4.3 AIR QUALITY

This section of the EIR analyzes air quality impacts associated with implementation of the LRDP. Impacts evaluated include (1) dust emissions related to construction activities, (2) emissions of ozone (O_3) precursors related to construction activities, (3) emissions of carbon monoxide (CO), reactive organic gases (ROGs), nitrogen oxides (NO_x), sulfur oxides (SO_x), and particulate matter less than 10 microns (PM_{10}) from vehicles, residential, academic, and administrative sources, (4) odor emissions, (5) toxic air contaminant emissions, and (6) cumulative regional criteria pollutant and toxic air contaminant emissions. More detailed analysis of the air quality impacts of the Phase 1 Campus is presented in Volume 2 of this EIR.

The proposed project is located in the San Joaquin Valley Air Basin, which comprises all the counties (San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern) within the San Joaquin Valley. The air basin is considered the regional study area for the proposed project and is under the jurisdiction of the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD). The local study area is defined to include areas (intersections) affected by project-related traffic changes.

Public comments in response to the Notice of Preparation of this EIR requested that the following issues be addressed in the EIR: regional air quality impacts from traffic, residential, and other development associated with the project; impacts to biotic resources from changes in air quality; potential impacts from ozone and ozone precursors; and the campus's effect on the air basin's potential failure to meet ozone standards by 2005. All of these topics are addressed in this section except impacts to biotic resources from changes in air quality, which are not discussed because such impacts would be speculative.

4.3.1 Summary of Site Selection EIR Impacts and Mitigation Measures

The SSEIR evaluated potential air quality impacts from the selection and eventual development of a new campus at the Lake Yosemite site, including emissions of criteria pollutants from construction, emissions of criteria pollutants from campus operations, odors, and effects of toxic air contaminants. All impacts identified in the SSEIR that are relevant to the proposed project are presented in the following table. For all impacts, the level of significance before and after application of mitigation measures identified in the SSEIR is also presented in the table. The location of the proposed campus has been shifted to a more southerly location on the VST property compared to the location that was evaluated in the SSEIR. However, most attributes of the proposed campus that could affect air quality (size of campus population, types of academic and other activities likely to occur on campus) are largely the same. Therefore, the change in the proposed location of the campus does not increase the significance or the severity of impacts on air quality identified in the SSEIR. However, due to its more southerly location closer to the City of Merced, the project as proposed now would result in reduced vehicle miles traveled and therefore a reduction in vehicular emissions compared to those from the development and operation of the campus at the original site. Furthermore, by increasing the number of students and faculty who would be housed on campus, vehicular emissions would be reduced compared to those that would have resulted under the campus as conceived earlier.

As the table below shows, the SSEIR analysis concluded that construction-related NO_x emissions due to the proposed project would be significant and unavoidable even after mitigation. It also identified significant and unavoidable NO_x impacts from the operation of the campus, and significant unavoidable cumulative emissions of NO_x, PM_{10}, and ROG. With respect to toxic air contaminants, the SSEIR concluded that impacts could not be accurately estimated and were therefore conservatively considered significant and unavoidable. These conclusions of the SSEIR were further evaluated for the campus as proposed now and the analysis is presented in this section. The air quality impact analysis confirmed the conclusions of the SSEIR with respect to construction-related NO_x, and operational emissions of all criteria pollutants. With respect to toxic air contaminants, the LRDP EIR concludes the impact of the campus would be less than significant based on health risk assessments conducted for other existing UC campus of comparable or larger size and comparable level of activity.

SITE SELECTION EIR IMPACT	Level of Significance Prior to Mitigation	Level of Significance after/with Mitigation
In Years 2010 and 2035, construction activities associated with the development of a campus at the site would result in the production of reactive organic gases.	LS	N/A
Construction activities associated with the development of a campus at the site would result in the production of nitrogen oxides.	S	SU_1
Construction activities associated with the development of a campus at the site would result in production of particulate matter.	S	LS
Eventual development and operation of a campus at the site could result in objectionable odors associated with campus activities.	LS	N/A
Eventual development and operation of a campus at the site would produce toxic air contaminants.	LS	N/A
Eventual development and operation of a campus at the site could result in increased regional levels of ozone precursors (reactive organic gases and nitrogen oxides) and particulate emissions at the site.	S	SU_3
Eventual development and operation of a campus at the site, in conjunction with off-campus and cumulative development in the surrounding area, would result in increased regional levels of ozone precursors (reactive organic gases and nitrogen oxide) and PM_{10} emissions.	S	SU_3
Eventual development and operation of a campus at the site, in conjunction with other development in the surrounding area, would result in increases of carbon monoxide concentrations at intersections in Years 2010 and 2035.	LS	N/A
Eventual development and operation of a campus at the site, in conjunction with other development in the surrounding area, may generate unacceptable cumulative toxic air contaminant health risks. Existing methods are inadequate to assess the magnitude of this impact, and therefore, it is considered too speculative to determine the precise level of significance.	S	SU_1

PS=Potentially Significant; S=Significant; LS=Less than Significant; B=Beneficial; NI=No Impact; N/A=Not Applicable; SU_1= Impacts that cannot be mitigated, or for which it is not certain that mitigation could reduce the impact to a less-than-significant level; SU_2= Impacts that could reduce the impact to less-than-significant levels but require action by a jurisdiction other than the University; SU_3= Impacts that, even with mitigation, cannot, or might not, be reduced to a less-than-significant level, and for which mitigation would not be under the University's jurisdiction.

Mitigation measures in the SSEIR that are applicable to the proposed project include the following:

- **SSEIR Mitigation Measure 4.8-1 –** *Prior to initiation of campus construction, the University shall develop and implement a construction emissions mitigation program, which could include, but may not be limited to, requirements that all construction contracts include following steps to reduce* NO_x *emissions:*
- *Construction employees shall reduce trips via carpools, transit, or other alternative modes.*
- *Stationary and mobile equipment shall be maintained in proper running order at all times.*
- **SSEIR Mitigation Measure 4.8-2 –** *Prior to initiation of grading activities on the campus site, the University shall develop and implement a grading emissions mitigation program, which could include, but may not be limited to, requirements that all construction contracts include the following steps to reduce* PM_{10} *emissions:*
- *All exposed grading surfaces shall be watered twice daily or more to keep the soil moist at all times.*
- *Grading equipment shall be maintained in proper running order at all times.*
- **SSEIR Mitigation Measure 4.8-3 –** *The University shall comply with all applicable legal requirements and shall coordinate with the SJVUAPCD in the development of a program to reduce, to the maximum extent possible and feasible, the generation of criteria pollutants, particularly ozone precursors, carbon monoxide, and fine particulate matter, generated by stationary, mobile, and area sources.*
- **SSEIR Mitigation Measure 4.8-9 –** *Evaluation of potential air toxics would be speculative at this time. Consequently, the identification of mitigation measures, and a determination of the effectiveness of those measures, would be speculative and inappropriate. Air toxics impacts will be evaluated during project-specific environmental analysis, as appropriate.*

SSEIR Mitigation Measures 4.8-1, 4.8-2, and 4.8-3 have been modified and carried forward as LRDP EIR Mitigation Measures 4.3-1 and 4.3-2, and would be implemented during construction of campus projects. In the event that any new stationary combustion sources are proposed for the campus, the University will comply with all legal requirements in compliance with SSEIR Mitigation Measure 4.8-3 and LRDP policies. In compliance with SSEIR Mitigation Measure 4.8-9, air toxics impacts from the potential power plant and science laboratories included in the Phase 1 Campus have been evaluated in Volume 2 of this EIR.

4.3.2 Environmental Setting

4.3.2.1 Regulatory Background

The project area is subject to major air quality planning programs by both the federal Clean Air Act and the California Clean Air Act of 1988. Both the federal and state statutes provide for ambient air quality standards to protect public health, timetables for progressing toward achieving and maintaining ambient standards, and the development of plans to guide the air quality improvement efforts of state and local agencies. Within the project vicinity, air quality is monitored, evaluated, and controlled by the United States Environmental Protection Agency

(EPA), California Air Resources Board (CARB), San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), and the Regional Council of Governments. The EPA, CARB, and the SJVUAPCD develop rules and/or regulations to attain the goals or directives imposed by legislation. Both state and local regulations may be more, but not less, stringent than EPA regulations. California has several air standards that are more restrictive than EPA standards.

Air quality evaluations are based on ambient air quality standards developed by federal and state agencies. The Clean Air Act (CAA) of 1970 required the EPA to establish national ambient air quality standards (NAAQS) with states retaining the option to adopt more stringent standards or to include other specific pollutants. California already had standards in existence before federal standards were established, and its standards are more stringent than the federal standards, as shown in Table 4.3-1.

The ambient air quality standards identify the level of air quality considered safe to protect the public health and welfare, especially for those most susceptible to respiratory distress such as asthmatics, the very young, the elderly, people weak from other illness or diseases, or persons who engage in heavy work or exercise. Healthy adults can tolerate periodic exposure to air pollution levels somewhat above these standards before adverse health effects are observed. Emissions limitations are typically imposed upon individual sources of air pollutants by local agencies or upon certain large or unique facilities by the EPA. Mobile sources of air pollutants such as automobiles, aircraft and trains are controlled primarily through State and federal agencies. Historically, air quality laws and regulations have divided air pollutants into two broad categories: “criteria pollutants” and “toxic air contaminants.” Federal and State air quality standards have been established for six ambient air pollutants, commonly referred to as “criteria” air pollutants. These standards were so-named because EPA published criteria documents to justify the choice of each standard. The criteria air pollutants for which federal and state ambient standards have been established include O_3, CO, NO, sulfur dioxide (SO_2), PM_{10}, and lead (Pb). In this analysis, O_3 is evaluated by assessing emissions of O_3 precursors: reactive organic gases (ROG) and NO. These criteria pollutants have been regulated for more than two decades. They are regulated separately from toxic air contaminants at both federal and state levels.

Federal

The 1990 Clean Air Act (CAA) Amendments require emission controls on factories, businesses and automobiles. The CAA Amendments affect automobiles by lowering the limits on ROG and NO, emissions, requiring the phasing in of alternative-fuel cars, requiring on-board canisters to capture vapors during refueling and extending emission-control warranties. Airborne toxins are reduced by requiring factories to install “maximum achievable control technology” and installing urban pollution control programs.

