Quarry Village Overview

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I. Overview

A. **Quarry Village (QV)** would be a dense, relatively car-free, mixed use development. It is an alternative to sprawl and dependency on automobiles. Located near California State University in the City of Hayward (CSUEB Hayward), QV supports a pedestrian-friendly life style which allows ample mobility without car ownership or with reduced car trips for car owners. QV includes the Village Bus, a rapid bus service in the corridor from the BART Station in downtown Hayward to CSUEB Hayward.[1] QV includes an on-site grocery store, restaurant, and community center. The Hayward Area Planning Association is engaged in research and advocacy for QV.

B. **Conventional sprawl and automobile dependency** were created by large distortions in market prices due to a failure to have drivers pay directly for the costs of their use of their cars. Market prices for detached, single family homes have distorted the housing market to favor sprawl. This combination of powerful market distortions over the last 60 years has created a self-reinforcing system. The housing market is now so dominated by

[1]The historic name was California State University, Hayward. In 2004, against the wishes of the students, the alumni, the faculty, and emeriti, and the city, the name was changed officially to California State University East Bay, Hayward Hills Campus.

car-dependent demand that it cannot respond to the latent demand for a less car-dependent life style.

C. **Benefits.** Car-free development is a smarter kind of focused growth. QV could do more than conventional development to provide efficient mobility; reduce congestion, fossil energy use and pollution, including greenhouse gases; encourage walking for health; increase safety; reduce foreign oil dependency; and improve national security. QV would also benefit CSUEB Hayward enrollments, local business, affordable housing, and other goals. "The Benefits" page on the website and a section at the end of this report go into more detail.

D. **The Problem of Scale.** A "car-free" lifestyle can provide a better quality of life at less cost than sprawl, but is difficult to provide because of problems of scale. Cheap autos give sprawl the advantage of functionality at a very small scale. For example, a single house on a large lot with a road to an urban area a few miles away can function. Transit-Oriented Development (TOD), by contrast, requires enough people close enough to each other to justify frequent, reliable transit and walking distances to basic local business. As density develops with cars, they get in each others' way and become less efficient. Cars and traffic also hinder transit, taking its customers and slowing its vehicles, even though transit uses the public right of way more efficiently. There is no simple market mechanism that would increase the user cost of cars as their external costs go up, which results in unfair competition against transit. Also, it is neither easy nor economical to convert an auto street grid to TOD. The TOD has functionality at a much larger scale, probably about 2,000 to 10,000 people per neighborhood. Thus, a large Village is required, not only for economies of scale in construction and management, but also for transportation functionality. The combination of density and size, if too small, has no functionality at all, but as it grows, it begins to get a trickle of benefits, and, when big enough, works effectively to be attractive in the market place. Along with density and size, the more car-free a Village is, the more it supports transit, walk trips, and local business.

E. **The Opportunity.** QV is possible because of a unusual combination of a large vacant site coming onto the market in a few years and of available capital funds for the Village Bus. The land, the long-closed Carlos Bee quarry, is now owned by Caltrans but is no longer needed for a now defunct freeway and will be sold. Concerning the Village Bus, Alameda County voters in 1986 and in 2000 approved sales taxes for transportation, and some of those funds could be used for capital investment in the bus.

F. **This report** covers topics not covered elsewhere on the www.quarryvillage.org website. This report describes the development proposal. Another report covers the timeline for market research, other research and advocacy activities, and what you can do to help.

G. **Guidelines and Ideas.** The green building movement has exploded over the last ten years, as exemplified in the success and growth of the West Coast Green Conference in San Francisco in 2006 and 2007.

1. The first multi-family guidelines came from the **Green Building Program** of Alameda County, which is an offshoot of StopWaste.org, an Alameda County

recycling program funded in large part by a special tax approved by county voters in 1990. The Green Building Program website has a page for Design and Building Professionals, www.stopwaste.org/home/index.asp?page=269. This page has links for designers and developers of multifamily housing:

a. Multifamily Green Building Guidelines, 256 pages for the 2008 revision: http://www.stopwaste.org/home/index.asp?page=291
b. Multifamily Getting Started Guide, an abridged version of the Multifamily Guidelines containing an overview of the 63 measures and 4 case studies, 40 pages: http://www.stopwaste.org/docs/gettingstarted.pdf
c. Technical Assistance and Grants: http://www.stopwaste.org/home/index.asp?page=484.
d. The Multifamily GreenPoint Checklist is an Excel spreadsheet that awards points for various features of green building based on the Guidelines is at www.stopwaste.org/docs/multifamily-greenpoints-calculator.2.15.08.xls. Cities may require developers to use the checklists, and Hayward has done so.
e. Multifamily Recycling Guidelines: http://www.stopwaste.org/docs/1720381662005mfu-designguidelines.pdf
f. There are also links to AccesssGreen Directory, photovoltaics for multifamily and the Green Affordable Housing Coalition.

2. **BuildItGreen**, www.builditgreen.org "is a non-profit membership organization whose mission is to promote healthy, energy- and resource-efficient building practices in California." It started in 2005 from a merger of two similar organizations.
   a. Multifamily Green Building Guidelines: www.builditgreen.org/system/files/uploads/GreenPoint%20Rated/Guidelines_checklists/Multifamily-Guidelines.pdf This is the same as the Green Building Program but easier to download. It still has the older edition of 210 pages from April 2004
   b. Multifamily GreenPoints Calculator: http://www.builditgreen.org/files/uploads/GreenPoint%20Rated/Guidelines_checklists/Multifamily-GreenPoints-Calculator.2.15.08.xls. This is also the same as the Green Building Program.

3. The US Green Building Council's Leadership in Energy and Environmental Design (**LEED**) has a Green Building Rating System which is the most advanced standard for energy conservation and use of non-fossil energy in buildings.[2]
   a. In 2007 LEED issued draft guidelines for neighborhood development, LEED-ND for Neighborhood Development: www.usgbc.org/DisplayPage.aspx?CMSPageID=148. LEED certification, however, may be too expensive for HAPA to participate in.
   b. Based on a preliminary estimate using the LEED-ND spreadsheet at www.usgbc.org/ShowFile.aspx?DocumentID=2846, QV would meet the LEED platinum standard. Newly constructed green buildings can cost about two percent more than traditional buildings but have much lower energy and water costs and less fossil fuel use. QV buildings should have dramatically less fossil energy

[2] http://www.usgbc.org/leed/leed_main.asp.

consumption than comparable-sized detached single family houses.

4. The National Association of Home Builders (**NAHB)** has a Green Building Subcommittee. [Apr 5 06 Flex Your Power Newsletter] 2005 green building was 2% of housing starts and $7.4 billion. Factors: utility company rebates; fashion, avoid leak and mold liability, consumer demand, regulations. Top items: 92% high efficiency HVAC, 89% low E-glass windows, 90% air quality HVAC, 88% energy-efficient appliances, 86% reduced air infiltration, 84% hi-performance engineered wood products, 82% above-code energy programs, 82% minimize site disruption, 75% water saving dish/clothes washers, 74% storm water mitigation, 73% formaldehyde-free finishes, 73% water conserving fixtures and faucets. Active builders perceived an average 8.7% cost increase. 3% were certified and 80% not. 95% use green friendly building materials, 80% use OSB not plywood, 75% use engineered wood like TJI and gluam to lumber, 54% reduce construction waste. Top brands: House wrap brand: Tyvek 66%; insulation brand: 29% Owens-Corning; door windows: Anderson, Pella; HVAC brand: Trane, Carrier; wood framing: Trus joist, TJI, Boise Cascade.

5. **Energy Star** certifies appliances and equipment. www.energystar.gov.

6. **Green Seal** certifies products. www.greenseal.org

7. Green procurement: www.epa.gov/epp/tools/index.htm#a

8. Certification for indoor emissions: www.greenguard.org

9. The cost of green new construction ranges from less than conventional to 5 percent over conventional.

10. Other ideas:
    a. Life Cycle Assessment LCA measures the usual capital and operating costs and adds environmental externalities and end-of-life disposal costs. The challenge is to quantify and monetize different qualitative costs that can't easily be prioritized or weighted in relation to each other, and whether to include costs of things that might not happen, or have a low priority of happening, like a fire burning materials that are otherwise healthy and superior to others. LCA should emphasize the more quantifiable and known factors to influence decisions, while noting caveats.
    b. Another idea is ecological footprint, which emphasizes the land impact of human consumption from the individual to the global. The analysis shows we are using more earths than we have, but has two weaknesses. It has no way to assert the value of land used by nature for biodiversity, which requires a value judgement. Footprint analysis also confuses air pollution with land use by converting greenhouse gases into the land area of average biological productivity needed to absorb the carbon dioxide. This breaks two rules of indicators, that they be transparent and that they suggest a solution to the problem.
    c. Another idea is the Genuine Progress Indicator, an alternative to GDP applicable

globally, nationally, and regionally. GPI starts from GDP and subtracts items that increase GDP but are negative. GPI adds values for non-monetary activities that re not compensated but are worthwhile for society. GPI analysis needs to develop economic input-output models that do what the GPI does but add a capability to consider elasticities and how full pricing would increase productivity and GPI.

II. The Focused Growth Corridor. QV is part of a larger specific planning area, the Hayward Focused Growth Corridor (the Corridor), running from the Hayward BART station to the CSUEB Hayward. The Corridor would have three- to five-story apartments and condominiums, with reduced and paid parking and frequent transit free to residents. Buildings at the bus stops of Village Bus would have businesses on the ground floor and housing above. Current development in the Corridor has new focused growth and new commercial around the BART station, older buildings downtown, and strip commercial along Mission Boulevard coming south toward CSUEB Hayward.

A. I studied properties along the east side of Mission from E St. to Central Blvd. using assessors maps and property information, Metroscan area data, city land use designations, and field inspection. There are 31 properties of which 19 should be redeveloped. At 17.4 units per acre, they have potential for 344 units, and at 34.8 units (top of the city's high density range, but not very high) they could have 687 units. 75 percent of these units are on two large properties. There will be some small reduction of this estimate due to right-of-way takes for the enlargement of the Carlos Bee / Mission intersection.[3]

B. Many existing uses on the east side would remain: Memorial Park, structurally sound buildings two or more stories high (a motel, a clothing store with apartments above, a commercial office building), a major auto dealer, a gas station, a power line corridor, and five properties with buildings on the Hayward fault that cannot be replaced (St. Regis Retirement, El Rancho Restaurant, Twilight Zone/auto parts; China AA Buffet, Giant Burger).

C. Redevelopment potential on the west side has not been estimated but would be less than on the east side due to lack of large parcels and recent redevelopment of land for a hotel, fast food, and major car dealer. I estimate that 200 more housing units are possible on the west side and 600 on the east, for a total of 800.

III. The Quarry Village Site Plan

A. **Site characteristics**. Quarry Village would have about 1,000 apartments and condos, a community building (Village Center), a commercial building, and mini-parks on land located north of Carlos Bee Blvd.

1. **Location and adjacent uses:** The property is north of Carlos Bee Blvd. and Overlook Ave., close to CSUEB Hayward. To the west the site has views of the Bay

[3]Details in C:\My\Quarry Village\city policy and resolutions\Mission redevelopment.qpw

Area. Adjacent to the site on the west at a much lower elevation are single family homes. On the north, above the creek channel, is the Highland Blvd. neighborhood. On the east side is a PG&E high power line and right of way, with the City View apartments just east of that. On the south side south of Carlos Bee Blvd. is sloped, undeveloped land. With vacant land to the south, a cliff and power corridor to the east, a wooded ravine to the north, and houses below and out of view to the west, the site is not part of any existing neighborhood.

