AIR QUALITY IMPACT ANALYSIS FOR THE PROPOSED COVELL VILLAGE PROJECT, CITY OF DAVIS

Prepared for:

Raney Planning & Management
1401 Halyard Drive, Suite 120
West Sacramento, CA. 95691

November 2004

INTRODUCTION

This report describes the impacts of the proposed project on local and regional air quality. The section was prepared using thresholds of significance recommended by the Yolo-Solano Air Quality Management. This report describes existing air quality; construction-related impacts, direct and indirect emissions associated with the project; the impacts of these emissions on both the local and regional scale; and mitigation measures warranted to reduce or eliminate any identified significant impacts.

EXISTING CONDITIONS

Air Pollution Climatology

The project is located in southern Yolo County which is within the Sacramento Valley Air Basin (SVAB). The basin is relatively flat and bordered by mountains on the east, west and north. Movement of air into the SVAB is through the Carquinez Strait - in a northeasterly direction from the Sacramento-San Joaquin River Delta. Quality of the air is either fresh from the marine environment or polluted from the urbanized San Francisco Bay area, depending on the meteorological conditions. Davis's climate includes primarily hot, dry summers and cool, rainy winters. Prevailing winds are from the south-southwest. Atmospheric temperature inversions occur frequently that limit the vertical dispersion of pollutants. These inversions may result in elevated levels of carbon monoxide (CO) during the winter months and high ozone levels during summer and fall.

Ambient Air Quality Standards

Criteria Pollutants

Both the U. S. Environmental Protection Agency and the California Air Resources Board have established ambient air quality standards for common pollutants. These ambient air quality standards are levels of contaminants which represent safe levels that avoid specific adverse health effects associated with each pollutant. The ambient air quality standards cover what are called "criteria" pollutants because the health and other effects of each pollutant are described in criteria documents. The federal and California state ambient air quality standards are summarized in Table 1.

The federal and state ambient standards were developed independently with differing purposes and methods, although both processes attempted to avoid health-related effects. As a result, the federal and state standards differ in some cases. In general, the California state standards are more stringent. This is particularly true for ozone and particulate matter (PM_{10} and $PM_{2.5}$)

The U.S. Environmental Protection Agency established new national air quality standards for ground-level ozone and for fine particulate matter in 1997. The existing 1-hour ozone

Table 1: Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Primary Standard	State Standard
Ozone	1-Hour 8-Hour	0.12 PPM 0.08 PPM	0.09 PPM --
Carbon Monoxide	8-Hour 1-Hour	9.0 PPM 35.0 PPM	9.0 PPM 20.0 PPM
Nitrogen Dioxide	Annual Average 1-Hour	0.05 PPM --	-- 0.25 PPM
Sulfur Dioxide	Annual Average 24-Hour 1-Hour	0.03 PPM 0.14 PPM --	-- 0.04 PPM 0.25 PPM
PM_{10}	Annual Average 24-Hour	50 µg/m^3 150 µg/m^3	20 µg/m^3 50 µg/m^3
$PM_{2.5}$	Annual 24-Hour	15 µg/m^3 65 µg/m^3	12 µg/m^3 --
Lead	Calendar Quarter 30 Day Average	1.5 µg/m^3 --	-- 1.5 µg/m^3
Sulfates	24 Hour	25 µg/m^3	--
Hydrogen Sulfide	1-Hour	0.03 PPM	--
Vinyl Chloride	24-Hour	0.01 PPM	--

PPM = Parts per Million
µg/m^3 = Micrograms per Cubic Meter
Source: California Air Resources Board, Ambient Air Quality Standards (7/9/03) http://www.arb.ca.gov.aqs/aaqs2.pdf

standard of 0.12 PPM microns or less) is to be phased out and replaced by an 8-hour standard of 0.08 PPM. Implementation of the 8-hour standard was delayed by litigation, but was determined to be valid and enforceable by the U. S. Supreme Court in a decision issued in February of 2001.

The State of California regularly reviews scientific literature regarding the health effects and exposure to PM and other pollutants. On May 3, 2002, the California Air Resources Board (CARB) staff recommended lowering the level of the annual standard for PM_{10} and establishing a new annual standard for $PM_{2.5}$ (particulate matter 2.5 micrometers in diameter and smaller). The new standards became effective on July 5, 2003.