The CAA Amendments require that each state have an air pollution control plan called the State Implementation Plan (SIP). The SIP includes strategies and control measures to attain the NAAQS by deadlines established by the CAA. The CAA Amendments dictate that states containing areas violating the NAAQS revise their SIP to include extra control measures to reduce air pollution. The EPA reviews the SIPs to determine if the plans would conform to the 1990 CAA Amendments and achieve the air quality goals. The EPA may prepare a Federal Implementation Plan for the nonattainment area if the EPA determines a SIP to be inadequate.

Table 4.3-1
State and Federal Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[a]	National Standards[b]		San Joaquin Valley State Status/ Classification	San Joaquin Valley National Status/ Classification
		Concentrations [c]	Primary[c, d]	Secondary[c, e]		
Photochemical Oxidants[f]	8-hour 1-hour[g]	-- 0.09 ppm	0.08 ppm 0.12 ppm	Same as Primary	Nonattainment/ Severe	Nonattainment/ Serious
Carbon Monoxide	8-hour 1-hour	9.0 ppm 20.0 ppm	9 ppm 35 ppm	Same as Primary	Attainment/ None	Attainment/None
Nitrogen Dioxide	Annual Mean 1-hour	-- 0.25 ppm	0.053 ppm --	Same as Primary	Attainment/ None	Attainment/None
Sulfur Dioxide	Annual Mean 24-hour 3-hour 1-hour	-- 0.04 ppm -- 0.25 ppm	0.03 ppm 0.14 ppm -- --	-- -- 0.5 ppm --	Attainment/ None	Attainment/None
Fine Particulate Matter (PM_{10})	Annual Mean Annual Geometric Mean 24-hour	-- 30 $\mu g/m^3$ 50 $\mu g/m^3$	50 $\mu g/m^3$ -- 150 $\mu g/m^3$	Same as Primary -- Same as Primary	Nonattainment/ Serious	Nonattainment/ None
Fine Particulate Matter ($PM_{2.5}$)	Annual Mean 24-hour	-- --	15 $\mu g/m^3$ 65 $\mu g/m^3$	Same as Primary	Not Designated/ None	Not Designated/ None

Notes: ppm = parts per million, $\mu g/m^3$ = micrograms per cubic meter

[a] California standards, other than carbon monoxide, sulfur dioxide (1-hour), and fine particulate matter, are values that are not to be equaled or violated. The carbon monoxide, sulfur dioxide (1-hour), and fine particulate matter standards are not to be violated.

[b] National standards, other than ozone, the 24-hour $PM_{2.5}$, the PM_{10}, and those standards based on annual averages, are not to be exceeded more than once a year. The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one. The 8-hour ozone standard is attained when the 3-year average of the annual fourth highest daily maximum concentration is less than 0.08 ppm. The 24-hour PM_{10} standard is attained when the 99th percentile of 24-hour PM_{10} concentrations in a year, averaged over 3 years, at the population-oriented monitoring site with the highest measured values in the area, is below 150 $\mu g/m^3$. The 24-hour $PM_{2.5}$ standard is attained when the 98th percentile of 24-hour $PM_{2.5}$ concentrations in a year, averaged over 3 years, at the population-oriented monitoring site with the highest measured values in the area, is below 65 $\mu g/m^3$. The annual average $PM_{2.5}$ standard is attained when the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations, from single or multiple community oriented monitors is less than or equal to 15 $\mu g/m^3$.

[c] All measurements of air quality are to be corrected to a reference temperature of 25° C and a reference pressure of 760 mm of mercury (Hg) (1013.2 millibar); ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[d] National Primary Standards: The levels of air quality deemed necessary by the federal government, with an adequate margin of safety, to protect the public health.
[e] National Secondary Standards: The levels of air quality deemed necessary by the federal government, to protect the public welfare from any known or anticipated adverse effects to a pollutant.
[f] Measured as ozone.
[g] The 1-hour ozone standard will be replaced by the 8-hour standard on an area-by-area basis when the area has achieved 3 consecutive years of air quality data meeting the 1-hour standard.

In general, attainment plans contain a discussion of ambient air quality data and trends; a baseline emissions inventory; future year projections of emissions, which account for growth projections and already adopted control measures; a comprehensive control strategy of additional measures needed to reach attainment; an attainment demonstration, which generally involves complex modeling; and contingency measures. Plans may also include interim milestones for progress toward attainment.

Under the EPA's general conformity rule (40 CFR Parts 53 and 91), a detailed analysis of conformity with state air quality implementation plans is required if a project exceeds the established *de minimis* level of emissions. In addition, the conformity rule requires that the proposed project must be consistent with emission growth factors (land use and population forecasts that were used to generate emission forecasts) contained in the local air district's clean air plan. The *de minimis* levels for O_3 and PM_{10} are 50 and 70 tons per year, respectively, as they are federal nonattainment pollutants. The *de minimis* level for NO_x and CO, as attainment pollutants, are 100 tons per year. The full campus is included in the SJVUAPCD Air Quality Attainment Plan; as such the project is consistent with emission growth factors contained in that plan.

The EPA has classified Air Basins (or portions thereof) as "attainment", "nonattainment" or "unclassified" for each criteria air pollutant, based on whether or not the NAAQS have been achieved. If an area is designated unclassified, it is because a lack of adequate air quality data was available to base a nonattainment or attainment designation. The EPA classifies the San Joaquin Valley Air Basin (SJVAB) as nonattainment for O_3 and PM_{10} and attainment for NO_x and CO. The SJVAB is unclassified or has no federal standard for lead.

State of California

The CARB regulates mobile emissions sources, oversees the activities of county and regional Air Pollution Control Districts (APCDs) and Air Quality Management Districts (AQMDs) and implements the California Clean Air Act (CCAA) of 1988. The CARB regulates local air quality indirectly by establishing state ambient air quality standards and vehicle emission standards, by conducting research activities, and through its planning and coordinating activities.

Until the passage of the CAA Amendments, there was no specific deadline for the attainment of state standards. The CCAA requires that nonattainment areas within the state develop plans to attain state air quality standards. These plans include the following: emission reduction requirements of all feasible control measures for an annual five percent reduction in nonattainment pollutants or its precursors, emission control standards that require local districts to stringently control emissions through varying degrees of stationary and mobile source control programs; application of additional control measures if a regional air quality management district or unified air pollution control district area contributes to downwind nonattainment areas; costeffectiveness estimates for all proposed emission control measures; and development and implementation of transportation controls for cities and counties to enforce.

California has adopted ambient standards that are more stringent than the federal standards for the criteria air pollutants. Under the CCAA, patterned after the federal CAA, areas have been designated as attainment, nonattainment or unclassified with respect to the state ambient air quality standards. The CCAA requires that districts design a plan to achieve an annual reduction in districtwide emissions of 5 percent or more for each nonattainment criteria pollutant or its precursor(s). The SJVAB is in nonattainment for the state O_3 and PM_{10} standards. The SJVAB is designated an attainment area for NO_x, SO_x, CO, and Pb. Sulfates, hydrogen sulfide, and visibility-reducing particles are unclassified in the SJVAB.

San Joaquin Valley Unified Air Pollution Control District

The SJVUAPCD has jurisdiction over air quality in the SJVAB. The SJVUAPCD regulates most air pollutant sources with the exception of motor vehicles, locomotives, aircraft, agriculture equipment and marine vessels. State and local government projects, as well as projects proposed by the private sector, are subject to requirements of the local district and CCAA if the sources are regulated by the district. In addition, the SJVUAPCD, along with the CARB, maintain ambient air quality monitoring stations at numerous locations throughout the air basin. The stations are used to measure criteria pollutant levels and to assist in the determination of agricultural “burn” days.

Before CCAA passage, the SJVUAPCD's primary role was stationary source control of industrial processes and equipment. After the passage of the CCAA and CAA Amendments, air districts were directed to implement transportation control measures and were encouraged to employ indirect source control programs to reduce mobile source emissions.

In 1991, the SJVUAPCD, in accordance with the requirements of the CCAA, prepared an *Air Quality Attainment Plan* (AQAP) that set forth the District’s strategy for attaining the California one-hour ozone standard. The strategy includes numerous measures that require District rulemaking and program development for their implementation. The 1991 AQAP identifies eleven Transportation Control Measures (TCMs) as “reasonably available” in the air basin. These include traffic flow improvements, public transit, passenger rail support/facilities, Rideshare program, suburban park-and-ride lots, bicycling program, trip reduction program, telecommunications, and alternate work schedules.

The 1991 AQAP committed the District to develop a number of new rules and rule amendments to reduce ozone precursor emissions and established a timeline for their development. However, in 1994, the District’s ozone attainment strategy was comprehensively revised in conjunction with the preparation of the *Ozone Attainment Demonstration Plan* (OADP), prepared to demonstrate attainment of the Federal One-Hour Ozone Standard. The 1994 California Clean Air Triennial Progress Plan and Plan Revision (1994 Triennial Plan) was incorporated into the OADP and reflected the new ozone attainment strategy. New control measures were added and the District’s rulemaking schedule was revised. In 1998, the District prepared its *1997 California Clean Air Act Progress Report and Plan Revision* (1997 Triennial Plan) and once again reviewed and updated its rulemaking schedule.

The Federal Clean Air Act Amendments require that areas classified as "moderate" nonattainment and above (the San Joaquin air basin is a "serious" nonattainment area for ozone) show reasonable further progress towards attainment by demonstrating that emissions reduction milestones are being achieved. Districts must prepare "rate of progress plans" to show this emissions reduction achievement. The *1999 Ozone Rate of Progress Report* demonstrated that the target level of emissions or milestones for 1997–1999 (9 percent) and for 1990–1999 (24 percent) were met. However, the 1994 OADP failed to demonstrate achievement of the federal ozone standards because basinwide monitoring data continued to show exceedances of the federal ozone standard, so a new plan is currently being prepared.

The SJVUAPCD does not meet the NAAQS for PM_{10}. The District is designated as serious nonattainment for PM_{10} and required to reach attainment of both the annual and 24-hour standards by December 31, 2001. However, the 24-hour standard will not be achieved before December 31, 2001. The *PM_{10} Attainment Demonstration Plan* demonstrates attainment of the annual standard by December 31, 2001. Therefore, the District is requesting that the EPA grant a 5-year extension so that the District can achieve both the annual and 24-hour standards by December 31, 2006. The *PM_{10} Attainment Demonstration Plan* describes present and future efforts pursued by the District to attain and maintain federal PM_{10} NAAQS by December 31, 2006.