2. **Current land Ownership and size:** The property is owned by Caltrans but is surplus from the now defunct Foothill Freeway. The quarry parcel itself has 29.42 according to the city GIS site and 29.91 according to the assessors map. It fronts only on the dead ends of Overlook and Palisade, with no frontage on Carlos Bee Blvd. For QV to work well, the properties on both sides of Overlook Ave., also owned by Caltrans, should be added. This area has eight occupied houses and two boarded up houses. If at all practical, the houses should be moved a few hundred yards to vacant lots in the Palisade neighborhood, also owned by Caltrans, to fill in the Palisade neighborhood and to create a more usable quarry site. In the table below, a reserve parcel is not listed. It is the frontage on Overlook south of Palisade and has .7 acres.

Quarry Village property acreages					
Area	APN	Square feet	Developable	Acres	Dev. Acres
Quarry itself	445018000100	1,281,535	731,540	29.4	16.8
Other parcels					
1175 Overlook	445017002001	36,590	36,590	0.8	
1155 Palisade	445017003803	50,965	50,965	1.2	
Palisade	row	8,467	8,467	0.2	
1174 Overlook	445017001701	37,200	37,200	0.9	
Overlook	row	41,548	41,548	1.0	
1138 Overlook	445017003401	29,400	29,400		
other parcels subtotal		174,771	174,771	4.0	4.0
total all parcels		**1,485,706**	**935,711**	**34.1**	**21.5**

3. **Site characteristics.** On the east side of the property below the PG&E power corridor is a sheer, steep cliff for most of the distance, which is not developable. On the north and west are low cut banks left by quarrying, a heavily-treed, deep, narrow creek channel, and step slopes. On the south, the natural hill slope is often obscured by long piles of overburden. In the southwest corner two streets, Overlook and Palisade, come to dead ends and have building pads on fronting properties, four of which have houses. Most of the site is very flat, very hard rock. About 24 acres are developable.

B. **General layout:** The site is wide on its north side and narrow on the south, where there is access from Palisade St. and Overlook Ave.

1. Palisade St. would be extended as a busway east and south to intersect under the power line with Bee Blvd. as a narrow road for Village Buses, delivery vehicles, sanitation, and public safety vehicles, but not personal vehicles.
2. Grading would create a site that rises gradually from south to north, with cut

equaling fill. HAPA has prepared maps with before and after contours. BkF, a civil engineering firm, estimate volumes and costs of cut and fill, shown in the financial analysis.

3. At the corner of Overlook and Carlos Bee Blvd. would be a small park, where there are already trees and a mini-wetland.
4. Village Square has a busway, a commercial building, Village Center, Village Plaza, and a small park.
   a. Based on an aerial survey and precise contours, the grading plan for cut and fill and the site plan were revised. The northern part is level and the busway and Village Center are a little further north Moving the busway north and to a higher elevation reduces cut and fill, reduces elevation gain for walking, and shortens walking distances. Some housing was added to south of the village center.
   b. A commercial building would be built on the south side of the busway.
   c. A community building, Village Center, would be on the north side of the busway.
   d. Just south of Village Center would be Village Plaza and just east, a small park.
5. Overlook Ave., just west of Village Square, would have short-term parking, a drop-off and pick-up strip, and an extension north of Overlook with car ports with 100 parking spaces.
6. Major walkways would start at Village Square, go north, and connect across to each other on the north side.
7. Multiple unit buildings totaling 1,000 units would run east-west for a solar roof orientation.
8. Buildings will be built to the most recent requirements, 1997 Building Code Standard, for an earthquake of 7.0 on the Richter Scale.
9. Buildings would be accessible from the walkways with smallest units on the south side going to largest units on the north.
10. The width and flatness of most of the site minimizes big views to the west. A knoll on the west side has great views and would not look down too much on the single family houses below. The steep slope and tree cover minimize potential intrusion on the neighborhood below.
11. Quarry Village would use New Urbanism features: walking-oriented design, walking streets, variegated facades, porches, fencing, awnings, flower boxes, ample landscaping. QV will have visually appealing building facades using traditional styles like Victorian and Georgian, and use neo-urban planning principles.
12. Landscaping with native drought-resistant trees, shrubs, and flowers and sedums, some possibly planted on roofs, would attract birds and butterflies
13. **Site Plan.** A sketch site plan and Village Square plan on the website show the land uses described above.

C. **Housing density.** Of the 34.1 acres, much is not developable. The property has a watercourse in deep crevice, steep slopes on the west side, and a cliff on the east side, which preclude development of about 12.6 acres, leaving 21.5 acres developable. About one acre is used for Village Center (The Store, The Center, Village Square) and a North Park and a South Park, and 1.6 acres is used for the busway, Palisade St., and Overlook Ave., leaving 19.5 acres for housing and internal circulation. The quarry site seems able to accommodate, just barely, 1,000 units of three-story apartments, townhouses, and

condominiums ranging from small studios to large six bedroom units. With 1,000 units the density of 47 units per gross acre would have about 107 persons per gross acre. This density is greater than an existing development, City View, just to the east, but would have much the same building type. Based on the building assumptions shown below, the coverage by buildings including The Store and The Center is half of the 20.8 developable acres. The Floor Area Ratio, then, is 1.45, meaning that if an acre has a building three stories high, half would be built on and half not built on.

D. **Mixed Use.**

1. On the south side of the busway would be a three-story commercial building. The grocery store at the busway level would have a sidewalk wide enough for fruit and vegetable boxes under awnings. Shoppers would be encouraged to use cloth shopping bags, but with paper or plastic bags for sale. There could be a small farmers market on Saturdays. Above the grocery store would be a café-restaurant with a roof deck with a great view overlooking the Bay Area to the west. On the north side of the busway would be Village Center, a three-story community building.
    a. On the top floor would be two apartments for use by site managers.
    b. On the second floor would be a large multi-purpose community room with view windows which would be used for meetings of the QV Homeowners Association and other purposes. The room would usually be open as a fitness center, with exercise machines that can be stored to one side to allow other uses. The second floor could also be used for community programs, club meetings, musical events, youth programs, etc., and rentable for special occasions. It could be divided into two smaller rooms. The second floor would have semi-public showers and lockers, bathrooms and a kitchen. It could have some office space needed for QV management. It could have smaller rooms for a computer-learning center, or a small media center with video conferencing equipment and other meeting space.
    c. Village Center on the ground floor by the busway would have an entry atrium, a service counter, and the main office. The office should be able to keep a eye directly on the plaza, the busway, and parking on Overlook, and to observe other public areas using remote cameras. Village Center ground floor on the north side would have a residents fireplace lounge, a laundry room for the studios and one bedrooms, a room and bathrooms suitable for eventual childcare, opening to an area that could be enclosed and used for a play area. Village Center would have the necessary support features of hallways, stairways, elevator, restrooms, and cleaning and utility closets.
    d. By the Village Center, or under its second floor, would be an sheltered area for resident mailboxes, parking for the minibus, the electrocart, and a service vehicle, and two parking slots for postal, UPS, FedEx, and other deliveries. There would be room for bicycle and tricycle parking, and cyclists would be able to use the showers and lockers on the second floor.
    e. East of Village Center would be Village Plaza where walkways come in from the north, with street furniture and a small fountain, and possible small retail on the east side.

E. **Telecommunications.** Quarry Village would be wired for telephone, DSL, cable, fiber optic, WiFi, satellite dish and other high-tech capabilities if affordable.

F. **Personal security.** Quarry Village will have special measures for personal security, Security measures include defensible space design (fencing, good sight lines, no hiding places) along the walkways. Mobile phones have become so inexpensive they could be provided as part of the rent, with service options for tenants ranging from limited security use to full service. An inexpensive mobile phone limited to security might work. Mobile phones could be programmed to call the office easily for access needs, public safety threats, and other needs. A site manager, available by mobile phone, would be on duty at all times and would patrol the site on an unpredictable schedule. The on-duty manager would lock the gate to the Highland bridge at night and open it in the morning. Walkways will have emergency telephones and surveillance cameras with screens in the office. The residents association would discuss and help manage security issues.

IV. Market, Rents and Sales

A. **The Market.** See website, Supporting Different Lifestyles.

1. **CSUEB Hayward faculty and staff.** Faculty and staff are a primary market because QV is so close to the campus and the prices are so affordable.

2. **BART riders,** especially commuters, including those who work in the Corridor and downtown Hayward would have quick access to BART using the Village Bus.

3. **Retired and empty nesters.** "Easy ownership" allows retired to have high security, most maintenance taken care of, and the ability to lock the door and go on long trips

4. **Families with children.** QV will have features designed to appeal to families. The car-free projects in Europe are full of kids.
   a. The townhouses on QV's north side are large, family-sized units.
   b. The park could have a children's play area and fencing to make caring for toddlers easier.
   c. Transportation for schools–Highland elementary, Bret Harte Middle School, Hayward High School–could be by the minibus owned by Quarry Residents Association.
   d. The Village Bus comes close to the Cal State Early Childhood Center (ECC). The campus now provides child care at the new Early Childhood Center, a high quality facility with room for 80 to 110 children.[4] The ECC is a result of a partnership among Head Start, State Preschool, and the Cal State Associated Students. The ECC has programs for infants, toddlers, preschoolers, and nutrition. The ECC meets Head Start standards and is accredited by the National Association for the Education of Young Children and is a very high quality program. ECC maintains a ratio of one staff to four children or infants, and that limits the facility to about 80 children.
   e. If the Village attracts enough children to justify a child care program, the Village

[4]Janice Fonteno, ECEC Director, 885-2571, http://www.asi.csuhayward.edu/childcare.html. In 2003 ECEC operated from 7:30 a.m. to 5:30 p.m. Costs involved $25 tuition and charges that ranged from $12.50 per half day to $32 per day. A child must be enrolled a minimum of 2 days per week, 4 hours per day.

Center will have a room usable for child care. This room will open onto an outside play area. Two toilets and a sink are required for the bathroom. A counter with s ink for food and art project clean up is needed. For up to 20 children a room of 1,000 square feet is needed, enough to meet the requirement for 35 square feet of unencumbered space per child. The outside play area needs 75 square feet per child, or, for 20 children, 1,500 square feet. QV will have then a facility easily convertible for child care, understanding that additional requirements have to be met before providing such care.

5. **Middle class affordability.** For some buyers, affordability will be their major motivation, and overcoming car dependency will be their major challenge. Younger buyers, first time buyers, singles, and young couples are included here. Also included are those who want to minimize housing costs to have more to spend on other desires or needs, and those who are frugal, budget-conscious, or just need to save money.

6. **Disabled.** Every ground floor entry, about 333 homes in total, has no entry steps. Of these, 214 units, from studios through three bedroom, are all on one level inside. There are no curbs from the units to the Village Center and Village Square, and the bus will have no step entry with wide doors. QV will implement elements of universal design to accommodate the disabled, especially for users of wheel chairs and the visually impaired.

B. Overlapping markets. The above categories overlap with health conscious, active life style, environmentally concerned, and women. Other concerns are discussed under Trip Purposes and Times.

1. **Health conscious.** QV will have less particulate pollution due to reduced vehicle movement and use. Less vehicle use also reduces noise. Less vehicle use increases safety. The store should feature local organic food.

2. **Active life style.** "Active" ranges from just walking more, to staying in shape, to athletic. Walking is built into the plan; most units are not close to parking. The Village Center second floor will have a fitness center. A par course and a dog run could be built to wind through the complex. The City View complex next door has a separate tennis and swim club. A regional trail should come through the site going to Castro Valley to the north and Industrial Blvd. to the south. This trail would intersect with the trail in Ward Creek, which goes down to Memorial Park, the Plunge (historic Municipal Swimming Pool), picnic tables, summer concerts in the band stand, and tennis courts. the Ward Creek Trail goes uphill to the Bay Ridge Trail, Garin-Dry Creek Park, and other regional parks. CSUEB Hayward playing fields are in easy walking distance, and the tennis courts are not too far.