Toxic Air Contaminants

In addition to the criteria pollutants discussed above, Toxic Air Contaminants (TACs) are another group of pollutants of concern. There are many different types of TACs, with varying degrees of toxicity. Sources of TACs include industrial processes such as petroleum refining and chrome plating operations, commercial operations such as gasoline stations and dry cleaners, and motor vehicle exhaust. Cars and trucks release at least forty different toxic air contaminants. The most important, in terms of health risk, are diesel particulate, benzene, formaldehyde, 1,3-butadiene and acetaldehyde.

Public exposure to TACs can result from emissions from normal operations, as well as accidental releases. Health effects of TACs include cancer, birth defects, neurological damage and death.

Health Effects of Pollutants

The primary air quality problems in the Sacramento Valley Air Basin are ozone and particulate matter. Carbon monoxide has been a problem in the past within urban Sacramento. The following is a discussion of the health effects of these important pollutants.

Ozone

Ozone is produced by chemical reactions, involving nitrogen oxides (NOx) and reactive organic gases (ROG) that are triggered by sunlight. Nitrogen oxides are created during combustion of fuels, while reactive organic gases are emitted during combustion and evaporation of organic solvents. Since ozone is not directly emitted to the atmosphere, but is formed as a result of photochemical reactions, it is considered a secondary pollutant. In the Sacramento Valley Air Basin ozone is a seasonal problem, occurring roughly from April through October.

Ozone is a strong irritant that attacks the respiratory system, leading to the damage of lung tissue. Asthma, bronchitis and other respiratory ailments as well as cardiovascular diseases are aggravated by exposure to ozone. A healthy person exposed to high concentrations may become nauseated or dizzy, may develop headache or cough, or may experience a burning sensation in the chest.

Research has shown that exposure to ozone damages the alveoli (the individual air sacs in the lung where the exchange of oxygen and carbon dioxide between the air and blood takes place). Research has shown that ozone also damages vegetation.

Suspended Particulate Matter

Suspended particulate matter (PM) is a complex mixture of tiny particles that consists of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid. These particles vary greatly in shape, size and chemical composition, and can be made up of many different materials such as metals, soot, soil, and dust. "Inhalable" PM consists of particles less than 10 microns in diameter, and is defined as "suspended particulate matter" or PM_{10}. Fine particles are less than 2.5 microns in diameter ($PM_{2.5}$). $PM_{2.5}$, by definition, is included in PM_{10}.

The major components of suspended particulate are dust particles, nitrates, and sulfates. A portion of suspended particulate is directly emitted to the atmosphere as a by-product of combustion, wind erosion of soil and unpaved road travel. Small particles are also created in the atmosphere through chemical reactions.

Particles greater than 10 microns in diameter can cause irritation in the nose, throat, and bronchial tubes. Natural mechanisms remove much of these particles, but smaller particles are able to pass through the body's natural defenses and the mucous membranes of the upper respiratory tract and enter into the lungs. The particles can damage the alveoli, tiny air sacs responsible for gas exchange in the lungs. The particles may also carry carcinogens and other toxic compounds, which adhere to the particle surfaces and can enter the lungs.

Carbon Monoxide

Carbon monoxide is a local pollutant in that high concentrations occur only very near the source. The major source of carbon monoxide, a colorless, odorless, poisonous gas, is automobile traffic. Elevated concentrations, therefore, are usually only found near areas of high traffic volumes.

Carbon monoxide's health effects are related to its affinity for hemoglobin in the blood. At high concentrations, carbon monoxide reduces the amount of oxygen in the blood, causing heart difficulties in people with chronic diseases, reduced lung capacity and impaired mental abilities.

Carbon monoxide concentrations are highly seasonal, with the highest concentrations occurring in the winter. This is partly due to the fact that automobiles create more carbon monoxide in colder weather and partly due to the very stable atmospheric conditions that exist on cold winter evenings when winds are calm. Concentrations typically are highest during stagnant air periods within the period November through January.