In addition to reducing emissions in order to meet federal requirements, the purpose of the AQAP is to comply with the requirements of the CCAA and its amendments to the California Health and Safety Code. The CCAA requires that all districts in the state achieve and maintain state air quality standards by the earliest practicable date. To accomplish these mandates, the CCAA requires that districts develop attainment plans and regulations. The CCAA has several key requirements for districts to achieve state standards for nonattainment pollutants. These requirements include a 5 percent reduction of nonattainment emissions per year; a permitting program to achieve no net increase in stationary source emissions; a reduction in vehicle trips, use, and miles traveled; increased average vehicle ridership per vehicle; reduction in population exposure to nonattainment pollutants; establishment of Best Available Retrofit Control Technology requirements for all permitted sources; and development of indirect and area source programs.

In 1998, SJVUAPCD published the *Guide for Assessing and Mitigating Air Quality Impacts* (GAMAQI). It is an advisory document that provides local jurisdictions with procedures for addressing air quality in environmental documents. The guide provides methods for assessing air quality impacts, thresholds of significance adopted by the air district, and recommended mitigation measures.

Local jurisdictions are also encouraged by the SJVUAPCD to incorporate air quality elements in local plans. In 1994, SJVUAPCD published the *Air Quality Guidelines for General Plans,* which provides assistance for developing policies and implementation strategies at the local level that will be consistent with regional efforts to manage air quality. A key recommendation of these guidelines is to incorporate air quality considerations when developing land use and transportation plans. Examples of this would be considering transportation demand (and motor vehicle emissions) that would be associated with land use patterns or considering land use compatibility of agricultural and industrial uses with uses that would be "sensitive" to localized air quality conditions.

Rules promulgated by the SJVUAPCD directly influence activities necessary to develop communities. Construction activities can generate PM_{10} emissions from the movement of soil, use of heavy equipment, bulk materials handling, asphalt paving, and other related activities. Dust, or PM_{10}, emissions from construction activities can be adequately controlled at the source. SJVUAPCD Regulation VIII, Fugitive Dust Prohibitions, requires reducing PM_{10} emissions from construction activities. Residential wood burning is regulated by SJVUAPCD Rule 4901, which specifies installation of only specially certified wood burning appliances.

As previously stated, the SJVUAPCD also regulates facilities that emit toxic air contaminants (TAC). The SJVUAPCD administers the region's Toxic Air Contaminant Control program, which is intended to reduce the public exposure to TACs from stationary sources in the region.

Merced County Association of Governments and Council of Fresno County Governments

The SJVUAPCD has entered into a memorandum of understanding with the Merced County Association of Governments and Council of Fresno County Governments. This memorandum of understanding ensures a coordinated approach in the development and implementation of the transportation plans required by the CCAA and the CAA.

4.3.2.2 Climate, Meteorology, and Topography

The air quality of the SJVAB is determined by routine monitoring of changes in the quantities of criteria pollutants in the ambient environment. Air quality in the SJVAB is a function of the criteria pollutants that are emitted locally, the existing regional ambient air quality, and meteorological and topographic factors that influence the intrusion of pollutants from sources outside the immediate vicinity.

Geography plays a significant role in weather patterns throughout the California Central Valley. The Central Valley, which extends from south of Bakersfield to north of Redding, is bounded by the Sierra Nevada on the east, the Coast Range on the west, the Tehachapi Range on the south, and the Cascade Range on the north. These mountain ranges tend to buffer the Valley from the marine weather systems that originate over the Pacific and are drawn inland by the jet stream. The only breach in this barrier is the Carquinez Straits, which exposes the midsection of the Valley to the Pacific Coast marine weather regime. The SJVAB is noticeably affected by this marine influence, which moderates climatic extremes on the northern end. This is especially evident on summer evenings when cooling occurs as a result of the penetration of sea breezes.

The climate of the San Joaquin Valley is characterized by mild, wet winters and warm to hot, dry summers. The major climatic controls are (1) the Pacific high-pressure system over the eastern Pacific Ocean, (2) the Pacific Ocean, and (3) the local topography. The formation of a high-pressure area over the Great Basin Region to the east also affects the area, though primarily in the winter months.

The project is located in the northern portion of the San Joaquin Valley. In the summer, the area is characterized by warm to hot, dry days and cool nights with clear skies and no rainfall. In the winter, the area experiences mild temperatures and occasional rains, with frequent heavy fogs. About 30 days of fog is normal for the period from December through January. On an annual basis, predominant winds are from the northwest; during the winter, drainage of cold air from the Sierra Nevada results in easterly winds.

Temperature

Temperatures in the vicinity of the proposed project site (Merced Municipal Airport, 1961–1990) vary seasonally. The annual average monthly temperature is 61.7°F. The hottest month is July, with an average temperature of 78.6°F. The coldest month, December, averages 44.8°F. Monthly average temperatures range from 35.3°F to 96.9°F (NOAA, 1992).

Precipitation

Precipitation occurs mainly in the months of November through April and is generally associated with the passage of Pacific-frontal winter storm systems. Any rainfall that occurs during summer months is usually light and associated with isolated showers or thundershowers. The annual average precipitation at the Merced Municipal Airport is 12.01 inches. The precipitation is seasonal, with nearly 90 percent of the area's rainfall occurring between November and April. January and February are the wettest months on average, receiving nearly 35 percent of the annual rainfall. Table 4.3-2 summarizes monthly average temperatures and precipitation.

Table 4.3-2
Average Monthly Temperature and Precipitation Data
(1961–1990)

Month	Normal Temperatures		Precipitation
	Maximum (°F)	Minimum (°F)	(inches)
January	54.5	35.7	2.07
February	62.3	38.7	2.06
March	67.4	41.4	2.00
April	74.9	44.4	1.06
May	83.7	50.4	0.28
June	91.4	56.1	0.06
July	96.9	60.2	0.03
August	95.2	59	0.04
September	90	54.8	0.20
October	80.5	47.5	0.65
November	65.3	40.4	1.86
December	54.3	35.3	1.70
Annual Average	76.4	47	12.01

Winds

Winds in the project area flow with the major axis of the San Joaquin Valley, up-valley from the northwest. Prevailing surface winds are northwesterly except during winter months, when the prevailing winds are from the southeast. On a regional scale, general air circulation in the San Joaquin Valley is up-valley flow in the winter and down-valley in the spring, summer, and fall. There are complex wind patterns aloft that include jets and eddies. The seasonal and annual average wind flows are modified by cyclic diurnal flow variations. On sunny days, small upslope winds are established. As cooling occurs during the evening and night, this flow reverses and downflow subsidence occurs. Average wind speeds range from 3.9 to 7.8 miles per hour (CARB, 1984).

Dispersion Conditions

Dispersion of air pollutants in the northern portion of the San Joaquin Valley is limited by persistent inversions and low surface-wind speeds. In the summer, subsiding air from the Pacific high-pressure system produces a persistent regional scale inversion, regularly trapping pollutants and limiting mixing. Morning air-mixing heights tend to be lower than in the afternoon, year-round. Light surface winds, and the physical barriers of mountain ranges to the east and west, channel airflow and limit horizontal dispersion. The primary route of ventilation is southeast over the Tehachapi Mountains to the Mojave Desert. Multiday periods of stagnation occur during summer and winter, causing air pollutant levels to build up to peak concentrations.

4.3.2.3 Air Quality

Criteria Pollutants

The major criteria pollutants of concern in the SJVAB are described below. Table 4.3-3 presents the major health effects from air pollutants of regulatory concern in the SJVAB.

Table 4.3-3
Health Effects Summary of Air Pollutants of Regulatory Concern

Air Pollutant	Adverse Effects
Ozone	Eye irritation
	Respiratory function impairment
Carbon Monoxide	Impairment of oxygen transport in the bloodstream, increase of carboxyhemoglobin
	Aggravation of cardiovascular disease
	Impairment of central nervous system function
	Fatigue, headache, confusion, and dizziness
	Can be fatal in the case of very high concentrations in enclosed places
Particulate Matter Less Than Ten Microns (PM_{10})	Increased risk of chronic respiratory disease with long exposure
	Altered lung function in children
	With SO_2, may produce acute illness
	May lodge in and/or irritate the lungs.

Source: Bay Area Air Quality Management District, 1996.

Ozone (O_3)

Ozone (O_3) is a secondary pollutant that forms as a result of the interaction between ultraviolet light, Reactive Organic Gases (ROG) and NO_x. ROG and NO_x are primary pollutants that are emitted directly into the environment, primarily generated by motor vehicle operation and emitted as exhaust, but also generated by stationary and area sources. Secondary or indirect pollutants are formed in the atmosphere, usually as the result of a chemical reaction involving primary pollutants. The major effects of O_3 and the other components of photochemical smog include reductions in plant growth and crop yield, chemical deterioration of various materials, and the irritation of the respiratory system and eyes.

A highly reactive molecule, O_3 readily combines with many different components of the atmosphere. Consequently, high levels of O_3 tend to exist only while high ROGs and NO_x levels are present to sustain the O_3 formation process. Once the precursors have been depleted, O_3 levels rapidly decline. Motor vehicles are primary sources of ROGs and NO_x. Because of the direct link between vehicular emissions and O_3 formation, air quality programs focus on reduction of mobile source emissions. Significant reductions in O_3 have been achieved through the state-mandated inspection program.

Particulate Matter of Less Than 10 Microns in Diameter (PM_{10})

Particulate matter consists of particles in the atmosphere resulting from many sources, including fume-producing industrial and agricultural operations, motor vehicle tires, combustion, atmospheric photochemical reactions, burned agriculture waste, and construction activities. Natural activities also introduce particulates into the atmosphere. Wind-raised dust is one such source.

Because of health impacts from breathing the particulates, the total suspended particulate standard was revised to reflect particles that are small enough to be considered “inhalable,” i.e., 10 microns or less in size. Current standards define acceptable concentrations of particles that are smaller than 10 microns in diameter, referred to as PM_{10}. Particulate matter can be responsible for a wide range of pollution effects, including visibility reduction, respiratory irritation, corrosion of structures and materials, and economic effects related to soiling.