3. **Environmentally concerned.** QV is a major improvement over suburbia for sustainability, quality of life, oil supply and reducing global warming emissions. It is, in fact, much better than Smart Growth, which does not reduce auto use very much. See details under The Benefits. This category also includes political, religious, and spiritual progressives seeking to walk the talk.

4. **Women.** Women are more concerned than men about their personal physical safety. Women in public generally feel more vulnerable to crime and are more sensitive to street safety issues than men. Car travel often provides more security than the public space. For this reason, QV has many special, even unique, security features built into the Village. Women now significantly outnumber men at Cal State, 6,051 to 3,477 for undergrads in fall 2001, and 2,365 to 1,347 for graduate students.

C. Rents would cover the costs for Ecopass and other transportation described below, security, and the many other special features described above, as well as the usual management and maintenance. Rentals are not financially feasible at this time, so QV is being planned for condos. Condo owners will be permitted to rent out their units, with regulation and oversight by QV HOA management.

1. **Cal State students.** Student surveys show a strong demand for affordable rents very close to the campus. Two market **surveys of Cal State students** have been completed. Significantly lower rents are the major reason, according to both studies, why so many students would want to move to QV. The students require, and would have, the ability to reach the campus, basic shopping, and work in an acceptable travel time. The second most important reason was to improve personal health through walking more, and the third reason was benefits to the environment and national security. The first survey had 81 respondents and found about 22 percent of students would probably move to QV. Probable movers had positive attitudes, wanted to save on rent, and could get where they needed to go without routine use of a car. The student market alone showed enough demand to fill the Village. Details are available in the report, "Survey on Access and Housing for Cal State Enrollment," April 21, 2004. QV should especially appeal to student now paying market rents and living in the Hayward-Castro Valley-Union City area.

D. **Rent to buy**. Should rentals become feasible, QV could anticipate conversion of rentals to sales. People wanting to buy eventually may not want to risk buying immediately without seeing if QV will work for them. They may want to try keeping their car for a while and learning how to use it less. They may want to have the chance to build equity through renting, and to protect their ability to buy the unit they are in, or to be in line to buy some other unit in the QV. They may want to trade up if their income allows, or trade down if they become empty-nesters, Rent to buy could ease the transition from car-dependent to transit-mobile. Buy one now, then sell and buy another, could also be arranged to increase the appeal. Rent to buy and owners wanting to sell and buy within QV could be on waiting lists ahead of others and could lock in prices to some extent. The portion of rent already paid equal to the condo monthly fee could be rebooked as fee payments. The remaining rent not associated with rental management, Ecopass, and other operating benefits could be considered for part of a down payment.

E. **"Efficient" mortgages.**

1. **Location Efficient Mortgage (LEM).** A LEM allows more household income to be used to qualify for a mortgage because of possible advantages of location. If a buyer still has to commute some distance to work or shop or for other routine travel, the LEM would not apply. If, however, a buyer works at CSUEB Hayward, uses BART to get to

work, works at home, is retired, or has some other basis for greatly reduced travel, the LEM concept would apply. The locational advantage is not only the work trip, but also the closeness and walking access to the grocery store and restaurant, and the

2. **Transportation Efficient Mortgage.** This concept overlaps with the LEM. The LEM is based on distance to routine destinations, and the Transportation Efficient Mortgage is based on the cost of routine transportation. If buyers can show reduced transportation costs, they would be able to use more income to qualify for a loan. The cost would include the bus portion of the Homeowners Association fee, parking costs, costs of car ownership and use, and other costs of routine travel. Vacation travel and long distance travel coss would be excluded. More income might used for mortgage payment if the borrower owns no cars.
3. **Energy Efficient Mortgage.** Operating costs for domestic hot water, space heat, lighting, and appliances would be net zero, leaving cost of some natural gas for cooking. The reduced operating cost is possible only because of the increased capital costs for solar and energy efficient lighting and appliances. The lower operating cost is to some extent offset by the higher capital cost, justifying more income being used to qualify for a mortgage.
4. **Overall costs: Housing, Utilities, Transportation.** Compared with usual home ownership costs, operating costs for utilities, cars, and mortgage costs would be lower while HOA fees would be higher. Mortgage costs should be lower because the costs of solar are less than the savings from less construction for the automobile and more efficient use of land area.

F. **Homeowners Association fees.** For condos and townhouses, the Homeowners Association (HOA) monthly fees includes Ecopass, other transportation, 24-7 management, other amenities, and maintenance. Our current estimate for the HOA fee is $250 per month average, but square footage is important, so the range is large.

V. Green Building

A. Construction methods and materials

1. **Stem wall foundations.** Stem wall and pier foundations could use reusable steel footing forms and factory assembled rebar inserts. The modular sizing of foundations allows reuse of the forms and many uses of the same rebar format.
2. **Factory-built modules** Using CAD, 6 unit types, and 11 building types allows design with minimal waste and increased efficiencies in construction. Construction takes place in a factory on large jigs using a manufacturing model rather than cottage-industry stick-built on-site construction. Working hours are predictable, inspection is systematic, and there are no weather problems. Modules are sized to fit on a truck for delivery by highway, where they are quickly assembled onto the foundations and bolted into a complete building.
3. **SIPs.** Walls, floors, and ceilings can be **structurally insulated panels (SIPs)**, a sandwich of fiber-reinforced cement board or oriented strand board (OSB) on the outside and rigid, super-insulating expanded polystyrene (EPS) (structural Styrofoam) on the inside. It is glued together with a special high-strength glue and dried under extreme pressure, creating a stressed-skin panel. The interior can be taped and finished for a uniform interior. The exterior can be painted or coated with a vinyl or synthetic stucco permanent finish. For siding or brick exterior finish, OSB will accept nailing or

ties.

a. **Design Flexibility**. Anything built with two-by-fours can be built with SIPs.
b. **Energy Savings**. 30-50% (or 50-60%; sources vary) greater energy efficiency, which equates to a comparable savings on heating and cooling costs. A 6" SIPs wall has an R-Value of 21.6 while a 6" stud wall is R 13.7.
c. **Strength.** Testing shows that SIPs are two to three times stronger than wood frame. Floor panels span up to 16 feet and roof panels up to 20 feet; load-bearing walls can go up to four stories. EPS panels are durable for earthquakes.
d. **Durability.** SIPs, being inorganic, do not shrink, rot or decompose, absorb moisture, or support mildew or other pests
e. **Fire resistance.** SIPs have passed fire endurance tests required by national codes. Their solid core construction eliminates the chimney effect caused by hollow stud walls. The fire rating means sheet rock is not necessary.
f. **Noise and Comfort.** SIPs are quieter, tighter and less drafty.
g. **Construction Speed.** SIPs are easy to assemble and easy to wire. Light-weight, large, pre-cut panels allow more rapid construction. EPS panels use an efficient construction process, a spline connection system to join 4' wide panels to build foundations, walls, floors, and roofs. A 4x8 foot panel weighs 125 pounds. The average 1500-2000 sq. ft. home. takes half a day for a trained 3-man crew. (I need to verify this claim; it seems to fast.)
h. **Cost.** A finish surface of cement board may be the most cost-efficient for maximum durability at lowest cost. SIPs are more expensive initially than raw materials for conventional construction but have savings in site labor, material waste and clean-up fees, and shorter construction time frames. SIPs may cost more than other panels due to the insulation component, largely offset by the cost of on-site insulation of wood frame. SIP walls typically carry a much higher insulation factor which would require additional expense for conventional framing.
i. **Code Compliance.** SIPs comply with the following building authorities: BOCA; SBCCI; CABO; UBC; IRC; IBC. NER-467 (National Evaluation Report) and ICBO PFC-6054. Reports are available with the above code information. SIPs adhere to all of the requirements of the current APA Plywood Design Specifications. AmeriPanel kits are VA and FHA Approved and are listed with Federal HUD nationwide. SIPs have national code recognition through ICC-ES Legacy Report NER-665; or are certified by the International Code Council (ICC).
j. Web sites:
   (1) SIPA: Structural Insulated Panel Association, P.O. Box 1699, Gig Harbor, WA 98335, 253-858-7472, http://www.sips.org/]
   (2) One manufacturer is PaceMaker, http://www.pacemakerbuildingsystems.com/, whose panel products include:
      (a) Structural Insulated Panels (SIPs): for walls, roofs and floors typically made with EPS sandwiched between two structural OSB (other surface types possible).
      (b) Nailbase: for roofing and walls, made of EPS and one outer layer of OSB, or other surface type.
      (c) Insulated Roof Panels with an OSB top face that allows shingles, shakes, metal or other roofing materials to be attached.
   (3) Another maker is ThermaSAVE panels, http://www.thermasave.us/ and

http://www.fas.org/housing/houston/factsheet-houston.pdf

k. 2007 cost estimates. Sources: Tim Schmidt (CEO, XtremeHomes, Oroville, builder of Kaufmann's mkLotus at West Coast Green, Sept. 2007) 10/18/2007: He spent 3 years in R&D of his system using CAD. Recommends using $115/sq ft cost for Bay Area (Truckee - $85) for the house. On-site costs including crane and roofing bring costs up to $150 /sq ft. Assumes nice but not high end finishing, 2 story single family. I think the on site includes the foundation; need to find out. His engineering team works with the general contractor on foundation specs. A "modernist" look adds 15 to 20% for more glass, cable railing, faucets. He can build all green with SIPs for 10% below stick built. He can use radiant heat or forced air. His firm does design work: development analysis, materials selection, budget, approvals, elevations, site plan. Factory takes 45 days, delivery takes a day, "crane day" takes a day, 30 days to certificate of occupancy, total = 11 weeks. Does not include design, approval, and materials acquisition time.

4. **ICFs**: Insulating concrete forms (ICFs) are an alternative to SIPs. They are hollow foam blocks or panels that crews stack into the shape of the exterior walls of a building. They then pour reinforced concrete inside, creating a foam-concrete sandwich. strong, energy efficient, quiet, comfortable, and durable, and can be built in any style. They are comfortable, quiet, energy efficient, and strong. ICFs have become a cost-effective way to build. http://www.icfweb.com/about/intro.asp
   a. Rastra is a concrete form system made of a lightweight material called Thastyron, which provides a permanent framework for a grid of reinforced concrete that forms load-bearing walls, shear walls, stem walls, lintels, retaining walls, and other components of a building. Rastra has insulation, soundproofing, and fire protection; easy-to-install; resistant against frost and against heat radiation. It does not entertain mold or attract nesting insects. 85% of its volume is recycled postconsumer polystyrene waste mostly now going to landfills. http://www.rastra.com/wi_ra.htm

B. Roofs: Most buildings will run east-west to provide optimal roof orientation for solar energy. Roof size for four bed 3 story townhouse is 20' x 30', = 600 sq ft. Roofs will also accommodate skylights and fans. Solar collectors will be tilted for maximum efficiency. I am looking for solar panels that can function as roof as well as panel. The panels would extend off the edge to serve as eaves. The top of the top floor would be similar to an interior floor. A steel frame could be mounted on this floor, to which panels would attach. They would be openable from below, allowing installation and servicing from the floor. The floor would be accessible from below, using a ceiling hatch on the townhouses or the stairway of the condominium in the center of a court (i.e., the central six-plex flanked by two six-plexes).

C. **Green building materials.**
1. The main concerns are sustainably of supply, energy needed to create the material, and off-gassing, e.g., formaldehyde, causing indoor air pollution which can last for years.
2. Structure: FSC lumber,
3. Floor covering: natural-fiber carpets like wool, cotton, and hemp, minimal stain repellants, installation with tacks instead of adhesives; eco-friendly linoleum [I have not seen but sounds unappealing] recycled Milliken carpet installed without glue;

bamboo flooring.