Regulatory Context

Federal Regulations

The Federal Clean Air Act (FCAA) required the states to classify basins (or portions thereof as either "attainment@ or "non-attainment" with respect to the criteria air pollutants, based on whether or not the NAAQS had been achieved, and to prepare air quality plans containing emission reduction strategies for those areas designated as "non-attainment." The Yolo-Solano Air Quality Management District (YSAQMD) includes all of Yolo County and eastern portions of Solano County. YSAQMD is classified as a "severe" non-attainment area for the federal one-hour ozone standard. The YSAQMD is classified as attainment or unclassified for other national standards.

Within the YSAQMD, West Sacramento is considered a "maintenance" attainment area for CO, which indicates that the area was once designated non-attainment for that pollutant, but is now designated as attainment in light of improved conditions. The remainder of the District is attainment for this pollutant.

Because the air basin is designated as a non-attainment area, the air pollution control districts and air quality management districts within the air basin have prepared the Sacramento Area Regional Ozone Attainment Plan as the basin's contribution to the State Implementation Plan (SIP), pursuant to the FCAA. The SIP includes plans for each of the state's non-attainment areas, along with rules and regulations and other control measures adopted by the air districts and the CARB. The air districts included in the Sacramento Metropolitan Federal Ozone Non-Attainment area (El Dorado APCD, Feather River AQMD, Placer County APCD, Sacramento Metropolitan AQMD and Yolo-Solano AQMD) are currently preparing an update to the Attainment Plan that is scheduled for completion at the end of 2004.

State Regulations

The CARB, California's state air quality management agency, regulates mobile emissions sources and oversees the activities of County Air Pollution Control Districts (APCDs) and regional Air Quality Management Districts (AQMDs). The CARB regulates local air quality indirectly by state standards and vehicle emission standards, by conducting research activities, and through its planning and coordinating activities.

Local Regulations

The project site is in Yolo County, under the jurisdiction of the Yolo-Solano Air Quality Management District (YSAQMD). The YSAQMD is responsible for implementing emissions standards and other requirements of federal and state laws.

Yolo-Solano Air Quality Management District developed the 1992 Yolo-Solano Air Quality Attainment Plan. The plan addresses the requirement to attempt to bring the district into compliance with the federal and state ambient air quality standards. The plan includes carefully planned strategies for progressive reduction of air pollutants by promoting active public involvement, by encouraging compliance through positive influence and behavior, and through public education in both the public and private sectors. YSAQMD also provides a handbook of guidelines for determining air quality thresholds of significance and mitigation measures for proposed development projects that generate emissions from motor vehicles.[1]

Current Air Quality

The California Air Resources Board operates an air quality monitoring site within the UC Davis Campus that monitors the gaseous pollutants ozone, nitrogen dioxide and carbon monoxide. The closest particulate monitoring site is operated by the Yolo-Solano AQMD operates a monitoring site in Woodland on Gibson Street. The Woodland monitoring site measures several gaseous pollutants as well as PM_{10}. A three-year summary of air quality data from these two monitoring sites is shown in Table 2. Table 2 shows that the federal/state standards for ozone, PM_{10} and $PM_{2.5}$ are sometimes exceeded in the project area.

[1] Yolo-Solano Air Quality Management District, Air Quality Handbook, May 1996 (Revised 2002)

Table 2: Ambient Air Quality at Davis and Woodland

Pollutant/Standard	Year	Days Exceeding Standard at: Davis	Woodland
Ozone/State 1-Hour	2002	3	9
	2003	2	3
	2004	0	0
Ozone/Fed. 1-Hour	2002	0	0
	2003	0	0
	2004	0	0
Ozone/Fed. 8-Hour	2002	2	4
	2003	0	0
	2004	0	0
Carbon Monoxide State/Fed. 8-Hour	2002	0	-
	2003	0	-
	2004	0	-
Nitrogen Dioxide State 1- Hour	2002	0	-
	2003	0	-
	2004	0	-
PM10/State 24-Hour	2002	-	6
	2003	-	2
	2004	-	2
PM_{10}/Federal 24-Hour	2002	-	0
	2003	-	0
	2004	-	0
$PM_{2.5}$/Federal 24-Hour	2002	-	1
	2003	-	0
	2004	-	0