In July 1997, EPA revised the 10-micron particulate matter NAAQS and issued a new NAAQS for 2.5 micron particulate matter. In May 1999, however, a federal appeals court remanded the new $PM_{2.5}$ standards back to EPA for failing to articulate adequately its authority to set the standards. EPA filed a petition for a rehearing with the federal D.C. Circuit Court of Appeals. On February 27, 2001, there was a court hearing and the $PM_{2.5}$ standard was upheld. The ARB is currently in the process of evaluating the attainment status of the state’s air basins with respect to the federal $PM_{2.5}$ standard.

Carbon Monoxide (CO)

Carbon monoxide (CO) is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. High levels of CO can impair the transport of oxygen in the bloodstream, thereby aggravating cardiovascular disease and causing fatigue, headaches and dizziness. Motor vehicles are a primary source of CO. Carbon monoxide tends to dissipate rapidly into the atmosphere. Consequently, violations of the CO standard are generally limited to major intersections during peak hour traffic conditions.

Other Criteria Pollutants

The air basin is in attainment of ambient standards, or unclassified, for the remaining pollutants. Health effects associated with ROGs are mostly associated with the formation of ozone.

Additionally, portions of ROG emissions are toxic compounds. The primary source of ROG is petroleum transfer and storage, mobile sources, and organic solvents.

There are no state or federal standards for ROG. However, ROG is an important component of ozone formation. Therefore, the SJVUAPCD *Air Quality Attainment Plan* contains many control measures to decrease ROG emissions from both stationary and mobile sources.

Oxides of nitrogen (NO_x) are created during the combustion of fossil fuels under high temperature and pressure. Health affects associated with NO_x are an increase in the incidence of chronic bronchitis and lung irritation. Chronic exposure to NO_x may lead to eye and mucus membrane aggravation, along with pulmonary dysfunction. Airborne NO_x can also impair visibility.

Sulfur oxides (SO_x) can damage and irritate lung tissue, accelerate the corrosion of materials exposed to them and can harm vegetation. Sulfur dioxide (SO_2) is a colorless gas created by the combustion of sulfur-containing fossil fuels. Often sulfur dioxide has the smell of rotten eggs at certain concentrations.

Lead (Pb) is a metal that was used to increase the octane rating in auto fuel. Adverse health impacts of lead toxicity include loss of appetite, weakness, apathy, and miscarriage. Lead can also cause lesions of the neuromuscular system, circulatory system, brain, and gastrointestinal tract.

State-Regulated Pollutants

In addition to the six criteria pollutants that are regulated by both the state and federal governments, four pollutants are regulated by the state only: sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. The status for sulfates, hydrogen sulfide, and visibility-reducing particles is unclassified in the SJVAB because of the limited amount of monitoring data. Vinyl chloride is not required by state law to have a designation.

Sulfates, vinyl chloride, and hydrogen sulfide are not evaluated in this EIR, because they are not associated with construction or operation of a campus. Sulfates are created by the photochemical reaction of burning of fuels containing sulfur. Sulfates are also produced in mining soils with sulfates. Vinyl chloride is typically produced by plastic industrial processes. The hydrogen sulfide standard was created to reduce odors. Hydrogen sulfide, which typically creates smells similar to rotten eggs, is produced in petroleum processing, geothermal plants, and the decomposition of vegetable and animal material without oxygen.

The visibility standard was created to increase visibility distance. Visibility is affected by light-scattering particles the size of visible spectrum wavelength and by the absorption of light by dark particles or soot. Sources of visibility-reducing particles include motor vehicles, industrial processes, power plants, and naturally occurring particles.

4.3.2.4 Existing Air Quality

Air quality on any given day is influenced by both meteorological conditions and pollutant emissions. In general, meteorological conditions vary more than emissions from day to day and, therefore, tend to have a greater influence on changes in measured concentrations. The influence of emissions variation is greatest for CO and PM_{10}, two pollutants for which ambient concentrations are particularly influenced by local sources. A 3-year summary of the measured concentrations of criteria air pollutants in the project area is provided in Table 4.3-4. These measurements were taken at two air quality sampling stations in Merced run by the CARB.

The entire San Joaquin Valley, which includes the project area, has been classified as a serious nonattainment area for ozone by the EPA. The EPA has also designated the San Joaquin Valley as being in serious nonattainment for PM_{10}. The CARB has also designated this area as nonattainment under the CAAQS for these same pollutants. The designation of an area as attainment or nonattainment is based on monitored data throughout the air basin, which comprises all counties in the San Joaquin Valley. Thus, although the pollutant monitoring station in Merced may show no exceedances of standards for “nonattainment” pollutants, elsewhere in the air basin the monitored data do show exceedances.

Table 4.3-4
Air Pollutant Data Summary (1997–1999)

Pollutant	Merced - Coffee Avenue		
	1997	1998	1999
Ozone (ppm)			
Highest 1-Hour	0.10	0.14	0.13
Days>State Standard	1	37	42
Days>Federal Standard	0	3	2
Carbon Monoxide (ppm)			
Highest 1-Hour	-----	-----	-----
Highest 8-Hour	-----	-----	-----
Nitrogen Dioxide (ppm)			
Highest 1-Hour	0.072	0.063	0.078
Annual	0.013	0.012	0.013
Particulate Matter <10 µm (PM_{10}) (µg/m^3)			
Highest 24-Hour	—	—	134
Days > State Standard	—	—	14
Days > Federal Standard	—	—	0
Annual Geometric Mean	—	—	40.6
Annual Arithmetic Mean	—	—	47.7

Notes:
1. Data obtained from the California Air Resources Board Internet Site.
2. PM_{10} data collected at the M Street Station in Merced.
3. NO_x levels did not exceed state or federal standards during this period.

4.3.2.5 Toxic Air Contaminants

Toxic air contaminants are a category of air pollutants that have been shown to have an impact on human health but are not in the category of criteria pollutants. Examples include certain chlorinated hydrocarbons, certain metals, and asbestos. Adverse health effects of toxic air contaminants can be carcinogenic (cancer-causing), short-term (acute) noncarcinogenic, and long-term (chronic) noncarcinogenic. Several hundred such pollutants are currently regulated by various federal, state, and local programs, as described below.

Regulatory Background

Federal. Air toxics have been regulated at the federal level since the Clean Air Act Amendments (CAAA) of 1977. Following the passage of this law, regulations for seven hazardous air pollutants (HAPs) were promulgated as National Emission Standards for Hazardous Air Pollutants (NESHAPS) over a 13-year period. The federal Clean Air Act Amendments of 1990 revamped the NESHAPS program to offer a technology-based approach for reducing the emissions of a greater number of air toxic compounds. Under the 1990 CAAA, a group of 189 substances were identified as HAPs and slated for regulation. The program requires certain facilities to control air toxic emissions by the installation of Maximum Achievable Control Technology (MACT), which is implemented and enforced in the San Joaquin Valley Air Basin by the SJVUAPCD.

State. California's air toxics control program began in 1983 with the passage of the Toxic Air Contaminant Identification and Control Act, better known as Assembly Bill 1807 (AB 1807) or the Tanner Bill. The Tanner Bill established a regulatory process for the scientific and public review of individual toxic compounds. When a compound becomes listed as a "toxic air contaminant" (TAC) under the Tanner process, the California Air Resources Board (ARB) normally establishes minimum statewide emission control measures to be adopted by local air pollution control districts (APCDs). By 1992, 18 of the 189 federal HAPs had been listed by the ARB as state TACs. Later legislative amendments (AB 2728, Tanner, 1992) required the ARB to incorporate all 189 federal HAPs into the state list of TACs. In April 1993, the ARB added 171 substances to the state program to make the state TAC list equivalent to the federal HAP list.

The second major component of California's air toxics program, supplementing the Tanner process, was provided by the passage of AB 2588, the Air Toxics "Hot Spots" Information and Assessment Act of 1987. AB 2588 currently regulates over 600 air compounds, including all of the Tanner-designated TACs. Under AB 2588, specified facilities must quantify emissions of regulated air toxics and report them to the local APCD. If the APCD determines that there is a potentially significant public health risk posed by a given facility, the facility is required to perform a health risk assessment and notify the public in the affected area if the calculated risks exceed specified criteria.

In addition to the above, Proposition 65 was passed by California voters in 1986, which required that a list of carcinogenic and reproductive toxicants found in the environment be compiled, the discharge of these toxicants into drinking water be prohibited, and warnings of public exposure by air, land, or water be posted if a potential public health risk is posed. The handling of any of these substances by a facility would require a public warning unless health risks could be demonstrated to be insignificant. This program is currently administered by the Office of Environmental Health Hazard Assessment (OEHHA).

On August 27, 1998, the CARB formally identified particulate matter emitted by diesel-fueled engines as a TAC. Diesel engines emit TACs in both gaseous and particulate forms. The particles emitted by diesel engines are coated with chemicals, many of which have been identified by the EPA as HAPs, and by the CARB as TACs. Since by weight, the vast majority of diesel exhaust particles are very small (94 percent of their combined mass consists of particles less than 2.5 micrometers in diameter), both the particles and their coating of TACs are inhaled into the lung. While the gaseous portion of diesel exhaust also contains TACs, the CARB's August 1998 action was specific to diesel particulate emissions which, according to supporting CARB studies, represent 50 to 90 percent of the mutagenicity of diesel exhaust (CARB, 1998).

The CARB action was taken at the end of a lengthy process that considered dozens of health studies, extensive analysis of health effects and exposure data, and public input collected over the last 9 years. CARB's Scientific Advisory Committee has recommended a unit risk factor of 300 in a million for diesel particulate. The CARB action will lead to additional control of diesel engine emissions in coming years by CARB. The EPA has also begun an evaluation of both the cancer and noncancer health effects of diesel exhaust.

The above (1998) ruling prompted the CARB to begin searching for means to reduce diesel PM emissions. In September 2000, the CARB approved the *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles* (Diesel Risk Reduction Plan). The Diesel Risk Reduction Plan outlines a comprehensive and ambitious program that includes the development of numerous new control measures over the next several years aimed at substantially reducing emissions from new and existing on-road vehicles (e.g., heavy duty trucks and buses), off-road equipment (e.g., graders, tractors, forklifts, sweepers, and boats), portable equipment (e.g., pumps), and stationary engines (e.g., stand-by power generators).

Title 8 of the California Code of Regulations contains California Occupational Safety and Health Administration (Cal/OSHA) requirements for fume hoods. The regulations focus on worker health and safety, requiring a minimum flow of speed, face velocity, and certain design features to protect laboratory personnel in their work. In addition, the code established specific requirements for the use and storage of carcinogens, including a requirement to scrub or filter air emissions from areas where carcinogens are used. Other than the requirement that the top of the fume hood stack must be located at least 7 feet above the roof, the regulations do not address emissions once the exhausted air mixes with outdoor air.