4. Wall paneling. Avoid plywood and particle board which uses formaldehyde-based glues and resins.
5. Paints, adhesives, and sealants low in volatile organic compounds (VOCs) certified by Green Seal. VOC information is on Materials Safety Data Sheets (MSDS) from manufacturers or stores.

VI. Energy

A. Solar Photovoltaic (PV) solar for electricity.

1. Solar photovoltaic should be sized to meet yearly electrical needs for appliances and lighting, but not hot water or space heat. It should sometimes take electricity from the grid and sometimes feed onto the grid, with zero net for the year.
2. PV systems are classified by their rated power output (peak power produced at solar radiation of 1000 watts per square meter at a module temperature of 25°C). Systems rated **between 1 and 5 kilowatts** meet the needs of homes, with 3 kilowatts an average.
3. The panels would be on the grid, taking advantage of modern, efficient inverters.

	PV Capacity Rating (Kilowatts)		
PV Module Efficiency (%)	1	2	4
	Roof Area Needed in Square Feet		
16	80	160	320
12	100	**200**	400
8	150	300	600

U.S. Department of Energy, Energy Efficiency and Renewable Energy:
http://www.eere.energy.gov/consumer/your_home/electricity/index.cfm/mytopic=10840

4. For QV estimate use **200 sq ft** for **2 kilowatt** system for 4 bed townhouse.
5. **Cost:** By 2010 the cost of silicon should come down as more manufacture should exceed more demand, and number of installers should be up more than demand.
   a. *Chron*: $9,500/kilowatt, state fed incentive $2,000, net $7,500. House needs **1.33 kilowatt**; most systems are 2-3 kilowatts. SF Chron 7/18/2007 p. 1. If so, net cost would be **$10,000.**
   b. West Coast Green 9/2006: Single family [size?] cost $20,000, state rebate $7,000, federal tax credit 10%; $2,000, net cost **$11,000**
   c. *Daily Review* 1/13/2006 "Sun Shines..." p. 1: **4 kilowatt** $34,000, state rebate $11,200, federal tax credit $3,400, net cost **$19,400**.
   d. *Chron* 11/23/2007: Average **3 kilowatt** system $23,820, reduced to **$15,220** with bulk purchase, including state $2.20 per watt rebate and federal $2,000 tax credit. Offer is from SPG Solar, a Marin firm.
   e. *Chron* December 11, 2007 rooftop solar in SF, **3 kilowatt** $30,000; state rebate via PG&E $2.30/watt= $6,900, fed tax credit @ 10%= $3,000, net cost = **$20,100**
   f. Tim Schmidt 10/18/2007: $6 /watt installed

g. **Two kilowatt.** Estimates assume a linear relation between size and cost; in reality there is a fixed base cost for any size of system, then a variable cost by size. Summary, net cost, 2 kilowatt systems: 7/18: **$15,000**; 9/2006: **$11,000**; 1/13: **$9,700**; 11/23: **$10,150**; 12/11: **$13,400;** 10/18: **$12,000**

h. http://www.gosolarcalifornia.ca.gov/ and http://www.cpuc.ca.gov/static/energy/solar/_index.htm have too much unsearchable information, unable to find typical case.

6. Sample large installation: Contra Costa Community College District, 3,200 kilowatts built as roofs over 34 car ports in six parking lots, Chevron Energy Solutions, $35.2 million, $8.5 million rebates and incentives, net cost, $26.7 million, or $8,344 per kilowatt. Per unit cost for QV 4 bed would be $16,688. However, the source may include cost of unrelated efficiency improvements. www.solarbuzz.com/News/NewsNAPR1008.htm Feb. 5, 2008.

B. **Thermal solar for hot water and space heat**.

1. Hot water collectors: DOE: 20 sq ft/ person for first 2, then add 12 sq ft per person. 4 people = 44 sq ft. Space + water heating roof area info is not on web. Assume space requires 4 times the hot water need, or 176 sq ft, plus hot at 44 = **220 sq ft**
2. Insulated hot water storage tank: DOE: 1.5 gallons of storage per sq ft of collector [4 people = 66 gallons?]. 1-3 persons require 50-60 gallons; 3 to 4 persons, 80 gallons; 4 to 6 people, a "large tank." my house: 40 gallons, 18" dia, 5' high. assume tank fits in 3'x3' room? Use 160 gallon? Uninsulated 175 gallon tank is 29" diameter, 66" high. http://www1.eere.energy.gov/solar/sh_basics_water.html http://www1.eere.energy.gov/solar/sh_basics_space.html
3. Slim, wall-mounted, hot water radiators, heated towel rails in bathrooms www.keeling.co.uk [steel convector radiator center, standard joints chrome plated from £292.58- ouch].
4. Tim Schmidt 10/18/2007 recommends the Thermomax Evacuated Heat Pipe Collector. http://www.thermomax.com/: "collectors minimize convective heat loss by placing the solar absorbing surface in a vacuum chamber. Radiation heat loss is also minimized by using a low emissive absorber. The Thermomax manufacturing plants are fully automated, with specialized machinery for efficient and consistent production." One estimate of total system cost (for a straw bale house) was $6,250.
5. Another source, http://www.greenbuilder.com/sourcebook/HeatCool.html, put hot water systems at $1,000 to $3,500 and space heat from $800 to over $4,000.
6. I will use **$7,000.**

C. Day lighting and use of natural light: skylights and clerestories with exterior sunshades, awnings and sun baffles to spread light evenly inside.

D. If roof is 600 sq ft, and PV and thermal take up 440 sq ft for collectors, 120 sq ft are left for skylights. Townhouse seems to have enough roof area. Need to make an estimate for flats.

E. **Passive solar** for space heat and cooling.

1. SIPs have great thermal mass for insulation. Additional insulation can come from blown-in cellulose or recycled fiber batts, also helps with weatherization.

2. Trees on west to shield from afternoon sun.
3. Window size and orientation Double glazed reflective windows with large ones facing south and smaller ones facing north
4. High reflectivity building materials
5. Weatherization, sealing and weather proofing; tight, sealed building

F. **Ventilation and air exchange.** Air exchange is crucial for control of mold and bacteria. Buildings will have air exchangers with air filter for indoor air quality. Given tight construction, air exchangers will be needed to refresh inside air when windows are closed. Air exchange could use wind-rotated cowlings on ceiling vents with heat-exchangers for wind-driven ventilation [BedZED, Beddington, London, www.zedfactory.com/home.html]. Windows at both ends will allow cross breezes (except studios). Whole house fan for town houses or top floor flats next to skylight.

G. **Appliances and Lighting.**
1. High efficiency Energy Star appliances: refrigerator, range, microwave oven, front-load clothes washer, clothes dryers (including solar clothes driers--an outside system using a "clothes line" to which wet clothing is attached using wooden "clothes pins"), dishwasher, bread maker, toaster, toaster oven, blender, food processor, mixer, computer and entertainment electronics.
2. High efficiency Energy Star lighting, compact fluorescent bulbs.
3. Use of skylights and window baffles to bounce light and avoid bright/dark interior lighting contrast caused by direct sun.

H. **Outside energy use and water use:** QV will use solar-powered walkway lights and fountains. Water conservation means less pumping of water, saving electricity.

I. **Wind.** Small wind turbines could be used where adding to visual design appeal. Would have to be small scale, quiet, and pose no harm to birds.

J. **Geothermal.** Heat pumps use underground thermal mass. Heat pumps cycle water through underground pipes. For **heating**, water that has been chilled in a heat exchanger is cycled underground so the earth makes it less cold. The water goes to a heat exchanger where it warms a liquid refrigerant (making it a gas). The evaporation of the gas cools the water and it returns to the earth loop. The gas refrigerant is compressed, which heats it up to 160 degrees F. The hot refrigerant goes to an air heat exchanger on the building, where a fan blows cool air from outside across coils heated by the refrigerant and into the building. The warm air heats the house and cools the refrigerant, which becomes a liquid again and returns to the heat exchanger. (www.econar.com/econar.html) Initial costs are higher but operating costs are lower, the system lasts longer, and overall costs are reduced 30 to 60 percent. Geothermal heat pumps are cleaner and quieter than natural gas forced air furnaces. Unlikely for QV because the bedrock on which the project is built is very hard rock and green building and solar energy can do the job.

VII. Units and building types.

A. QV proposes a wide range of unit sizes imitating the existing national distribution of floor

space, except for units over 2,500 square feet.

1. Apartments tend to be small and occupied by smaller households. It's hard to know how much of this is due to an inheritance of units from times past when people were less affluent, how much is due to market distortions favoring detached single family houses as the dominant type for large floor space, how much is due to a market willingness to take less floor space near downtowns to get greater access to central areas, and how much is due to real market preference. I assume that most of the smallness of apartments is due to historic and non-market forces, and that interior floor space is a valuable amenity that can be separated from density.
2. QV should as much as possible provide a market choice that can meet national norms for floor space. In practice, QV cannot economically provide houses at the largest end of the spectrum, over 2,500 square feet, but could reach a six bedroom size. QV is intended for a mix of incomes and lengths of residency, and so it needs units larger than usually found in apartment complexes. Market research will determine revisions of these initial assumptions.

B. The Residential Energy Consumption Survey (RECS) has the best and only comprehensive data on US interior floor space.

1. The average floor space of US housing units in 2001 was 2,006 square feet of **enclosed space**, including attached garages, basements, finished and heated attics, and enclosed porches. A little over half of all housing units have garages. The average one car garage has 250 square feet and the average two car garage has 400 square feet.[5] If about 200 square feet is the average size for garages for all housing units, then the adjusted floor space, after taking out 200 sq ft for the garage, would be about 1,866 square feet.
2. **Heated floor space** is another, and perhaps better, measure of interior living space, and averages **1,707 square feet per unit**. QV units, averaging 1,250 per unit, would be larger than most apartments but still smaller than the national average for housing.[6]
3. At this time, it is important to establish the footprints of the various units as simple rectangles for planning purposes. The units are all designed with no window on side walls so as to allow side-by-side construction. They all are deeper that they are wide, but never more than twice as deep as the width. Studios through three bedroom are one level units; four and six bedroom units are each three story interiors. Bedrooms have a minimum dimension of 10 feet and a maximum of 16 feet. Bathrooms have a minimum of 5 by 8 feet. Kitchens have a minimum of 7 feet by 8 feet.

4. I have sketched typical floor plans for various unit types from studios to 6 bedrooms, which are the basis for the table below. Parameters for floor plans: rectangular for efficient construction, no windows on sides for row housing, 14' maximum room depth for light from window, stairwells and bathrooms in center as they do not need daylight, 2'6" doors, .375' interior walls, .5' exterior walls, stacked washer dryers, 4/5/4 steps in stairwell to minimize space, entry area big enough for bikes and cart.
   a. Studios are designed to have one window and an entry from a hall opposite the window. The bathroom, kitchen, and closets are near the hall, leaving the area by the

[5]Residential Energy Consumption Survey (RECS).

[6]Details in C:\My\Quarry Village\Project spreadsheets\Quarry Village.qpw

window for dining, living, and sleeping areas.

b. One bedroom units have windows front and back, with living dining in front, kitchen, bathroom, and closets in the middle, and bedroom in back.
c. Two bedroom units are wider than one bedroom units, with similar layout in front and middle and two bedroom in back.
d. Three bedroom units are deeper than two bedroom units, with the third bedroom in front next to living dining, and the rest of the layout like two bedroom units.
e. Four bedroom units are narrow and not as deep as three bedroom units, but have three floors. The ground floor has living dining in front and kitchen in back, and half bath and stairwell in the middle. The second and third floors floor have a bedroom in front and in back with stairwell and bathrooms in the middle.
f. Six bedroom units are similar to four bedroom units, but are wider and not as deep, allowing two bedrooms in back on the second and third floors.