Source: Air Resources Board, Aerometric Data Analysis and Management (ADAM), 2004. (http: //www.arb.ca.gov./adam/cgi-bin/adamtop/d2wstart)

IMPACTS AND MITIGATIONS

Method of Analysis

Construction

The URBEMIS-2002 program[2] was applied to the project to estimate the maximum construction emissions from site grading, equipment exhaust, construction worker vehicle trips and other construction activities. Construction was assumed to be completed over the 7 year build-out period for the development. The URBEMIS-2002 model output is included in Appendix 1.

Operation

Estimates of regional emissions generated by project traffic and area sources were made using a program called URBEMIS-2002. URBEMIS-2002 is a program that estimates the emissions that result from various land use development projects. Inputs to the URBEMIS-2002 program include trip generation rates, vehicle mix, average trip length by trip type and average speed. Average trip lengths and vehicle mixes for the Lower Sacramento Valley air basin were used. Average speed for all types of trips was assumed to be 35 MPH.

The URBEMIS-2002 program was run to calculate daily operational emissions during the summer months with an ambient temperature of 85 degrees Fahrenheit. Analysis year was 2010. Both summer and winter runs were made. The summer results were used to estimate ozone precursor emissions while the winter results were used to estimate PM_{10} emissions. The URBEMIS-2002 output is included in Appendix 1.

Local Carbon Monoxide Concentrations

A screening procedure for estimating carbon monoxide concentrations was applied to signalized intersections affected by project traffic under existing and future traffic conditions. Concentrations at a major signalized intersection would be expected to be the highest carbon monoxide concentrations due to the deceleration, idling and acceleration of vehicles at these locations. Three intersections were selected for analysis as signalized intersections where the Level of Service (LOS) is forecast to be D or worse under cumulative conditions. These locations are worst-case locations in that they should be the location of the highest concentrations of carbon monoxide.

The screening procedure contained in *Transportation Project-Level Carbon Monoxide*

[2] Jones and Stokes Associates. Software User's Guide: URBEMIS2002 for Windows with Enhanced Construction Module, Version 7.4. 2003.

Protocol was utilized.[3] The screening procedure is intended to allow the prediction of conservative estimates of carbon monoxide concentrations without having to run computational models such as EMFAC and CALINE4. The methodology uses estimates of the contributions to carbon monoxide concentrations for a "base case" characterized by a specific intersection configuration, meteorology, traffic volume and indicators of intersection performance. A series of correction factors are then applied to adjust the initial estimates of carbon monoxide concentrations for the specific conditions of the intersection under study. Correction factors are provided by a series of tables.

The screening procedure provides a worst-case estimate of concentrations of carbon monoxide generated by vehicles impacting an intersection. Concentrations were calculated at the corner of the intersection, which would be expected to be the location of the highest carbon monoxide concentrations due to the deceleration, idling and acceleration of vehicles at these locations. Concentrations were estimated for a distance of 7 meters (20 feet) from the roadway edge.

The other contribution to the total concentration is the background level attributed to more distant traffic. The background concentration was estimated using the highest concentration of carbon monoxide measured at the UC Davis monitoring site during the period 2002-2004.

Significance Criteria

The Yolo Solano Air Quality Management District has established the following quantitative standards of significance:[4]

- The District considers increases in emissions during construction or operation of 82 pounds per day of ozone precursors (ROG or NO_x) or 150 pounds per day of PM_{10} as significant.
- A predicted violation of any California Ambient Air Quality Standard (CAAQS) during both construction or operation of the project would be considered a significant impact.
- A project is considered to contribute substantially to an existing or project violation of the CAAQS if it emits pollutants at a level equal to or greater than five percent of the CAAQS.

The Yolo Solano Air Quality Management District has also established the following qualitative standards of significance:

- Potential to create or be near an objectionable odor.

[3] Garza, Vincente J.; Peter Granly; Daniel Sperling, Transportation Project-Level Carbon Monoxide Protocol, Institute of Transportation Studies Report UCD-ITS-RR-97-21, 1997.