Existing Air Toxics

Air Toxics Emissions Sources

Air toxics are generated by a number of sources, including stationary sources, such as dry cleaners, gas stations, and laboratories; mobile sources, such as automobiles; and area sources, such as farms, construction sites, or residential areas. The ARB has prepared an air toxics emissions inventory of mobile, area, and natural sources. The inventory identifies air toxics emissions from sources in each California air district and quantifies these emissions where feasible.

There are no known substantial sources of air toxics in the vicinity of any of the campus site. The campus area is currently undisturbed except for grazing and the use of the golf course. Surrounding land uses are also agricultural. Several miles southwest of the site are new residential developments. These developments would be expected to include potential air toxics sources, such as dry cleaners and gas stations.

Existing Ambient Concentration

Air toxics monitoring stations exist throughout California. These stations, maintained either by the ARB or the local APCD, monitor and record existing levels of various organic gases and metals in air. The SJVUAPCD does not conduct any air toxics monitoring within its jurisdiction. The ARB does not conduct any air toxics monitoring in Merced County.

4.3.2.6 Odors

There are four major elements involved in evaluating odor emissions: deductibility, recognition, intensity, and hedonic tone. Deductibility is the lowest concentration of an odorant that will elicit a sensory response; at this concentration there is an awareness of the presence of an added substance but not necessarily an odor sensation. Recognition, however, is the minimum concentration that is recognized as having a characteristic odor quality by a segment of the population. Odor intensity refers to the perceived strength of the odor sensation, and odorant character is what the substance smells like (e.g., fishy, rancid, hay, sewer, turpentine, ammonia, etc.). Hedonic tone is a judgment of the relative pleasantness or unpleasantness of the odor, and is influenced by factors such as subjective experience and frequency of occurrence. The apparent presence of an odor in ambient air depends on the properties of the substance emitted, its concentration in facility emissions, and the dilution of emissions between the emissions point and the receptor (person). Except for the corrals of the VST property where cattle are held, there are no odor sources present on or in the vicinity of the project site.

4.3.2.7 Sensitive Receptors

Some receptors are considered more sensitive than others to air pollutants. Sensitive receptors include children, the elderly, and people with health problems. Land uses such as primary and secondary schools, hospitals, and convalescent homes are considered sensitive receptor locations. This is because the very young, the old, and the ill are more often susceptible than the general public to respiratory infections and other air quality–related health problems. Recreational users are often moderately sensitive to air pollution, because vigorous exercise places a high demand on the human respiratory function. Currently there are no schools, hospitals, or convalescent homes within 2 miles of the proposed campus.

4.3.3 Impacts and Mitigation

4.3.3.1 Standards of Significance

The following standards of significance are based on Appendix G of the CEQA Guidelines and standards presented in the SJVUAPCD's Guide to Assessing and Mitigating Air Quality Impacts.

Criteria Pollutants

For the purposes of this EIR, an impact is considered significant if the implementation of the LRDP would

- conflict with or obstruct implementation of the applicable air quality plan;
- violate any air quality standard or contribute substantially to an existing or projected air quality violation;

- result in a cumulatively considerable net increase of any state or federal nonattainment pollutant or precursor of a nonattainment pollutant;
- expose sensitive receptors to substantial pollutant concentrations; or
- create objectionable odors affecting a substantial number of people.

The San Joaquin Valley Unified Air Pollution Control District utilizes significance thresholds of 10 tons per year for ozone precursors (oxides of nitrogen (NO_x) and reactive organic gases (ROG)). These thresholds are used in this EIR below to determine whether LRDP implementation would have a significant impact for CEQA purposes.

For PM_{10}, compliance with SJVUAPCD Regulation VIII is considered adequate by the SJVUAPCD to reduce PM_{10} emissions from construction projects to a less-than-significant level, except for large or high-intensity construction projects near sensitive receptors, which may require additional mitigation.

The SJVUAPCD thresholds are generally intended to be used to identify projects for which an emissions budget may not have been included in the applicable implementation plan. For large-scale developments such as the campus and surrounding community, a more appropriate approach is to include those emissions in appropriate planning efforts, so that conflicts with attainment and maintenance efforts can be avoided.

Toxic Contaminants

Since there are no ambient standards for toxic air contaminants, evaluation of impacts is based upon health risk analysis. Evaluation of significant cancer risk for TACs from stationary sources will follow regulations under Proposition 65, which defines a significant cancer risk as any risk exceeding 10 in one million.

Evaluation of significant noncarcinogenic (chronic and acute) health risks from TACs from stationary sources is based on changes in ground-level concentration of pollutants emitted from the campus that would exceed the relevant noncancer effect criterion. For the purposes of this EIR, the noncancer effect criterion is a hazard index greater than 1.0.

Evaluation of exposure to sensitive receptors is based on chronic cancer and noncancer health risks calculated for a hypothetical maximally exposed individual (MEI) living at the point of highest off-site concentration for an entire 70-year lifetime.

4.3.3.2 Analytical Method

Vehicular Emissions

Emissions from vehicles associated with the proposed project were estimated using the California Air Resources Board (ARB) model BURDEN7G. BURDEN7G is part of a suite of models called MVEI7G that are used to estimate vehicle fleet activity and emissions for large-scale projects or air quality plans. Traffic data used as inputs to the model were obtained from Section 4.14, Traffic, Circulation, and Parking.

For the Phase 1 Campus analysis of vehicular emissions, the URBEMIS7G model was used. URBEMIS7G is an ARB emissions estimation model for land use development projects and is more appropriate for the smaller-scale vehicle volumes associated with the Phase 1 Campus than is BURDEN7G. The URBEMIS7G model was run with the estimated number of students, faculty, and staff traveling to and from the campus.

Local Carbon Monoxide Emissions

Impacts from CO emissions from vehicles associated with the full LRDP were evaluated at intersections in the project vicinity exhibiting the most congestion due to the proposed project and where the difference between project and no-project volumes were greater than five percent. The method of evaluation followed that described in the Transportation Project-Level Carbon Monoxide Protocol (UC Davis, 1997) referred to a the "CO Protocol." The analysis approach in the CO Protocol involves a screening process where dispersion modeling (e.g., with CALINE4) is not required if there exists a similar intersection in the air basin that has equal or higher traffic volumes or congestion, or receptors that are as close or closer to the roadway as the intersection(s) under consideration for impacts from the proposed project. The results of this analysis are discussed below

Stationary Source Emissions

As explained in Section 2, the maximum electricity demand on campus opening is projected to be 2.1 megawatts (MW). By 2008, the maximum electricity demand is expected to be 3.5 MW. At full development, the campus would have a maximum electricity demand for 18.3 MW. The University is exploring several options to establish its own sources of electricity. These include (1) on-site generation and use of hydroelectric power from the MID-owned hydroelectric power plant on Fairfield Canal; (2) on-site generation using cogeneration or other technologies; and (3) connection to the grid to provide power for the short term and for reliability.

Because it is uncertain what combination of electricity sources will be used to provide the full amount of electricity at full LRDP development and at completion of the Phase 1 Campus, this air quality section conservatively assumes that the entire 3.5 MW of electricity in 2008 and the entire 18 MW of electricity at full LRDP development would be provided by cogeneration using natural gas–based turbines. These are environmentally conservative assumptions because the cogeneration turbines would result in the highest quantity of air pollutant emissions, as compared to the other potential sources of electricity. Thus, actual emissions of pollutants associated with electricity generation for the campus likely will be lower than the amounts presented in this section.

To estimate emissions from this power plant, emission factors from the EPA document AP-42, Fifth Edition (EPA, 1995, revised 2000) were used, as supplemented by the SJVUAPCD Best Available Control Technology (BACT) Guideline 3.4.3 for NO_x emissions from natural-gas-fired turbines less than 10 MW capacity serving a cogeneration operation with heat recovery (February 16, 2000 update). This assumes the 18.3 MW facility will be composed of more than one turbine each less than 10 MW. Emissions of CO, ROG, and PM_{10} were estimated using the emission factors presented in AP-42 directly. Sulfur dioxide (SO_2) emissions were estimated from an assumed sulfur content of 1 grain per 100 dry standard cubic foot (dscf) of natural gas, the maximum sulfur content in California natural gas if delivered by a California utility regulated by the Public Utilities Commission (PUC). Maximum emissions were calculated assuming turbine capacity, while annual emissions were estimated assuming an annual capacity utilization factor of 75 percent, which was the recent experience of UC Berkeley for their central campus cogeneration plant (URS, 2000). Results of the emissions analysis for the gas turbine are described below.

In addition to the emissions from the turbines, natural-gas-fired boilers used for space heating on campus would emit criteria pollutants. For the purposes of assessing potential boiler emissions, it was assumed that the campus would need central plant boiler capacity similar to that of UC Berkeley, which has three central plant boilers approximately 135 MMBtu/hr in size, and several smaller boilers in individual buildings, totaling to approximately one additional large central plant boiler in aggregate capacity. The annual utilization of central plant boiler capacity at UC Berkeley runs at about 10 percent (URS, 2000), and the smaller boilers likely have a higher annual utilization. For the purposes of this screening-level assessment, it was assumed that the total boiler capacity at the UC Merced Campus would run at a 25 percent annual utilization. Emission factors from the EPA document AP-42, Fifth Edition (EPA, 1995, revised 2000) were used, as supplemented by the SJVUAPCD BACT Guideline 1.1.2 for NO_x emissions from natural-gas-fired boilers greater than 20 MMBtu/hr capacity operating base-loaded or with small load swings (June 30, 1999, update). Emissions of CO, ROG, and PM_{10} were estimated using the emission factors presented in AP-42 directly. Sulfur dioxide (SO_2) emissions were estimated from an assumed sulfur content of 1 grain per 100 dry standard cubic foot (dscf) of natural gas, the maximum sulfur content in California natural gas if delivered by a California utility regulated by the Public Utilities Commission (PUC).

Area Source Emissions

Area source emissions include natural gas combustion for water and space heating, fireplaces, landscape maintenance equipment, and consumer product use (e.g., hairsprays and deodorants). These emissions were estimated with the URBEMIS7G model, using the number of student and faculty apartments projected for the campus.