C. The primary building type would be **three-story, wood frame walk ups** possibly using modular panels on concrete foundations. We have a sketch site plan in AutoCAD software and a graphically enhanced drawing of this plan showing general circulation and building footprints. We have a Form Z extrusion and fly-through simulation providing a perspective view, but they are not yet satisfactory. The next step is to use the table above to redo the building footprints and site layout, and to measure walkway lengths

Floor Area by Unit Type

	width	depth	floors	usable area
Studios	16	32	1	480
One bed one bath	20	36	1	672
Two bed one bath	24	38	1	864
Two bed two bath	28	38	1	1,016
Three bed two bath	32	40	1	1,232
Four bed 2.5 bath	20	30	3	1,800
Six bed 4 bath	22	34	3	2,244

Units and Buildings

Unit type	# of units	sq ft of unit	floors/ building	units/ building	# of buildings	bldg width	bldg depth	building footprint	all buildings footprint
Studios*	48	24,576	3	48	1	128	64	8,192	8,192
1 bed 1 bath	216	155,520	3	6	36	40	36	1,440	51,840
2 bed 1 bath	90	82,080	3	6	15	48	38	1,824	27.360
2 bed 2 bath	180	191,520	3	6	30	56	38	2,128	63,840
Threes	108	138,240	3	6	18	64	40	2,560	46,080
Fours	200	302,400	3	2	100	36	28	1,008	120,000
Sixes	158	354,552	3	2	79	44	34	1,496	118,184
total		1,244,88			279				446,240

*Studios are on a four foot hallway, so depth is 30 + 4 +30 = 64'.

D. The four-bedroom units could use a **quad-type design** for non-traditional households. All this really requires is locks on each bedroom door to allow roommates to share the rent but keep some privacy. This design has been successful at the CSUEB Hayward apartments, Pioneer Heights.

E. **Ground-floor units** would be at grade for no-step entry, facilitating access by wheelchairs, shopping carts, and bicycles. Entries could have space for bicycles and a security chute for deliveries. (Space for this has not yet been included in the floor space table above.) Studio, one, two, and three bedroom units are on one level and would be stacked and joined to create a building type that would be repeated in the footprint.

F. Townhouses. Four and six bedroom units would be three stories internally, enabling them to function as apartments or townhouses, with the mix determined by market research. These larger units would be on the north side of the site.

G. **Facade types** probably be based on traditional types of design such as Victorian or Georgian, but also consider designs used on attractive three story apartments in Hayward, such as Warrington Place, City View, Atherton Place, City Walk, and City Center Pinnacle. I also have pictures of attractive three- to seven-story residential buildings from several cities in US, Canada, and Europe. It would be desirable to get architectural help, 3-D computer renderings, and architectural scale models.

VIII. Landscaping and water

A. Walkways could be rubberized asphalt and porous asphalt (open-graded) to accelerate run off and reduce slipping. Porous asphalt uses gravel 3/8” diameter, allowing water to seep through. Rubberized asphalt provides a base of 2” with porous asphalt on top.

B. The main access walkway needs to serve garbage trucks, fire trucks, and other heavy vehicles. To avoid the negative visual effect of wide pavement, some of the width could be grasscrete or some kind of colored permeable cement or porous asphalt. “GrassPave2" has a foundation of gravel, a plastic honeycomb grid, a filler of sand, and grass. It can support cars; I don’t know about fire trucks. It costs a little more than asphalt, but avoids having to manage much run-off water and filters the rain. It must be managed carefully for the right amount of fertilizer and to prevent thatch build-up.

C. Impermeable area. While QV has must less pavement than a subdivision, it has more roof area, so the impermeable area may be about the same. The run off from roofs, however, would be cleaner than from pavement, and can be retained in storm water ponds for irrigation and landscaping.

D. Storm water retention. Storm ponds would capture and store storm water-run off and function like natural ponds for maximum natural water supply. The site would retain all its normal storm water using a pond at the north park and at the wetland park.. It could have a large rain storage cistern, play pond, or meadow. It would have a Strom Water Pollution Prevention Plan.

E. Grey water. The project could have a grey water system for landscaping, probably tied into the roof drains and storm water system.

F. Inside water use is reduced. Appliances would be water-saving dish washers and clothes washers, water conserving, low flow showerheads, and water conserving faucets. Units would have dual flush toilets which have a toggle button on the top of the tank, one side for a 1.6 gallon flush and the other for a .9 gallon flush.

G. Landscape watering. Outside water use is reduced by avoiding over-watering using moisture sensors, using off-site water only for initially establishing plants, using storm retention ponds for watering, using native, drought-resistant plants, and avoiding use of water for cleaning sidewalks and cars. Water not used on the surface can replenish natural aquifers.

H. Landscaping will be native, drought-resistant plants, such as bushy verbena, manzanita, buckwheat, blue fescue, rushes, and sage. No oil-derived pesticides or fertilizers will be used except possibly for some small, showy plantings at the office and village square. It will be important to conserve the limited soil on the site for use in landscaped areas. The landscaping will attract bees, moths, butterflies, and birds. The crevice creek will not be affected by the project.

I. Water pollution is reduced by avoiding cars putting pollutants on pavement and by capturing storm water before it can flow into city storm drains.

J. It would be nice to have some seasonal water flow through Quarry Village, but the ravine on the north side is so deep that diverting some of its water does not seem feasible. A gravity flow diversion from the ravine would have to go upstream onto other properties.[7] The pond at North Park could be designed to retain a large amount from rain that trickle down to a smaller more permanent pond, with a small water flow along the central path through Village Square and on to the Wetland Park.

IX. Additional options. There are a number of ideas which could be added.

A. I would like to have design flourishes in the SF Victorian style. I would like 9 light windows as a signature feature for buildings and statuary lions as a signature feature for walkways.
B. Ground floor units could have back yards big enough for a yard or a garden; fronts could have small fenced area for flowers.
C. Part of the site and the PG&E corridor could be used for allotments of small gardening areas and fruit trees.
D. The Village Center and commercial buildings could have skylight atriums with an indoor garden.
E. Cooling boxes with wet filters could be used for air-conditioning.

[7] Storm water and creek design: Dr. Ann Riley, private consultant, Berkeley; Gary Mason of Wold Mason, Albany. Sustainable Services. The creek channel needs to be looked at to see if there is a problem of its cutting its channel too deep due to unnatural flows, and whether it needs some stabilization.

F. Some windows could have awnings to reduce heat from the sun and for architectural interest.
G. Buildings along important walkways could be connected to Village Plaza by an attractive, covered, glass-walled walkway with greenhouse features and sliding glass doors, for use in inclement weather.
H. There could be a dog run.
I. There could be a par course for jogging with exercise stations along the way.

X. Village Bus

A. Village Bus Overview.

1. Bus technologies are being modernized around the world and ridership grows rapidly under supportive conditions. Latin America starting with Curitiba showed what could be done and many other modern cities have followed suit–even Las Vegas, where some innovations have demonstrated what could work in Quarry Village. Growth in riders in London has been rapid since 2000 due to new buses, exclusive bus lanes, low fares, automatic ticketing, and the high fee charged to cars to enter central London. New York City's anti-graffiti policy and new fare system has helped propel a huge increase in riders.

2. Quarry Village, CSUEB Hayward, and the Hayward Focused Growth Corridor can provide the ridership that justifies rapid bus service, "the Village Bus." The bus provides the mobility that supports a "car-free" corridor with much less traffic than a car-based approach. Good transit along a focused growth corridor also supports a higher quality of life at a lower cost than sprawl for both housing and transportation. More focused growth means more riders, which supports more frequent service, which supports more focused growth. Less car ownership and less car use reduce traffic, speeding up transit, increasing transit use.

3. The Village Bus is a fast, frequent bus free to QV residents, owned and financed by QV, and operated by a private bus company under contract with the QV Corporation. The Village Bus would be a public carrier regulated by the California PUC.

4. The Corridor is **currently ill-served by transit**. BART is poorly connected to the campus by two slow bus services, the CSUEB Hayward Hill Hopper and AC Transit Route 92. Compared to a modern service, the current service has problems similar to much American transit: bus stops too far away to walk to, too much time waiting for the bus, slow speeds, circuitous routes, and infrequent service in underdeveloped, low density corridors. The Hill Hopper runs slowly, along a longer route, for only part of the day, so the Village Bus would be a big improvement. Route 92 has fairly frequent service all day, but uses a roundabout route and a noisy, under-powered diesel engine that lumbers slowly up hills. The engine, in fact, is too weak to come up Carlos Bee Blvd.

5. **Transit in the US must be extraordinary to compete with cars.** The conventional image of transit as big boxes poking along as a social service for the unfortunate poor must be overcome. Poor quality, inefficient service used as a last resort will not work.

Rapid Bus attracts people out of their cars with frequent, fast, safe, reliable, and high quality service. Modern Bus Rapid Transit (uses exclusive bus lanes) and Rapid Bus (operates in mixed flow lanes) started in Curitiba, Brazil, and has spread and improved since then. The efficacy of high quality bus service has been demonstrated in a several American cities, including Los Angeles, and in many Latin American and European cities.

B. **CSUEB Hayward can grow better with transit.** CSUEB Hayward should be attracting more students than it does. Many positive steps have been taken but more could be done. Among other things, CSUEB Hayward needs more affordable housing close by and better transit access.

1. **Car access.** Road capacity for vehicle access to the campus is not going to improve and it should not improve for environmental, economic, and social reasons detailed elsewhere. While transit usually has visible budget subsidies, cars cost much more in terms of indirect and external costs. Cars require large amounts of land for parking and roads, preempting other uses for the land and creating congestion. Ironically, a student driving to CSUEB Hayward after the peak hour does not necessarily save any time. The driver will have less congestion delay, but then face fuller parking lots, more hunting time, and a longer walk in. For a campus, as enrollment increases, cars require increasing amounts of pavement and parking capacity. Parking structures are a large subsidy to drivers and take capital that could be used for better purposes.[8] More cars congest access roads and slow down buses. More vehicles access will only add to congestion and require even more land and capital that should be used for better purposes. Even more time will be spent in campus traffic, looking for a parking spot, and walking to campus buildings.

2. **Transit access.** Transit is more economically efficient, environmentally sustainable, and socially equitable. For **"point" destinations** like a downtown, a campus, or other large institution, transit can easily deliver larger numbers of people much closer to destinations using much less pavement. The Village Bus would get students to class rooms faster than their driving to outlying lots, hunting for a parking space, and walking into the campus. For many students, the Village Bus would have a time advantage because of its fast, no-hassle access to the middle of the campus. Avoiding the $36 parking permit and gaining the ability to relax and do a little reading on transit would also attract some students. Increased transit access can expand indefinitely on existing roadways. Development of land saved from parking in turn supports more transit ridership and frees road space for other vehicles. The Village Bus, thus, provides superior access at less cost. Linked to complementary, affordable focused growth, better bus service can help increase CSUEB Hayward enrollments, attract people out of their cars, stimulate affordable transit-oriented housing, and boost local business along the Focused Growth Corridor and in downtown Hayward.

[8]The expense of providing for cars increases from surface parking, which is the cheapest, up the scale to car ports, parking underneath structures, multi-level parking structures, and, most expensive, underground parking.

3. **Other campuses** have made great strides in recent years in improving non-car access. Stanford and Berkeley have implemented many measures managing parking aggressively and promoting transit that could be adapted to CSUEB Hayward's needs. San Jose State has limited campus parking and uses a shuttle to remote parking. Research should consider data on how other campuses manage access, including parking policies, class pass, and bus finance and operations.