[4] Yolo-Solano Air Quality Management District, Air Quality Handbook, May 1996 (Revised 2002)

- Potential for accidental release of air toxic emissions or acutely hazardous materials.
- Potential to emit an air toxic contaminant regulated by the District or on a federal or state air toxic list.
- Burning of hazardous, medical, or municipal waste as waste-to-energy facilities.
- Potential to produce a substantial amount of wastewater or potential for toxic discharge.
- Sensitive receptors (e.g., schools, households, etc.) located with a quarter mile of air toxic emissions or near CO hot spots.
- Carcinogenic or air toxic contaminant emissions that exceed or contribute to an exceedance of the District's action level for cancer, chronic and acute risks.

The YSAQMD has also developed significance criteria for cumulative impacts. Development projects are considered cumulatively significant if:

- The project requires a change in the existing land use designation (i.e., general plan amendment), and
- Projected emissions (ROG, NO_x or PM_{10}) of the proposed project are greater than the emissions anticipated for the site if developed under the existing land use designation.

Project Impacts and Mitigation Measures

Impact 1 Construction activities such as excavation and grading operations, construction vehicle traffic, and wind blowing over exposed earth would generate exhaust emissions and fugitive particulate matter emissions that would affect local and regional air quality during construction of the project. This impact would be **significant**.

Table 3 shows expected maximum daily construction emissions for the project assuming no mitigation and with mitigation. Maximum emissions occur during the first phases of construction when clearing, earthmoving and grading occur. Because these activities are related to project area rather than development levels, emissions for either the proposed project of High Density Alternative would be identical. In the absence of emission controls and mitigation measures, these emissions would exceed the YSAQMD's significance threshold for ROG and NO_{x} , but not the threshold for PM_{10}. However, particulate matter emissions during construction would have potential to create a local nuisance whenever construction activities occur near existing or previously-completed residences in addition to contributing to regional air quality effects. Therefore, PM_{10} emissions would also be considered significant even though the YSAMQD threshold would not be exceeded.

The majority of the PM10 from construction shown in Table 3 would be soil particles, while a small fraction would be from diesel exhaust. Diesel exhaust particulate is a pollutant that has come under increased scrutiny in recent years. In 1998 the California Air Resources

Table 3: Maximum Construction Emissions (Pounds Per Day)

	ROG	**NOx**	**PM_{10}**
Project Emissions (Unmitigated)	87.1	721.0	133.7
Project Emissions (Mitigated)	78.4	576.8	15.2
Yolo-Solano AQMD Thresholds	82.0	82.0	150.0

Board identified particulate matter from diesel-fueled engines as a toxic air contaminant (TAC). CARB has completed a risk management process that identified potential cancer risks for a range of activities using diesel-fueled engines.[5] High volume freeways, stationary diesel engines and facilities attracting heavy and constant diesel vehicle traffic (distribution centers, truckstops) were identified as having the highest associated risk.

Health risks from Toxic Air Contaminants are function of both concentration and duration of exposure. Unlike the above types of sources, construction diesel emissions are temporary, affecting an area for a period of days or perhaps weeks. Additionally, construction related sources are mobile and transient in nature, and the bulk of the emission occurs within the project site at a substantial distance from nearby receptors. Because of its short duration, health risks form construction emissions of diesel particulate would be a less-than-significant impact.

Mitigation 1a: Implement the following dust control mitigation measures during all construction phases:

- Apply nontoxic soil stabilizers according to manufacturer's specifications to all inactive construction areas (previously graded areas inactive for ten days or more).
- Reestablish ground cover in disturbed areas quickly.
- Water active construction sites at least three times daily to avoid visible dust plumes.
- Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Enclose, cover, water twice daily or apply non-toxic soil binders to exposed stockpiles (dirt, sand, etc.).
- Enforce a speed limit of 15 MPH for equipment and vehicles operated on unpaved areas.
- All vehicles hauling dirt, sand, soil, or other loose materials should be covered or should maintain at least two feet of freeboard.
- Sweep streets at the end of the day if visible soil material is carried onto adjacent public paved roads.