Construction Emissions

Fugitive dust (PM_{10}) would be emitted during construction activities that involve grading, earthmoving, and travel on unpaved haul roads, and from uncovered soil stockpiles. In addition, construction vehicles and equipment would emit ROG, NO_x, and PM_{10} in the exhaust.

With the exception of the first phase of campus development for which detailed information is available, estimates of a schedule, the extent of construction activities, and the number of simultaneously occurring construction projects would be too speculative at this point. For construction activities beyond Phase 1, this EIR also presents typical or generic air emissions of fugitive dust and construction equipment exhaust assuming that the type and scale of construction activities in the subsequent phases of campus development would be similar to the first phase. This results in a conservative analysis because subsequent construction projects are expected to be smaller in scale and duration than Phase 1.

An analysis was not performed for impacts from $PM_{2.5}$ because of several factors, including the following: (1) an acceptable analysis method for $PM_{2.5}$ emissions has not yet been established; (2) a comprehensive monitoring network has not yet been established to adequately characterize background $PM_{2.5}$ conditions; and (3) the attainment status of each region in the state with respect to the federal $PM_{2.5}$ standard has not yet been determined.

4.3.3.3 Project Impacts and Mitigation

4.3-1 Construction activities as part of development allowed under the LRDP could result in short-term generation of fugitive dust (PM_{10}). This is considered to be a *potentially significant* impact.

Construction-related activities would generate fugitive dust, which is measured in terms of PM_{10}, from earthmoving, excavation, grading, and travel over unpaved haul roads. The term "fugitive dust" refers to particulate matter emitted from an open area (i.e., not through a stack or an exhaust vent) due to human activities or by the forces of wind acting on exposed material such as dirt roads or soil storage piles. Particulate emissions from fugitive dust would vary with the level and type of activity, silt content, and moisture of the soil and prevailing weather.

If no control measures are taken, academic, administrative, and housing uses located adjacent to construction areas could be affected by high concentrations of PM_{10}. The state 24-hour PM_{10} standards could be violated at times in the vicinity of several projects being constructed simultaneously. This would especially be the case in the event of several ongoing grading or excavation activities in proximity to each other on the campus. However, emissions of PM_{10} from construction activities would be reduced with dust control techniques described in the SJVUAPCD Regulation VIII (see Mitigation Measures below for a list of such control techniques) to a less-than-significant level. Compliance with SJVUAPCD Regulation VIII generally is accepted by the SJVUAPCD to reduce PM_{10} emissions to a less-than-significant level. In addition, a quantitative analysis of PM_{10} emissions was performed for the Phase 1 Campus construction to provide an estimate of the magnitude of PM_{10} emissions.

Fugitive dust (PM_{10}) emissions from the Phase 1 Campus construction were estimated to be 32 tons per year, and with implementation of dust-control mitigation measures, the emissions would be reduced to 9 tons per year. This is based on an assumed 103 acres to be graded, 25 of which would be graded on the worst-case day (the URBEMIS model guidance suggests that 25 percent of total acreage would be disturbed on the worst day). These are expected to be the maximum PM_{10} emissions associated with any of the construction projects within the LRDP, because the Phase 1 Campus is anticipated to be the largest construction project for the campus. These emissions would be considered less than significant when compared to any air district's thresholds, where such quantitative thresholds exist.

In addition to construction on the campus, the LRDP will result in off-site construction of infrastructure improvements, such as pipelines and electricity transmission lines. The University also would contribute to the construction of roadway improvements that may be built, in part, to mitigate traffic impacts from the campus. Each of the off-site construction projects could result in fugitive dust emissions. However, in each case the entity constructing the projects will be required to comply with SJVUAPCD's Regulation VIII, which will minimize construction dust.

Mitigation Measures

Implementation of the following mitigation measures would reduce the magnitude of this impact to a *less-than-significant* level. Typically a control efficiency of 50 to 70 percent is assumed for these types of mitigation measures (Jones & Stokes, 2000).

4.3-1(a) The Campus shall include in all construction contracts the measures specified in SJVUAPCD Regulation VIII (as it may be amended for application to all construction *projects generally) to reduce fugitive dust impacts, including but not limited to the following:*

- *All disturbed areas, including storage piles, which are not being actively utilized for construction purpose, shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, or vegetative ground cover.*
- *All on-site unpaved roads and off-site unpaved access roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.*
- *All land clearing, grubbing, scraping, excavation, land leveling, grading, cut & fill, and demolition activities shall be effectively controlled of fugitive dust emissions utilizing application of water or by presoaking.*
- *With the demolition of buildings up to six stories in height, all exterior surfaces of the building shall be wetted during demolition.*
- *When materials are transported off-site, all material shall be covered, effectively wetted to limit visible dust emissions, or at least six inches of freeboard space from the top of the container shall be maintained.*
- *All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at least once every 24 hours when operations are occurring. (The use of dry rotary brushes is expressly prohibited except where preceded or accompanied by sufficient wetting to limit the visible dust emissions.) (Use of blower devices is expressly forbidden.)*
- *Following the addition of materials to, or the removal of materials from, the surface of outdoor storage piles, said piles shall be effectively stabilized of fugitive dust emissions by utilizing sufficient water or chemical stabilizer/suppressant.*

4.3-1(b) The campus will include in construction contracts for large construction projects near sensitive receptors the following control measures characterized by the SJVAUPCD as enhanced and optional control measures:

- *Limit traffic speeds on unpaved roads to 15 mph;*
- *Install sandbags or other erosion control measures to prevent silt runoff to public roadways from sites with a slope greater than one percent; and*
- *To the extent feasible, limit area subject to excavation, grading, and other construction activity at any one time.*

With implementation of these measures, particulate emissions from fugitive dust during construction will be reduced to a *less-than-significant* level.

4.3-2 Construction activities and development allowed under the LRDP would generate increased levels of CO, O_3 precursors (ROG and NO_x), and PM_{10} emissions. This could hinder air quality attainment and maintenance efforts even though those emissions were included in air quality planning efforts. This is considered to be a *significant* impact at the LRDP level.

Construction Emissions

Emissions of NO_x, ROG, CO, and PM_{10} from construction vehicle exhaust would be generated during construction activities. Construction at the campus is expected to be ongoing. Therefore, these types of emissions will occur throughout development of the LRDP. The emission levels of exhaust pollutants are discussed in generic terms because the schedule, types, and amount of construction equipment is unknown at this point.

Table 4.3-5 presents emission factors of ROG, NO_x, and CO from construction equipment exhaust. These emission factors are expressed in pounds of pollutant per hour of equipment usage to give an idea of the magnitude of hourly pollutant emissions per individual piece of equipment.

If the emission factors in Table 4.3-5 are examined, it appears that construction-related emissions of ROG, NO_x, and CO could be substantial, depending upon the scale and duration of the individual construction project. To further evaluate the likely magnitude of impact that could occur from future construction projects on the proposed campus, construction emissions for the Phase 1 Campus were estimated and are reported in Table 4.3-8.

Table 4.3-5
Emission Factors for Heavy-Duty Construction Equipment (lb/hr)

Equipment Type	Reactive Organic Compounds	Nitrogen Oxides	Carbon Monoxide	Sulfur Oxides	Particulate Matter
DIESEL					
Tracked Tractor	0.12	1.26	0.35	0.14	0.11
Wheeled Tractor	0.19	1.27	3.59	0.09	0.14
Wheeled Dozer	0.19	4.17	1.79	0.35	0.17
Scraper	0.28	3.84	1.26	0.46	0.41
Motor Grader	0.04	0.71	0.51	0.09	0.06
Wheeled Loader	0.25	1.89	0.57	0.18	0.17
Tracked Loader	0.10	0.83	0.20	0.08	0.06
Off-Highway Truck	0.19	4.17	1.79	0.45	0.26
Roller	0.07	0.86	0.30	0.07	0.05
Miscellaneous	0.15	1.69	0.68	0.14	0.14
GASOLINE					
Wheeled Tractor	0.5	0.43	9.52	0.02	0.02
Motor Grader	0.56	0.32	12.10	0.02	0.02
Wheeled Loader	0.7	0.52	15.60	0.02	0.03
Roller	0.79	0.36	13.40	0.02	0.03
Miscellaneous	0.73	0.41	17.00	0.02	0.03

Source: U.S. EPA, 1985.

The Phase 1 Campus construction is expected to be the largest construction project within the LRDP. Construction exhaust emissions from that phase of construction were estimated to be 12.2, 3.4, and 1.0 tons per year, respectively, of NO_x, ROG, and PM_{10}.

Operational Vehicular Emissions

The increased number of vehicles from students, faculty, and staff using the campus would contribute to regional emissions of NO_x, ROG, and CO. These emissions were estimated for the campus at full development using the BURDEN7G regional emissions model. The modeled emissions of NO_x, ROG, and CO from vehicle exhaust at full LRDP development are 65.8, 25.5, and 281.0 tons per year, respectively. For Phase 1 Campus, vehicular emissions were modeled using URBEMIS7G, and were estimated to be 6.1, 24.6, and 71.0 tons per year for NO_x, ROG, and CO, respectively.

Stationary Source Emissions

Air pollutant emissions from the potential cogeneration plant were estimated assuming maximum operation of a 18.3-MW natural-gas-fired turbine facility in cogeneration operation (24 hours per day, 365 days per year at full capacity) and a fuel-to-electricity efficiency of 42 percent.

Table 4.3-6 presents the resulting emission estimates. It should be noted that the turbine facility would need to meet SJVUAPCD BACT requirements if emissions of NO_x, ROG, PM_{10}, or SO_2 exceed 2 lb/day for any pollutant. The turbine emission estimates presented in Table 4.3-6 suggest that SJVUAPCD BACT requirements would be triggered for all four pollutants. The NO_x emission estimate assumes application of the current SJVUAPCD NO_x BACT level of 5 parts on a dry volumetric basis (ppmvd) at 15 percent oxygen in the flue gas exhaust for a turbine less than 10 MW in cogeneration operation (as of February 16, 2000). This assumes that the 18.3 MW facility would be comprised of more than one turbine, each less than 10 MW. BACT for ROG, PM_{10}, and SO_2 would be an air inlet cooler and lube oil vent coalescer. When the air permit application for the cogeneration facility is filed with the SJVUAPCD, actual turbine vendor data may be supplied to the SJVUAPCD, thus the emission estimates in Table 4.3-6 may be revisited, and potential BACT requirements reassessed. However, it is anticipated that these emission estimates will remain reasonable.