4. **Improved visibility, speed and safety require going to the center of campus.** The Village Bus would start just south of the pedestrian bridge on the northeast side of the CSUEB Hayward Library. It would go to the PE Building using routes already used by vehicles, and from there go to the Loop Road on a new bus-only ramp by the Music Building above the retaining wall by the swimming pool. This retaining wall is the main reason the route does not cross much pedestrian traffic.
   a. This route would greatly improve visibility, travel time, and safety over current service. There are only three crossings with pedestrians.
   b. Currently, buses go around the campus on a long, slow route that lacks visibility as a viable alternative mode of reaching the campus. The route conflicts with pedestrians and vehicles in over a dozen places, creating both speed and safety problems. With more transit vehicles, these problems will only get worse, and with more auto access, much worse still.
   c. The campus has a spacious layout with wide sidewalks already used by many vehicles: maintenance, delivery, disabled shuttle, police cars, and vendors. On April 5, 2007, at 6:45pm, for example, I saw a campus-operated bus come on to the central campus to reach the new Valley Center and drop off a rider.

5. **Social equity for students.** Timely transit access to CSUEB Hayward is needed because so many students have families and are working. The Village Bus would provide equity for students who must stretch to pay for driving and for those who cannot afford a car at all, who waste time on slow buses. Low-cost transit access becomes even more important as gasoline prices continue to rise.

C. **Speed** up a steep hill is essential. The hill goes from an elevation of 100 feet at Mission Blvd. to 520 feet at campus center. We need horsepower for a 30' bus carrying 30 passengers to go up almost a mile, part of which has a 14 percent grade, matching the average car **speed of up to 45 mph.**

D. **Energy efficiency and air quality: propulsion.** Clean, energy-efficient propulsion uses hybrid or all-electric technologies. In this discussion, "**engine**" will refer to the internal combustion engine or ICE, and "**motor**" will refer to the electric motor. In some cases an electric **generator** is always a generator. In other cases the drive motor may become a generator when regenerative braking uses it to charge the batteries. All systems discussed below have **regenerative braking,** so that much energy used going up a hill can be recovered going back down. During deceleration the control system changes the electric motor into a generator. and charges the batteries, increasing fuel economy and friction brake life. While not specific to the hybrid technology, most hybrids have **low floor** design or **no step entry** for easier access, shorter loading and debarking times for passengers and operators.

1. **Blended drive** is not about the engine and the motor but about how energy from them goes to the wheels.

   In cars like the Prius the power goes from the engine to the generator to the motor to the wheels (serial drive). In **blended drive**, both the engine and the motor, using battery power, drive the wheels directly (parallel drive). The drive blending mechanism is made by Allison Transmissions, part of GM. These buses run quietly and smoothly with reduced fuel use and pollution. In January three Gillig 29 foot low-floor diesel hybrid electric buses sold for $1,900,000, or $632,000 each.[9] The Las Vegas Max has a hybrid diesel-electric with four electric motors, creating quieter operation and smother acceleration. The Max *Irisbus* has a 22 year running life, is 61 feet long, and carries 120 passengers.

2. The **Whisper 3G Bus** uses a new technology, e-Traction, which puts an electric motor in the wheel and eliminates the need for gears. The revolving part of the motor, or rotor, is on the outside and the stator, or non-rotating part, is on the inside, reversing the system used in most electric motors. The tire goes on the outside of rotating part of the motor. Similar to diesel hybrids, e-Traction also uses a small diesel engine about the size of the engine in a compact car. This engine turns a generator which charges the lithium ion batteries and drives the electric motor/wheel with direct current (not alternating). A new variable-speed, brushless motor produces torque across a range in response to need and becomes a generator when braking. While the wheels are heavy, the total bus weighs the same as a conventional bus, 8,700 kilos, or 19,200 pounds.

   Noise. The small engine in a full-size engine compartment allows extra sound-proofing and makes the bus very quiet. Noise is reduced from about 78 DB to 58 DB.

   Operating efficiency. The lack of any gears significantly increases fuel efficiency. In conventional propulsion, about 25 percent of the potential energy reaches the wheel, while e-Traction gets 90 to 95 percent to the wheel. E-Traction also boosts mileage by charging the batteries from the electrical grid when the bus is not running. Plugging in can supply 30Kw or 75 percent of battery capacity. With only one moving part, the rotor, maintenance costs are low. Gas mileage is excellent: In 2005, a prototype in field tests in Apeldoorn, the Netherlands, got 13.9 miles per gallon, compared to 3.5 miles per gallon for a conventional diesel US city bus. (Compressed Natural Gas gets even less.)[10] Saving on fuel and maintenance could make the Whisper 3G less expensive for capital plus operating costs overall than conventional diesel. Operating costs could be .580€, per kilometer compared to .875€ for a similar standard bus.[11]

   Pollution. Global warming and pre-smog emissions are much less. The Whisper also has a particulate trap. The efficiency of the engine reduces particulates about 65 percent and the trap another 28 percent, for a 93 percent reduction.

   Powering up. Early prototypes were under-powered for hills, and the new version, the Whisper 3G, has a bigger motor and bigger batteries. The motor/wheels are heavy,

[9] (http://ci.santa-rosa.ca.us/doclib/agendas_packets_minutes/Documents/080129_CC_Item10.3.pdf

[10] http://www.e-traction.com/fuel_consumption_calculator.htm adjusted for gallon equivalence of electrical charging of batteries from the grid.

[11] www.e-traction.com/, accessed January 8, 2006; website changed to www.e-traction.com/index.htm

have less pneumatic cushioning than regular tires, and run directly on the pavement, increasing tire wear. However, on most city streets, the slower speeds, level pavement, and less weight in the body allow the air suspension to be less stiff, providing a smooth ride. Higher speeds on rougher surface would be a problem.[12]

This promising technology has been under development for several years, and needs to reach a breakthrough to be considered for campus service. The Whisper 3G now under development is, at 40 feet, over-sized for CSUEB Hayward use. E-Traction estimates the cost per bus at $330,000, which seems low to me.[13]

3. **The Diesel Hybrid.** Clean diesel hybrid buses using particulate filters out-perform natural gas, clean diesel, and gasoline hybrid buses for greater fuel efficiency and reduced emissions. Diesels are better than gasoline power for delivering constant power over long periods, have less wear, and operate more efficiently. Diesel engines and electric motors have high torque and diesels can use biofuels. ISE, Allison, and BAE make diesel hybrid drive systems, which can be used by bus manufacturers such as GM or Daimler. Major transit agencies including SF Muni, New York City, Boston, Washington DC, Toronto, and Seattle have adopted diesel hybrid bus technology

   The **ISE-Thundervolt** diesel hybrid drive system uses a small Cummins ISB02 5.9 liter engine (found in pick-up trucks) to drive a Siemens generator charging efficient sodium chloride "Zebra" batteries or even more efficient ultracapacitors. It drives power steering, braking, and accessories electrically, allowing the engine to be stopped, which it does when the vehicle stops. ISE has a 30 foot bus, TB30-HD, which gets about six miles per gallon and has enough torque to climb the hill. It is rated for 400 miles on a 100 gallon tank; at most 205 miles are needed. The ISE system has been CARB (California Air Resources Board) tested and it is the cleanest internal combustion bus drive system in California.[14]

   Daimler also makes a 40 foot diesel hybrid bus, the Orion VII (DHEB), for about $500,000 per full-sized bus, about $150,000 more than a regular bus. They use the same small diesel engine (5.9 liter Cummins) which turns a generator to drive the electric motors Buses recently purchased by S.F. Muni have controls which operate the engine at optimal emission and fuel economy settings. Batteries supply additional peak energy for acceleration and hill climbing, which reduces engine speed (rpm) fluctuations, reducing emissions and increasing fuel economy.

   From the MUNI website: Advantages over old diesel include:

   • 30% increased fuel economy
   • 95% less particle matter, 40% less oxides of nitrogen (NOx), and 30% less greenhouse gases
   • Smoother, quicker acceleration,
   • Less engine noise
   • Dramatically lower wear rates and repair on brakes.
   • No transmission to service; fewer moving parts
   • Less engine wear and tear

[12] www.e-traction.com/whisper_3g.htm, accessed April 5, 2008. Personal communication from Chris Peeples, lost date, maybe 2006.

[13] http://www.e-traction.com/Purchase%20Criteria.htm

[14] www.isecorp.com/ise_products_services/diesel_hybrid_drive_system

• Less expensive engine
• Fewer service bays and maintenance spares

All of these features mean more reliability, lower maintenance requirements and therefore reduced operating expenses offsetting higher initial cost. Hybrid-electric drive systems are setting reliability records at agencies that have similar transit duty cycles (Manhattan) and terrain (Seattle) to San Francisco Muni.

4. In 2006-2007 AC Transit road-tested three hydrogen fuel cell bus. Burning hydrogen produces water vapor and no pollutants or global warming gases. In a year of testing, the three buses went 40,000 miles, climbed 18% grades, and carried over 75,000 riders with almost twice the energy efficiency of diesels. The bus uses an electric drive motor.[15] Solar photovoltaic panels or electricity from the grid can do electrolysis to produce the hydrogen. In principle, DOE estimates that hydrogen should cost $3 per kilogram (~= 1 gal. gasoline) and go twice as far for a net cost equal to $1.50/gallon. These are, however, million dollar buses using expensive fuel.
5. I need information on directed-injection turbo-charged diesel and better batteries.

E. **Energy efficiency and air quality: Fuels.**

1. **Diesel fuel.** For air quality, low-sulfur diesel with advanced filter traps are cleaner than natural gas for particulates and between natural gas and diesel for NOx. Alternative fuels cost more but have lower emissions and better fuel economy. Low-sulfur diesel is likely to be the most economical and available fuel in 2010 when diesel emissions standards get stronger. With better engine design and hybrid applications, clean diesel is better than natural gas.

2. **Hydrogen** from non-fossil sources is expensive at this time. If made from fossil fuel, it worsens global warming. Generation by wind power or photovoltaics is technically easy but not yet economic. Storage of hydrogen in the vehicle and use in the engine needs more technological development, but the AC Transit prototypes are working.

3. **Biofuels.** In-between are various biofuels or bio-diesel like **vegetable oil and waste cooking oil**. "San Francisco produces 500,000 gallons of waste oil a year; the Bay Area produces a staggering 3,000,000 gallons. This oil is picked up at a cost to the restaurant of $45 per 55-gallon jug and later processed into 'yellow grease,' a primary ingredient in dog food, animal feed and cosmetics. [Ben] Jordan's proposal for Health Fuels is to gather this oil free of charge from the restaurants and recycle it into bio-diesel. He predicts that with $250,000 in start-up money, Health Fuels could produce 20,000 gallons of locally made bio-diesel per month. With more money and support, they could quadruple that. 'MUNI uses over 6,000,000 gallons of diesel fuel a year,' explains Jordan. ... In California, the fuel averages more than $3.50 a gallon [and there are] fewer than 25 stations throughout California.... But this hasn't stopped the lines of people waiting to fill up at Biofuel Oasis in Berkeley every weekend. For them,

[15]Gail Schickele, "Taking the HyRoad," *Bay Area Monitor*, LWV-Bay Area, Feb-March 2007, p. 4. Interview with Jamie Levin, AC Transit,

paying a whopping $3.70 a gallon seems a small price to drive 'guilt free.'"[16] Corn ethanol is not desirable because growing it is usually an energy sink, uses land, and pollutes water. Cellulosic ethanol has potential for more energy efficiency than corn ethanol. It can be made from brewery wastes, stover (corn stalk, cob, etc. usually left on fields or fed to livestock), switchgrass, poplar trees, straw, and cheese whey, but the current technology is inefficient. Ethanol alone could fuel the Village Bus or be used in a blend for a flex fuel engine. We will try to find the best balance of sustainability and economy for the bus.