According to the YSAQMD *Air Quality Handbook* implementation of the above measures would be about 88.6% efficient in controlling PM_{10} emissions. The above mitigation measure reduces would reduce the PM nuisance potential to a level that is less-than-significant.

Mitigation 1b: Prior to the start of each project phase, the applicant shall provide documentation to the YSAQMD demonstrating that the heavy-duty (>50 horsepower) off-road vehicles to be used in the construction project, including owned, leased and subcontractor vehicles, will achieve a project-wide fleet-average 10% ROG reduction and 20 percent NOx reduction compared to the most recent CARB fleet average at time of

[5] California Air Resources Board, Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles, October 2000.

construction.

Implementation of Mitigation Measures 1a and 1b would reduce emissions of ROG to below the YSAQMD threshold of significance, however, emissions of NOx would remain well above the threshold. Therefore, construction emissions of NOx would result in a **significant and unavoidable**, but temporary, impact on regional air quality.

Impact 2: The project would change traffic volumes and congestion levels, changing carbon monoxide concentrations at nearby intersections. This impact would be less-than-significant.

On the local scale the pollutant of greatest interest is carbon monoxide. Concentrations of this pollutant are related to the levels of traffic and congestion along streets and at intersections. Predicted worst-case carbon monoxide concentration for existing conditions and future conditions with the project are shown in Table 4.

The concentrations in Table 4 are for worst-case locations under theoretical worst-case meteorological conditions. Concentrations at greater distances from the roadway and at locations not near the intersections would be substantially lower. Table 4 shows that existing concentrations meet state and federal standards. Concentrations with the proposed project or High Density Alternative would be increased but remain below the most stringent air quality standards. Project impacts on local carbon monoxide concentrations and nearby sensitive receptors would be less than significant.

Impact 3: Trips to and from the project and area sources associated with development would result in new air pollutant emissions within the air basin. This would be a **significant impact**.

Project traffic emissions would have an effect on air quality outside the project vicinity. Trips to and from the project would result in air pollutant emissions within the air basin. Project land uses would also result in a number of area sources of pollutants such as natural gas combustion, fireplace/woodstove emissions and maintenance equipment. The daily increase in regional emissions from vehicles and area sources are shown in Table 5 for Reactive Organic Gases and Nitrogen Oxides (the two precursors of ozone) and PM_{10}. Table 5 shows that proposed project and High Density Alternative operational emissions would exceed the YSAQMD thresholds of significance for both ozone precursors and PM_{10}, so project regional air quality impacts would be significant.

The proposed project and High Density Alternative are mixed-use developments with a wide range of land uses. The project would include transit improvements and amenities, including dedicated bus turnouts and sufficient rights-of way for transit movement, bus shelters, and pedestrian easy access to transit. The project also includes bicycle and pedestrian facilities, including bicycle lanes and pedestrian walkways connecting residential areas with neighborhood commercial centers, recreational facilities, schools, and other public areas. These are all mitigating factors for air pollutants, since these features allow for capturing of

Table 4: Worst-Case Carbon Monoxide Concentration, in Parts Per Million

Intersection	**Existing (2004)**		**Existing + Project (2004)**		**Existing + High Density Alternative (2004)**		**Cumulative+ Project (2012)**		**Cumulative + High Density Alternative (2012)**	
	1-Hr.	**8-Hr.**	**1-Hr.**	**8-Hr.**	**1-Hr.**	**8-Hr.**	**1-Hr.**	**8-Hr.**	**1-Hr.**	**8-Hr.**
Covell/ Pole Line	5.4	3.8	6.7	4.7	7.3	5.1	5.8	4.1	5.8	4.1
Covell/ F Street	5.4	3.8	6.7	4.7	6.7	4.7	5.5	3.8	5.5	3.8
Covell/ J Street	5.4	3.8	6.4	4.5	6.9	4.9	5.5	3.8	6.0	4.2
Most Stringent Standard	20.0	9.0	20.0	9.0	20.0	9.0	20.0	9.0	20.0	9.0

Table 5: Project Regional Emissions in Pounds Per Day

	ROG	**NO_x**	**PM_{10}**
Proposed Project: Area Sources Vehicles Total	 81.4 164.1 245.5	 19.7 184.9 204.6	 807.8 218.6 1026.4
High Density Altern. Area Sources Vehicles Total	 84.4 184.9 269.3	 20.9 211.7 232.6	 838.0 250.5 1088.5
YSAQMD Threshold of Significance	82.0	82.0	150.0

trips within the project site, and promote non-automobile travel. These factors have been accounted for in the emissions estimates shown in Table 5.