Table 4.3-7 presents estimated emissions from the natural-gas-fired boilers. Maximum emissions assume the firing of a total of 540 MMBtu/hr capacity, while the estimated annual emissions assume an annual capacity utilization of 25 percent. The boiler emission estimates suggest that SJVUAPCD BACT requirements will be triggered for NO_x, ROG, PM_{10}, and SO_2. The NO_x emission estimate assumes application of the current SJVUAPCD NO_x BACT level of 9 ppmvd at 3 percent oxygen in the flue gas exhaust for a boiler greater than 20 MMBtu/hr (as of June 30, 1999). BACT for ROG, PM_{10} and SO_2 would be the use of natural gas fuel. When the air permit application for the boilers is filed with the SJVUAPCD, actual boiler vendor data may be supplied to the SJVUAPCD, thus the emission estimates in Table 4.3-7 may be revisited, and potential BACT requirements reassessed. However, it is anticipated that these emission estimates will remain reasonable.

Table 4.3-6
Estimated Air Pollutant Emissions from the Proposed 18.3-MW Generation Facility

Pollutant	Emission Factor (lb/MMBtu)		Maximum Hourly Emissions (lb/hr)	Maximum Daily Emissions (lb/day)	Estimated Annual Emissions (tons/yr)[4]
NO_x	0.0155	(1)	2.305	55.32	7.57
CO	0.0150	(2)	2.231	53.54	7.33
PM_{10}	0.0066	(3)	0.981	23.56	3.22
ROG	0.0021	(3)	0.312	7.49	1.03

(1) Estimated assuming the AP-42 value of 0.13 lb/MMBtu (AP-42 Table 3.1-1, April 2000) for turbines controlled by water-steam injection (typically associated with a NOx flue gas concentration of 42 parts per million, dry volume basis (ppmvd) at 15% oxygen) multiplied by 5/42, which accounts for the SJVUAPCD BACT level of 5 ppmdv at 15% oxygen, per BACT Guideline 3.4.3, updated 2/16/2000.

(2) Emission factor assuming lean-premix turbine technology from AP-42 Table 3.1-1, April 2000.

(3) Emission factors from AP-42 Table 3.1-2a for natural-gas-fired turbines, April 2000.

(4) Emissions of SO_2 are estimated to be 0.68 tons per year. Calculated from the PUC maximum natural gas sulfur content of 1 grain per 100 dscf, and assuming a higher heating value of 1,024 British thermal units (Btu) per dscf: (1 grain/100 dscf) x (lb/7000 grains) x (dscf/1024 Btu) x (10^6 Btu/MMBtu) = 0.0014 lb/MMBtu.

(5) Analysis assumes 42% turbine efficiency; annual capacity of 75%; and estimated heat output of 148.71 MMBtu/hr.

Table 4.3-7
Estimated Air Pollutant Emissions from Assumed Central Plant Boiler Load

Pollutant	Emission Factor (lb/MMBtu)		Maximum Hourly Emissions (lb/hr)	Maximum Daily Emissions (lb/day)	Estimated Annual Emissions (tons/yr)[4]
NO_x	0.0155	(1)	5.832	139.97	6.39
CO	0.0860	(2)	46.440	1114.56	50.85
PM_{10}	0.0078	(3)	4.212	101.09	4.61
ROG	0.0056	(3)	3.024	72.58	3.31

(1) SJVUAPCD BACT Guideline 1.1.2 of 9 ppmdv at 3% oxygen (0.0108 lb/MMTtu) for turbines greater than 20 MMBtu/hr assumed to be operating base-loaded or with small load swings (updated June 30, 1999). Boilers with highly variable loads and high turndown ratios would have a higher NO_x emissions allowance.

(2) Emission factor from AP-42 Table 1.4-1 (July 1998) for natural-gas-fired boilers greater than 100 MMBtu/hr, assuming a high heating value of 1,024 British thermal units (Btu) per dry standard cubic foot (dscf) or natural gas.

(3) Emission factors from AP-42 Table 1.4-2 (July 1998) for natural-gas firing, assuming a high heating value of 1.024 Btu/dscf.

(4) Emissions of SO_2 are estimated to be 0.68 tons per year. Calculated from the PUC maximum natural gas sulfur content of 1 grain per 100 dscf, and assuming a higher heating value of 1,024 British thermal units (Btu) per dscf: (1 grain/100 dscf) x (lb/7000 grains) x (dscf/1024 Btu) x (10^6 Btu/MMBtu) = 0.0014 lb/MMBtu

(5) Analysis assumes total plant at 540.0 MMBtu/hr; annual capacity of 25%.

Area Source Emissions

Emissions of NO_x, ROG, CO, and PM_{10} from area sources (water and space heating, fireplaces, landscaping equipment, and consumer product use) estimated from the URBEMIS7G model are 12.7, 129.0, 99.2, and 12.8 tons per year, respectively, at full development of the LRDP.

Total Emissions

Total operational emissions of regional criteria pollutants are the sum of construction equipment emissions, regional emissions from vehicular sources, stationary sources (cogeneration facility and central plant boiler), and area sources (faculty and student housing). Total emissions of NO_x, ROG, CO, and PM_{10} from the full development under the LRDP are summarized in Table 4.3-8. These emissions are above significance thresholds, resulting in a significant impact. For comparison purposes, the Phase 1 Campus emissions (year 2008) are also summarized in this table.

Table 4.3-8
Total Operational Emissions (tons per year)

	Phase 1 Campus (2008)				Full LRDP			
Source	**NO_x**	**ROG**	**CO**	**PM_{10}**	**NO_x**	**ROG**	**CO**	**PM_{10}**
Construction	12.2	3.4	--	1.0	12.2	3.4	N/A	1.0
Vehicular	6.1	24.6	71.0	0.1	65.8	25.5	281.0	Negligible
Area	1.5	12.9	8.8	1.1	12.7	129.0	99.2	12.8
Turbines	1.5	0.2	1.4	0.6	7.6	1.0	7.3	3.2
Boilers	2.1	1.1	17.0	1.5	6.4	3.3	50.9	4.6
TOTAL	**23.4**	**42.2**	**98.2**	**4.3**	**104.7**	**162.2**	**438.4**	**21.6**

As Table 4.3-8 shows, many of the sources, if taken individually, would not result in emissions that would exceed the SJVUAPCD's significance thresholds. Furthermore, each of the sources listed above represents a sum of numerous individual projects, and each project on its own may or may not exceed the significance thresholds. This is particularly important to note because the campus would be gradually built over time and the full campus emissions noted in the table above would not result until about 40 years from now. Over time, particular types of emissions would ebb and flow. Construction emissions would be highest in the earlier years. Vehicular emissions, the single largest source of criteria pollutants, would reach their peak in the latest years. In addition, the LRDP includes a large number of policies aimed at reducing the use of automobiles (especially the solo drivers) and encouraging the use of alternate transportation, including bicycles and transit. Special policies related to managing transportation demand include development of financial incentives for alternate mode use; establishment of a joint City/County/University transportation clearinghouse and website that provides information on transit services and alternate travel options, including ridesharing; development of a comprehensive public information strategy to publicize alternate travel options, and investment in telecommunications network to enable alternate work arrangements. Those policies are described in Section 4.14, Traffic, Circulation, and Parking. The LRDP also includes policies regarding energy conservation and energy-saving building design.

The University will implement the following mitigation measures to further address impacts from contributions to the regional emissions of criteria pollutants.

Mitigation Measures

4.3-2(a) Construction Sources

The following mitigation measures will be implemented to reduce impacts of ozone precursor emissions from construction equipment exhaust. (Applicability—project level)

- *When feasible, use alternative fuel construction equipment*
- *Minimize idling time to a maximum of 10 minutes when construction equipment is not in use.*
- *To the extent practicable, manage operation of heavy-duty equipment to reduce emissions.*
- *Employ construction activity management techniques such as extending the construction period outside the ozone season of May through October.*
- *Use low-emission on-site station equipment.*

4.3-2(b) The campus will work with the SJVUAPCD to ensure that emissions directly and indirectly associated with the campus, University Community, and induced growth are adequately accounted for and mitigated in applicable air quality planning efforts. The SJVUAPCD can and should adopt adequate measures consistent with applicable law to ensure that air quality standard violations are avoided. (Applicability—program level)

4.3-2(c) Vehicular Sources

The following measures will be implemented to reduce emissions from vehicles, as feasible. (Applicability—program level)

- *Provide pedestrian-enhancing infrastructure to encourage pedestrian activity and discourage vehicle use.*
- *Provide bicycle facilities to encourage bicycle use instead of driving.*
- *Provide transit-enhancing infrastructure to promote the use of public transportation.*
- *Provide facilities to accommodate alternative-fuel vehicles such as electric cars and CNG vehicles.*
- *Improve traffic flows and congestion by timing of traffic signals to facilitate uninterrupted travel.*

4.3-2(d) Area Sources

The following measures will be implemented to reduce emissions from area sources, as feasible. (Applicability—project level)

- *Use solar or low-emission water heaters.*
- *Orient buildings to take advantage of solar heating and natural cooling and use passive solar designs.*

- *Increase wall and attic insulation.*
- *For fireplaces or wood-burning appliances, require low-emitting EPA certified wood-burning appliances, or residential natural-gas fireplaces.*
- *Provide electric equipment for landscape maintenance.*

4.3-2(e) Turbines and Boilers

Mitigation is already accounted for by assuming BACT will be applied to these sources.

Quantification of the effectiveness of these measures in reducing air emissions is not feasible. With the implementation of the LRDP policies, these mitigation measures, and coordinated planning efforts with the SJVUAPCD, the impacts would be substantially reduced. Furthermore, air emissions from the proposed project are already accounted for in the SJVUAPCD's Air Quality Attainment Plan. As noted earlier, attainment plans include a baseline emissions inventory, future year projections of emissions which account for growth and already adopted control measures, a comprehensive control strategy of individual measures needed to reach attainment, and contingency measures. The project would therefore not add emissions that have not already been included in the SJVUAPCD's planning effort.

However, because of the SJVUAPCD's recent history of not achieving attainment for ozone, the addition of the campus as a new source in the air basin could potentially hinder the SJVUAPCD's attainment efforts, and it is possible that the SJVUAPCD will not attain the air quality standards with the inclusion of this project in the plan. The impact (on a campuswide basis) is therefore considered to be *significant and unavoidable*.