F. **Ticketing.** The bus stops will have automatic Ticket Vending Machines (TVM) for riders without passes. The buses could have TVMs also, but the tickets would be more expensive as an incentive to buy before boarding. The TVMs would sell different kinds of tickets, validate for day of travel, and accept various forms of payment. Tickets could also be sold over the Internet.

G. **Fare collection** should be fast and inexpensive. The Village Bus will not have fare collection equipment, speeding up boarding. The bus would instead use random inspections and fines if a rider does not have a ticket, called "proof of purchase." The driver just drives the bus and is not a ticket seller or policeman at the same time.

H. **Right-of-way.** Rapid Bus requires level, well-paved travel lanes for a smoother ride at higher speeds. Too often conventional buses have to maneuver right lanes with exaggerated camber, potholes, and storm drain dips.

I. The bus driver will have **signal preference**, i.e., the ability to change red lights to green. Traffic signals will be equipped to change in response to signal preference requests from the bus driver, holding the green or shortening the red as needed.. Some **queue jumping lanes** will be built to allow a bus, for example, to use a right turn lane, turn the signal red for other traffic, and go straight through an intersection instead of turning right.[17] Some of these improvements need to be incorporated into City of Hayward plans for the Foothill Mission Corridor.

J. The Village Bus will use **raised sidewalk platforms** with shelters at stops for fast, no-step entry into **buses with wide doors** like the Las Vegas MAX, which uses two double-sized doors. No-step entry also makes the bus easily accessible for the handicapped. New technology allows automatic guidance to align a bus within half an inch of a platform.

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[16]See UCS, Clean Vehicles Program; National Renewable Energy Laboratory's Bioenergy Center. James Nestor, "On the Bio-diesel Bandwagon; Can the Bay Area's 3 million gallons of used vegetable oil rid us of our petroleum problem?" *San Francisco Chronicle,* Sunday, July 10, 2005.
http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2005/07/10/CMGI8D65IU1.DTL&hw=transportation&sn=015&sc=276.

[17]Also known as "queue jumper lanes." See CCS Planning and Engineering, "Discussion paper on pedestrian/transit elements associated with traffic signals," prepared for ACTA, Jan. 3, 2001.

K. Close to docking at a stop, the pavement will have two dashed white lines recognized by a camera on the bus. Sensors, actuators and computer based processors move the bus automatically and dock it precisely within millimeters of the edge of the platform. The Las Vegas MAX uses this system.

L. Village Bus Route. The Village Bus would connect QV to Hayward BART and to CSUEB Hayward. See website www.quarryvillage.org, About Quarry Village, Location and Bus Route for route map.

1. The bus starts at the Hayward BART station, goes along C St. to a stop at Mission Blvd., follows Mission to stops at Fletcher and at Highland, turns left to a stop at Carlos Bee Blvd. and comes up the hill to QV.

2. The bus would stop at Quarry Village using Overlook and an extension and realignment of Palisade St. From Overlook, Palisade would curve right and stay at elevation to a new junction with Carlos Bee Blvd., and would be restricted to use by the Village Bus and service vehicles. This busway would go between the store and Village Center. The QV stop also serves City View and Carlos Bee Hall.

3. The bus would go from QV up Carlos Bee to the campus and access the campus along an alignment by the Music Building above the retaining wall to a stop on the east side of the PE Building. The last stop would be just past the pedestrian overpass on the east side of the Library. There is room for a turn around just past the unused east library entrance. Coming south into the platform, the bus would turn 120 degrees, stop, and off-board and board riders. It would then back up with another 120 degree turn, and go forward with a final 120 degree turn to resume its route northbound. The bus could have a 30 foot turning radius and use automatic guidance. Also, two buses could easily pass each other here. There is room for this with little effect on pedestrian traffic, which would not cross the busway, but go around it to the east side with minimal offset from the current sidewalk.

4. The route has 8 stops including end points: BART, C St., Fletcher, Highland, Carlos Bee, Quarry Village, PE Building, Library.

M. **Speed and distance.** The distance of the route is 2.1 miles and the average speed is 16 mph, for a run time of 8 minutes. Planning is based on 10 minutes, or 3 round trips per bus per hour. From the viewpoint of residents of QV, the Village Bus would take two minutes to the campus center and would be faster than driving a car to a parking lot, looking for a space, and walking in. The Village Bus from QV to Hayward BART would take six minutes and be faster than driving a car to the BART parking structure and walking in. Intermediate stops would deliver people to stores, restaurants, and other businesses along Mission Blvd. and in downtown Hayward.

N. **Hours of service and frequency.** BART trains serving Hayward weekdays run from 4:15 am to 1:13 am with headways varying from 7.5 minutes to 20 minutes. The Village Bus hours would run from 6 am to 1 am with headways varying between 20 minutes and 7

minutes, with the 7 minute headway going from 8 am to 10 pm.

O. Since the Village Bus would operate as an extension of BART service, its route could be added to BART maps. Such publicity would not only increase transit ridership but also increase public knowledge about the accessibility of CSUEB Hayward.

P. **Organizational considerations.** The Village Bus is a very small operation, and almost totally financed by Quarry Village. It is therefore appropriate that the QV run the service. QV could use a subsidiary company to receive the funds from the management subsidiary and oversee a contract for service with a private bus company. This arrangement would also avoid the excessively high costs and rigid work rules of AC Transit, but would still provide health and retirement benefits and be unionized. It might be possible to arrange for students to work for the contractor and this work could be integrated into the instructional program for business.

Q. **Ridership potential.** The ridership potential is enough to support even more frequent service.

1. Quarry Village ridership was estimated at 1.8 rides per day per car-free resident assuming 95 percent occupancy. These assumptions yielded 3,249 riders per day.

2. CSUEB Hayward student riders were estimated to average 800 per day, with considerable daily variation by day of the week and time of the year. The QV estimate allows for lower summer enrollment, lack of week-end riders, and continued use by many students of the AC Transit Route 92 bus.

3. For several reasons, many students are unlikely to use a bus. A major reason is that their route of access to the campus does not over lap with the bus route. Sixteen geographic areas that lie to the southwest, south, and east of the campus are probably not served by a bus. They have about 56 percent of enrollment. The Hayward-Castro Valley area has about 20 percent of total enrollment, of which perhaps about 15 percent may not be close to the route. The eleven remaining areas with about 24 percent of trips lie to the north and north west: the San Lorenzo area, San Leandro, Oakland, the rest of northern Alameda county, the Richmond area, San Francisco, and counties even further away which have only 1.3 percent of CSUEB Hayward enrollment. These areas have a general route to campus that overlaps the BART and bus route. Thus, about 5 percent of total enrollment might be living close to the route and another 5 percent might use BART and the bus. While this reduces probable ridership considerably, it is still about 1,300 students.

4. The existing slow bus service, AC Transit Route 92, carried about 4,200 riders per weekday in 2004. Many of these riders are generated along Second St. and by the high school and junior high. The 92 makes 58 one-way runs, or 116 total, thus averaging about 12 riders per bus. This ridership is very uneven during the day. AC does not know how many go to the campus, but one estimate is roughly 1,400 going to and from CSUEB Hayward.

5. Other riders, such as people living in the Corridor or going to destinations at CSUEB

Hayward or elsewhere in the Corridor, were estimated at 400 per day.

6. Total ridership would be about **4,449 riders per day**, averaging 15 riders per bus per one way trip.

7. If CSUEB Hayward adopted a Class Pass, ridership would increase considerable and more service could be added.

8. If the development in the Corridor were Focused Growth with limited parking, parking charges, and Ecopass, ridership wold increase and more service could be added.

9. If downtown Hayward evolved from a parking lot to a destination and park and ride lots were added in the Corridor, ridership would increase and more service could be added.

10. If gas prices, parking costs, congestion charges, subsidy reductions, or other transportation pricing reforms were implemented, ridership would increase and more bus service could be added.

R. **Financing.** See website www.quarryvillage.org, Neighbors and Investors, Investor Information, Financial Analysis, Village Bus for a spreadsheet on Village Bus.

1. **Ecopass.** Residents would pay for an Ecopass as part of their monthly rent or association fee and receive a pass with unlimited free ridership. Ecopass would be required as mitigation for possible poaching of off-site parking by QV residents. Poaching is the use of parking intended for one purpose for another purpose, typically use of free parking by those wishing to avoid paid parking, or use of neighborhood or commercial parking by commuters. The Ecopass increases transit ridership and decreases pressure on off-site parking. Ecopass funds would be transferred to the Village Bus operator for operating expenses, and residents would get a free pass for unlimited rides each month (the Ecopass). Assuming $78 per unit per month were applied to the Ecopass and QV occupancy was 95 percent, $889,200 in revenues per year would be generated. A project in Santa Clara is already using Ecopass.[18]

2. **Class pass** would be voted on by CSUEB Hayward students and collected as part of their fees. Student would then get a free pass for the quarter. At $ .50 per quarter unit would cost the average student with 12 quarter units $3.00 per quarter and produce about $240,000 per year. About 35 campuses, including Berkeley and San Jose, already have very successful bus pass schemes approved by student votes, often by landslides.[19]

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[18]Cheeto Barrera, "First phase of 'affordable' apartment project to open," *Morgan Hill Times*, Sept. 16, 2003: "Eco-passes will be issued for free transportation on buses and light rail."

[19]Jeffrey Brown, Daniel B. Hess, and Donald Shoup, "Unlimited Access; Prepaid Transit at Universities," *Access* 19, Fall 2001, pp. 40-41. www.sppsr.ucla.edu/its/UA.

3. **Other riders.** 400 other riders at $1 per ride would produce $146,000 per year.

4. **CSUEB Hayward revenues.** CSUEB Hayward supports the Hill Hopper from parking fines and could use this funding instead for the Village Bus, supplementing the class pass. (QV estimates assume no revenues from CSUEB Hayward.)

5. **Operating costs.** MV Transportation, which serves Union City, estimated a three bus option would cost $39.56 per bus hour. Assuming $42 per hour, 50 hours per day, and QV management costs at 10% of the MV costs, operating costs would be $843,150 per year.

6. **Capital costs.** Capital costs could come from ACTIA and the 2000 Measure B, or ACTA and the 1986 Measure B, which would require support from local governments. The major capital costs are for:

   a. Three buses at $5000,000 each. These buses would probably be mid-sized: about 30 fee long seating 30 passengers. They will probably have dual mode propulsion with battery assist, with sufficient power to come up the 14 percent slope on Carlos Bee Blvd. at a speed fully loaded of 45 miles per hour. The buses will also have two wide doors and no-step entry, equipment for signal preference (allowing the bus driver to turn traffic lights green for the bus) and for automatic guidance to loading platforms (based on Las Vegas MAX). Such buses support very fast boarding and off-boarding, including by wheelchairs and by people carrying grocery bags, luggage, or other burdens. The buses will also be able to carry two bicycles.
   b. Route improvements at $2,200,000. Route improvements include 14 raised sidewalk, sheltered bus stations, a ramp from Carlos Bee Blvd. and the Loop Road to the PE Building (which also involves some minor realignment of the intersection), and a fenced Y for turning around at the Library.
   c. Signal preference at $300,000. This equipment will be installed on the ten existing traffic signals along the route.
   d. The Quarry Busway and bus stop and the traffic signals for intersections of Carlos Bee with Overlook and the busway will be built by Quarry Village.
   e. Capital costs total about $4 million. The value of this investment at a discount rate of 10 percent would be $400,000 per year, or, at 8 percent, $320,000.

   f. **Americans with Disabilities Act (ADA)**. ADA exempts peak hour service like the Hill Hopper, but has an unfunded mandate imposed on all-day transit. ADA requires that paratransit service be provided within a buffer area 3/4 of a mile along transit routes. Para-transit is a door to door service and costs about $45 per vehicle hour. AC Transit routes 99 and 92 and BART have buffers overlapping the Village Bus route and they pay for para-transit in the buffer. The Village Bus operating expenses may need to include a cost for its fair share of para-transit costs. No estimate of cost has been made yet.

