resulting from the operation of the West Village Expansion component would not exceed the YSAQMD significance. Therefore, the impact from activities associated with the West Village Expansion component would be **less than significant**.

### **WVE Mitigation Measure 3.3-2: Reduce emissions of ROG and NO<sub>x</sub>.**

Implement 2018 LRDP Mitigation Measure 3.3-2.

Although the project-level impact of operational emissions is less than significant, the WVE is still subject to 2018 LRDP Mitigation Measure 3.3-2 because the West Village Expansion component is part of the 2018 LRDP and the plan-level emissions are potentially significant under 2018 LRDP Impact 3.3-2. Reduction of project-level operational emissions will help reduce the impact of plan-level operational emissions.

#### **Significance after Mitigation**

Although this impact is less than significant, the implementation of WVE Mitigation Measure 3.3-2 would result in lower emissions although the degree to which they would reduce is uncertain, as noted in Impact 3.3-2 of Volume 1 regarding the 2018 LRDP. Nonetheless, emissions associated with the West Village Expansion would not exceed YSAQMD thresholds, and the impact would remain **less than significant** with implementation of this measure.

### **Impact 3.3-3: Short-term construction emissions of toxic air contaminants.**

Construction-related activities would result in temporary, short-term project-generated emissions of TACs, particularly diesel particulate matter (PM). Diesel PM emissions from construction would not exceed YSAQMD health risk thresholds associated with TACs. This impact would be **less than significant**.

Construction-related activities in the West Village Expansion would result in temporary, short-term project-generated emissions of diesel PM from the exhaust of off-road, heavy-duty diesel equipment used during site preparation (e.g., grading, excavating); paving; application of architectural coatings;

as well as on-road truck travel and other miscellaneous activities. For construction activity, diesel PM is the primary TAC of concern. On-road diesel-powered haul trucks traveling to and from the construction area to deliver materials and equipment are less of a concern because they would not stay on the site for long durations.

Based on the emission modeling conducted and presented in Table 3.3-3 above, maximum daily diesel exhaust emissions of PM<sub>2.5</sub> from construction equipment would not exceed 4.6 lb/day during the most intense season of construction activity. According to the results of the health risk assessment (HRA) conducted for the 2018 LRDP, discussed in Section 3.3, "Air Quality," of Volume 1 under Impact 3.3-4, the estimated health risks are less than one fourth of the YSAQMD health risk thresholds and were calculated based on average daily operational emissions of 5.71 lb/day of diesel PM emissions in addition to other TACs (Yorke Engineering 2018:6,31). Thus, construction activity under the West Village Expansion component would not likely exceed YSAQMD thresholds of 10 in one million for cancer risk and a hazard index (HI) of 1 for the maximally exposed individual (MEI).

Proximity of nearby sensitive receptors to TAC emissions is another key factor in determining health risk. Studies show that diesel PM is highly dispersive (e.g., diesel PM concentrations decrease by 70 percent at 500 feet from the source) (Zhu et al. 2002:1032), and receptors must be in close proximity to emission sources to result in the possibility of exposure to concentrations of concern. No sensitive land uses, such as child care centers or outdoor athletic facilities, are located within 1,000 feet of the West Village Expansion area. However, a recreational outdoor pool and some open space are located within this boundary. These facilities would mostly be used by college-age students for recreational purposes, are not considered to be sensitive land uses, are located over 200 feet from any on-site construction activity at the West Village Expansion.

Considering the relatively low mass of diesel PM emissions that would be generated during West Village Expansion construction, the relatively short duration of construction activities within specific portions of the West Village Expansion site, the distance to the nearest off-site sensitive receptors, and the highly dispersive properties of diesel PM, construction-related TAC emissions would not expose sensitive receptors to an incremental increase in cancer risk that exceeds 10 in one million or a hazard index greater than 1.0. This would be a **less-than-significant** impact.

### **WVE Mitigation Measure 3.3-3: Reduce short-term construction-generated TAC emissions.**

Implement 2018 LRDP Mitigation Measure 3.3-4.

Although prior to mitigation the West Village Expansion component would result in less-than-significant impacts related to TAC emissions during construction, the implementation of 2018 LRDP Mitigation Measure 3.3-4 would further reduce construction-related TAC emissions under the construction engine and idling requirements. Engines with a minimum of a Tier 3 final rating or better are anticipated to decrease PM emissions, which include TACs, compared to the default engine rating which includes a mix of lower tiered engines. Construction activity would already be located over 150 feet from the nearest sensitive receptor and outdoor recreational facilities.

#### **Significance after Mitigation**

Although this impact is less than significant, the implementation of WVE Mitigation Measure 3.3-3 would result in lower construction TAC emissions due to the use of Tier 3 engines and equipment idling limits. Thus, the impact would remain **less than significant** with implementation of this measure.