4.3-3 Development allowed under the LRDP would result in an increase in localized CO concentration from vehicle traffic at intersections but the increase would not result in localized concentrations that would exceed air quality standards. This is a *less-than-significant* impact.

Localized carbon monoxide impacts were analyzed for the cumulative case (Impact 4.3-7) and found to be less than significant. Therefore, project impacts would be *less than significant*, as well.

<u>Mitigation Measures</u>

No mitigation required.

4.3-4 Development allowed under the LRDP would not include sources of odorous emissions, with the exception of a small recycled water facility. This is considered to be a *less-than-significant* impact.

The recycled water facility would be properly sited on the campus to be far from both the campus residential areas and those in the University Community. There are no other receptors nearby, and the prevailing wind direction would carry any potential odors toward the east where receptors are not present. The adjacent land uses are grazing and agricultural. All research using odorous materials would take place inside buildings, so there would be no odorous emissions associated with research activities. This impact is considered *less than significant*.

<u>Mitigation Measures</u>

No mitigation required.

4.3-5 Campus occupants and residents in the immediate vicinity of the campus would not be exposed to significant quantities of toxic air contaminants emitted from uses on the campus. This is considered to be a *less-than-significant* impact.

Toxic air contaminants could potentially be emitted from the Central Plant, campus boilers, and research facilities that would be developed under the LRDP. Compounds used during research could volatilize and escape through hood vents in the laboratories. The precise size of the research facilities that would be developed on campus over time is not known currently, nor is information currently available on the specific types of research programs that would be undertaken at the new campus. Therefore, a quantitative estimate of toxic contaminants emitted from the fully developed campus would be too speculative at this point. As research laboratories are proposed, additional analysis would be conducted to determine the significance of toxic air emissions, at which time potential impacts from toxic compounds would be addressed and quantified.

However, health risk assessments have been prepared for several of the UC campuses, including UC Davis and UC Berkeley. These risk assessments are based on data from on-site sources of TACs, the amount of laboratory square footage that is built or proposed on campus, estimates of hazardous chemical usage based on survey data, and physiochemical properties and intrinsic toxicity of the chemicals involved. The analysis for UC Davis shows that with the projected amount of laboratory space that would be built on campus under the current UC Davis LRDP, the estimated cancer risk is 0.47 in one million. Similarly, a recent health risk assessment was conducted for UC Berkeley that took into account a number of TAC sources, including a cogeneration plant, three large boilers, 15 small boilers, laboratories, and other facilities somewhat unique to UC Berkeley. This analysis estimated a cancer risk of 1.30 in one million. Based on the experience of these UC campuses, the potential health hazard from campus-related toxic air emissions from the full development under the LRDP is considered to be *less than significant*.

<u>Mitigation Measures</u>

No mitigation required.

4.3.3.4 Cumulative Impacts

4.3-6 Development allowed under the LRDP, in conjunction with cumulative development in the region, could hinder air quality attainment and maintenance efforts for criteria pollutants. This is considered to be *a significant* impact.

Campus, University Community, and Campus Parkway. Development of the campus, in conjunction with development of the Campus Parkway and University Community, would result in cumulative increases in emissions of criteria pollutants.

Table 4.3-9
Cumulative Emissions (tons per year)

	NO_x	ROG	CO	PM_{10}
Phase 1 Construction	12.2	3.4	0	1.0
Vehicles (Campus, Community, and Campus Parkway)	110.0	124.2	478.1	4.1

Area Sources				
Campus	12.7	129.0	99.2	12.8
Community	39.7	107.1	20.5	0.1
Stationary Sources	14.0	4.3	58.2	7.8
TOTAL	**188.6**	**368.0**	**686.0**	**25.8**

Cumulative emissions from construction activities would occur. Construction of the Campus Parkway is expected to precede construction of the University Community. Therefore, these two sources of construction emissions would not be expected to combine. However, construction of the Campus Parkway project is likely to occur at the same time as construction of portions of the Phase 1 Campus, and construction of the full LRDP will substantially overlap construction of the University Community. Because it is not yet possible to quantify construction emissions for the University Community or the Campus Parkway projects, cumulative construction emissions cannot be quantified. For this analysis, emissions from construction of the Phase 1 Campus serve as a guide. Before mitigation, construction of the Phase 1 Campus is expected to result in emissions of NO_x, ROG, CO, and PM_{10} in the amounts of 12.2, 3.4, 0, and 1.0 tons per year, respectively.

Cumulative operational vehicle emissions would occur. The combined vehicle trips for the campus and University Community, with the Campus Parkway in place, would result in modeled emissions of NO_x, ROG, CO, and PM_{10} in the amount of 110.0, 124.2, 478.1, and 4.1 tons per year, respectively.

Cumulative area source emissions would occur. Both the campus and community would result in area source emissions of criteria pollutants from fireplaces, landscaping equipment, water and space heating, and consumer products. Combined emissions of NO_x, ROG, CO, and PM_{10} are estimated to be 52.4, 236.1, 119.7, and 12.9 tons per year, respectively.

Cumulative stationary source emissions also could occur. Stationary source emissions associated with electricity generation and a boiler plant have been quantified for the campus. Stationary sources in the community are not yet known and therefore cannot be quantified. Stationary sources from the campus could result in emissions of NO_x, ROG, CO, and PM_{10} in the amounts of 14.0, 4.3, 58.2, and 7.8 tons per year, respectively.

By totaling criteria pollutant emissions from all of the sources that can be quantified at this time, full development of the campus, University Community, and Campus Parkway could result in emissions of NO_x, ROG, CO, and PM_{10} in the amounts of 188.6, 368.0, 656.0 and 25.8 tons per year, respectively. Mitigation measures required for all three projects would reduce these emissions. Further, emissions from the campus are already accounted for in the SJUAPCD's Air Quality Attainment Plan. Population growth and traffic associated with development of the campus, University Community, and Campus Parkway was accounted for in the Merced County Association of Governments Regional Transportation Plan and population projections. Nevertheless, as explained under Impact 4.3-2, the air pollutant emissions resulting from the cumulative projects may hinder the District's attainment efforts, and it is not certain that the District will be able to achieve attainment in the near term. Accordingly, this cumulative impact is considered *significant and unavoidable.*

Other Cumulative Development. The District publishes projections of criteria pollutant emissions for each county in the air basin. Regional growth throughout the air basin also would contribute to emissions of criteria pollutants that would hinder attainment efforts. While the District accounts for projected growth in preparing its attainment plans, the District has not yet been able to achieve attainment. This cumulative impact is considered *significant and unavoidable.*

4.3-7 Development allowed under the LRDP, in conjunction with cumulative development in the region, would not cause an exceedance of CO standards. This is considered to be a *less-than-significant* impact.

Campus, University Community, and Campus Parkway. Development of the campus, in conjunction with development of the Campus Parkway and University Community would result in cumulative increases in traffic that could result in localized CO impacts.

Carbon monoxide emissions impacts from vehicles associated with the LRDP were evaluated at intersections in the project vicinity that would be most affected by the full campus at full development under the LRDP: where the change in traffic volumes between the project and no-project scenarios is greater than five percent. Average daily traffic volumes by roadway segments, or links, were used to estimate traffic volumes at the affected intersection. It was assumed that peak-hour traffic would be ten percent of average daily traffic. The method of evaluation followed that described in the UC Davis CO Protocol, as discussed under Analytical Method.

Vehicle volumes at the intersections most affected by the Full LRDP Development and Full University Community, with the Campus Parkway were compared to those at another intersection in the general project vicinity under the Without Project with Campus Parkway conditions. The intersection found to exhibit the highest volumes as a result of the proposed project is the Bellevue Road and Campus Parkway intersection. Volumes at this intersection were compared to volumes at the intersection of G Street and West 16th Street, for purposes of the analysis. These comparisons are summarized below:

	Bellevue and Campus Pkwy (Project condition)	G and West 16th Streets (No-Project condition)
Sum of ADT at Intersection	113,375	115,073
Peak-Hour Volume (10% of ADT)	11,338	11,507

The volumes at G and West 16th Streets are higher than those at Bellevue Road and Campus Parkway. In addition, the G and West 16th Streets intersection is located in the urbanized are of Merced with receptors (homes and businesses) nearby. The Bellevue Road and Campus Parkway intersection is located nearer the proposed campus location, in a less densely populated area of Merced where there are fewer receptors nearby.

The results of this analysis showed localized impacts from carbon monoxide to be less than significant, based on the criteria of 1) not contributing substantially to a potential exceedance of the ambient CO standard, based upon the worst-case “comparison” intersection operating within a CO attainment area, and 2) not exposing sensitive receptors to substantial pollutant concentrations.

Other Cumulative Development. Population growth and traffic associated with development of the campus, University Community, and Campus Parkway was accounted for in the Merced County Association of Governments Regional Transportation Plan and population projections.

4.3-8 Development allowed under the LRDP, in conjunction with cumulative development in the project vicinity, would not result in significant health risks from emissions of toxic air contaminants. This is considered to be a *less-than-significant* impact.

Campus, University Community, and Campus Parkway. Development of the University Community could include industrial sources, such as research and design facilities and wastewater treatment plants. These sources could generate TACs. However, due to regulations pertaining to TACs from stationary sources and the types of sources in the University Community, the amount of TACs from these sources would not be substantial. Based upon the analysis described above of TACs emitted from other UC campuses, and the small quantity of TACs that would be expected from the types of sources anticipated in the University Community, combined emissions of TACs are not expected to result in a significant localized health risk. Thus, this cumulative impact is *less than significant.*

Other Cumulative Development. As explained in the previous paragraph, a small quantity of TACs from University Community development might combine with TACs from campus operations. No other known sources of toxic air contaminants are present within a sufficiently proximate radius that such emissions would combine with localized emissions of toxic air contaminants from campus operations. The only other known potential source of TACs near the campus would be from agricultural operations on lands south and east of the proposed University Community area. At times, these operations can require the aerial application of pesticides. The application of aerial pesticides is regulated by the California Code of Regulations and is implemented by the Merced County Agricultural Commissioners Office. Pursuant to these regulations, pesticides are applied aerially during calm weather conditions with equipment that allows the pesticides to be dropped straight down. Because of the existing regulations on the application of pesticides and the distance between the agricultural operations and the campus, the aerial pesticides would not result in spray-drift affecting residents of the campus or community. Accordingly, this cumulative impact is *less than significant.*

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