Mitigation Measure 3a: The commercial portions of the project should implement the following mitigation strategies:

- Provide transit information kiosks.
- Implement feasible travel demand management (TDM) measures for a project of this type. This would include a ride-matching program, guaranteed ride home programs, coordination with regional ridesharing organizations, and transit incentives program.
- Provide preferential parking for carpool/vanpool vehicles.
- Implement parking cash-out program for employees (non-driving employees receive transportation allowance equivalent to the value of subsidized parking).
- Provide showers and lockers for employees bicycling or walking to work. Provide secure and conveniently located bicycle parking and storage for workers and patrons.
- Provide a satellite telecommute center within the Village Center.
- Provide preferential parking for Low Emission Vehicles (LEVs).
- Specialty equipment (utility carts, forklifts, etc.) should be electrically, CNG or propane powered.
- Use electric lawn and garden equipment for landscaping.
- Utilize reflective (or high albedo) and emissive roofs and light colored construction materials to increase the reflectivity of roads, driveways, and other paved surfaces, and include shade trees near buildings to directly shield them from the sun's rays and reduce local air temperature and cooling energy demand.
- Provide electric vehicle charging facilities.
- Use energy-efficient lighting and process systems, such as low NOx water heaters, furnaces and boiler units.
- Orient building structures and install landscape that takes advantage of passive solar design principles.

Mitigation Measure 3b: Residential development within the project should utilize the following mitigation strategies:

- Allow only natural gas fireplaces, pellet stoves or EPA-Certified wood-burning fireplaces or stoves in single-family houses. Conventional open-hearth fireplaces should not be permitted. EPA-Certified fireplaces and fireplace inserts are 75 percent effective in reducing emissions from this source.
- Allow only natural gas fireplaces in the multifamily residential portion of the project.
- Equip residential structures with electric outlets in the front and rear of the structure to facilitate use of electrical lawn and garden equipment.
- Include installation of solar water heaters for at least 25 percent of residential units.
- Utilize reflective (or high albedo) and emissive roofs and light colored construction

materials to increase the reflectivity of roads, driveways, and other paved surfaces, and include shade trees near buildings to directly shield them from the sun's rays and reduce local air temperature and cooling energy demand.

- Orient building structures and install landscape that takes advantage of passive solar design principles.
- Install solar water heaters for at least 25 percent of the residential units in the development.

Information on the effectiveness of various air quality mitigation measures on actual emissions is not readily available. Where estimates have been made, a wide range is generally provided, indicating that local conditions will have a profound influence on the effectiveness of a given measure. In Davis, most strategies for reducing air pollutants are requirements of development, and the infrastructure for non-auto travel is uniquely available and utilized. The above mitigation program would be expected to reduce emissions by 5-10%. This would not reduce project and cumulative regional air quality impacts to a level that is less than significant. Project regional air quality impacts would remain significant and unavoidable.

Impact 4: The proposed project is would cumulatively impact regional air quality. This impact is **significant**.

The YSAQMD has developed significance criteria for cumulative impacts (YSAMQD, 1996). Development projects are considered cumulatively significant if:

- The project requires a change in the existing land use designation (i.e., general plan amendment), and
- Projected emissions (ROG, NO_x or PM_{10}) of the proposed project are greater than the emissions anticipated for the site if developed under the existing land use designation.

The site is currently under the jurisdiction of Yolo County and is designated as Agriculture. The project would redesignate entire site. Since expected emissions under the current zoning are essentially zero, all emissions shown in Table 5 exceed the emissions anticipated for the site if developed under the existing land use designation. The project would therefore have a significant cumulative air quality impact.

Mitigation Measure 4a: Same as Mitigation Measures 3a and 3b.

Appendix 1: URBEMIS-2002 Output