7. **Policy history.** This project was seriously proposed to AC Transit twice between about 2003 and 2005, and was not supported. The Metropolitan Transportation

Commission (MTC) called for citizen submissions of projects and in September 2003 accepted the concept for study. The capital cost was estimated at $6 million based on estimates from AC Transit, the basis for which was never made public. The Transportation Solutions Defense and Education Fund (TDE) sued MTC on several issues and as part of a settlement MTC agreed to study TDE proposals in the Regional Transportation Plan (RTP) of 2005. The BART-CSUEB Hayward Village Bus and the land use densities of Quarry Village and the Mission-Carlos Bee Corridor were part of the Focused Growth Alternative included in the EIR for the RTP. The results were not separately reported, and the service is very small in a huge regional model. A more focused study, however, would get usable ridership estimates.

8. **Bottom line.** Ecopass revenues more than covers the operating costs. If other revenues as estimated above materialized, total revenues would more than cover operating and capital costs. There is no cost per new rider; there is a surplus per rider. While details would have to be developed in a bus feasibility study, the information available now strongly indicates that ecopass fees will easily support all Village Bus operating costs.

XI. Other Mobility Features

A. Parking.

1. **For residents, on site.** There will be 100 parking spaces in carports on upper Overlook and a northward extension of it on either side of an access aisle. Carport spaces will be available for one year rental at a market price, separate from apartment rentals and condo ownership. Monthly parking rents will initially be based on a market estimate of their value separate from housing rent. We estimate the market at this time would support about $125 per month. If there were too few takers, the price would be lowered. If they all rented out, the bidding for vacated spaces would raise the rate to reach a market price, allowing a few spaces to be vacant occasionally. Some number, perhaps 5 to 15 spaces could be leased by car rental agencies. Charging for parking allows rents to be correspondingly reduced, increases Village Bus ridership, and increases patronage of local business using walk and bus access. Alternatively, funds from parking could go for the site-owned mini-bus, taxi vouchers, and the Village Bus, giving those without a car a benefit from those who have one.

2. **For car share/rental and passenger pickup/drop off.** Between upper Overlook and the busway on Palisade will be about five curbside parking spaces for passenger drop-off and pick-up.

3. **For outside public, access to business and office.** Generally, QV will advertise how to park and take the bus for convenient access.
   a. On lower Overlook below Palisade will be ten additional metered public parking spaces, including one handicapped space, with short-term parking meters for the grocery store and café-restaurant. ADA requirements will be met. These spaces are inconvenient as they require walking a distance of 270 feet and gaining 40 feet in elevation.
   b. There will be overflow parking close to a Village Bus stop. The off-site overflow

parking would also be metered, logically with a lower rate, and provide a round trip bus ticket. The bus stops at the Village Center and is more convenient than the on-site parking. About 25 to 50 spaces might be needed. Trader Joe's in Castro Valley has about 85 spaces.

c. All spaces, on-site and off, will have meters that accepts credit and debit cards and the charge would be based on demand. The meters would not accept currency and would not print a stub for the car, just a receipt. There would be no time limit. Users would indicate the space they were using and check in with a card and check out. These meters cost about $7,000 each and three would be needed.

4. **Enforcement.** The office will boot and then tow illegally parked cars and collect fines.

5. **Off site parking.** The office will facilitate off site parking of resident vehicles, with likely sites on PG&E ROW where it overlaps with the Alquist Priolo Earthquake study zone, south of Carlos Bee Blvd. Also, PG&E ROW and used car lots on Mission may accommodate space rental.

B. **Car rental** is of two type, long term and short term (car share). For special longer trips and vacation trips, Enterprise Rent-a-Car is already located nearby on Mission Blvd. at Highland by a Village Bus stop. Car sharing companies like Car Share, Flexcar and Zipcar provide short term rentals. Residents could make advanced arrangements with rental agencies to facilitate quick, easy, and affordable rentals. QV itself could own some cars for car-share use. The QV Association management would analyze the cost compared to the three car share companies that would be the alternative. QV could have an eco-car such as a battery-assisted plug-in hybrid which could dock to recharge at Village Center.

C. **Taxi vouchers**: Tenants would be given a small number of taxi vouchers for emergencies, "guaranteed ride home" (when Village Bus is not operating, e.g., taxi fare from BART to home), and for necessary trips that are hard to make by bus, like for to a clinic or hospital, but not for more optional trips like shopping.

D. **Minibus.** The residents' association would own and operate a minibus for getting kids to school and for special trips decided by the association.

E. **Electrocart.** An flatbed freight electrocart kept at Village Center would be available for special household needs like moving luggage or over-sized deliveries.

F. **Walking.** There would be several walkways to provide access to buildings.

1. The main walking circulation would be along a long, U-shaped, one lane, landscaped walkway and other main north-south walkways as needed to reach Village Plaza.

2. The main walkways would be supplemented by several shorter, narrower, east-west walkways into the courts of the housing.

3. Many people could use a light-weight, two-wheeled, collapsible shopping cart. These are wire-framed with a box for holding shopping bags and a handle for easy pushing

or pulling.

4. The site plan will accommodate a walking trail through Quarry Village connecting Highland Blvd. with Bee Blvd. This requires a bridge across the ravine. The trail would have a gate that would be closed at night. This trail could be part of a longer trail from Grove Way east of Foothill Blvd. to Industrial Blvd.

5. The longest walking distance is 1,440 feet, or .27 mile, which takes 5.4 minutes to walk. Most walks would be four minutes or less.

G. **Bicycles.** Units further from the center could have delta frame 3 wheelers, an adult tricycle with a basket on the back, easy-step-through frame, and coaster brake. Ground floors could have entries and closets designed for easy three wheeler parking. Second and third floor condos will probably have lockable hook and slot bike holders under stairs or in a vestibule, about two per unit. The center office should have a secure parking area observable from the office windows and near or on the square, but off to one side of pedestrian flows. The bus should accommodate two bicycles and have some kind of fast loading and unloading system.

H. **Shopping carts.** Residents may have shopping carts to help with shopping, carrying things, and recyclables. Units should have space for cart storage under stairs or in vestibules. Carts should have bigger, pneumatic tires for ease of use and ownership identification.

I. **Public Safety Vehicles.** The main walkways would be wide enough for police, fire, and ambulance. The walkways would allow public safety vehicles to get sufficiently close to the front doors of all units.

J. **Deliveries.** The busway would have a pull-out for postal and most package delivery at Village Center. For even bigger objects, moving vans and big delivery trucks could use the walkways. The electrocart and dollies could also be used. The commercial building would have a truck delivery and dock on the east side of the building off the busway Most mail and parcels would go into big mailboxes for all the units at Village Center. Boxes too big for a big mailbox could be held behind the counter in the office. Units would have insulated lock-boxes outside their front doors for deliveries of groceries. The grocery store could delivery groceries for a small charge. The store could promote a large number of deliveries on Saturday with a reduced charge, or free delivery for purchases above some minimum.

K. **Waste Collection.** Each unit would have a kitchen with a built-in recycling bin for organic waste. Each unit would have its own garbage can and recycling bins located along major walkways. Large dumpsters for common use are efficient but unsightly and hard to keep clean. Ownership of one's own garbage can and bins leads to better maintenance. The walkways would be used once a week by garbage and recycling trucks.

XII. Off Site Parking Management

A. Neighborhood Parking Management. Quarry Village would fund neighborhood parking management to mitigate possible problems of poaching by QV residents of parking spaces on old neighborhood streets. Neighborhood parking management typically consists of neighborhood parking permits for cars and two hour time limits on spaces in the area of potential poaching, probably for about 14 houses on upper Palisade St.

B. **Commercial Parking Management.** There may be some poaching pressure on commercial parking close to Village Bus stops. A contingency plan needs to be in place to respond quickly to merchant concerns.

C. The easiest approach would be signage against all day parking, such as by commuters, students, or residents of QV. This problem already occurs at BART stations, and is easily managed by signage backed up by the occasional tow.

D. More difficult, but interesting to try, would be to issue local customers an electronic tag for free parking. Other parkers would have to pay for parking. Such paid parking would be market-based and use advanced, convenient payment technologies, e.g., tags and readers using prepaid accounts or credit cards, similar to FastPass.

E. **CSUEB Hayward parking.** CSUEB Hayward has its own paid parking permit system at $36 per quarter ($12 per month), which would apply to QV resident students. They could park their cars at the two closest lots and walk or at more distant lots and use the bus.

XIII. Trip Purposes and times

A. The Work Trip. Jobs in the Corridor can be reached within about 15 minutes. Jobs near BART in Oakland can be reached in about 40 minutes. Jobs near BART in downtown San Francisco can be reached in about 50 minutes. Residents would get about 4 taxi vouchers per month for health-related and guaranteed ride home.

B. The Education Trip. The Early Childhood Education Center on campus can be reached in about 12 minutes. Highland Elementary School can be reached by minibus in about ten minutes, most of which is getting kids to and into the bus. Bret Harte Junior High and Hayward High are about 3 to 4 minutes beyond Highland by minibus. AC Transit Route 92 serves Bret Harte and Hayward High and goes to the campus where the Village Bus is. This trip would take about 30 to 35 minutes.

C. The Shopping and Personal Business Trip. Most grocery shopping, ATM, coffee/ice cream/snacks, fast food, take-out food, and restaurant dining can be done on-site, a short walk away from the residence. Access to downtowns–Hayward, Oakland, Berkeley, San Francisco–is about as easy or easier than by car; other downtowns, regional malls, and big box stores is more difficult. The Village Bus, however, could be used for excursions to Costco, Southland and other Meccas of the affluent. The Village Bus provides handy access to BART, Cal-State, and downtown for restaurants and shops.

D. The Social Trip. Trips to resident association meetings would be a walk on site to Village Center. Hayward City Hall and the Main Library are in downtown Hayward. Trips to visit friends and relatives have destinations too diverse to discuss. For some buyers, ability to

reach other family will be a major issue. Some religious activities are available at places in downtown Hayward; others would be more difficult to reach.

E. The Recreational Trip. See Active Life Style above. Also, the campus is easily reached by Village Bus. The cineplex at Bay Fair Mall can be reached by BART in about 30 minutes. A new cineplex is under construction in downtown Hayward and would be about 15 minutes away. The cultural attractions of San Francisco, and other centers are served by BART, which is easily reached by the Village Bus.

F. The Health Trip. Residents would get about 4 taxi vouchers per month for health-related and guaranteed ride home. It takes about 20 minutes to reach Kaiser Hospital in Hayward or Eden Hospital in Castro Valley, a minute or two slower than driving. Time is spent getting a cab; time is saved being dropped off at entrance compared to parking and walking in for these purposes. Other health services are in downtown Hayward. Residents would get about 4 taxi vouchers per month for health-related and guaranteed ride home.

G. Car and Passenger Service Trips. These trips include buying gas, car servicing and picking up, transporting, or dropping off someone else. For the most part, residents of QV would not need to make these kinds of trips.

XIV. Financial Estimates

A. QV has inherent cost advantages in more units on the same land and less cost of paving and structure for autos. It has savings from reduced transportation costs and reduced utility costs. It is, however, difficult to estimate what the savings is. In one careful estimate, parking requirements in SF zoning increased condo costs about 13 percent or $38,804 and reduced housing supply by about 16,600 single family houses and 26,800 condos.[20] In another case, when Oakland, California, introduced a parking requirement of one space per apartment unit, construction costs went up 18 percent per unit, units per acre fell 31 percent, and land value fell by 33 percent.[21] Todd Litman state, “Based on typical affordable housing development costs, one parking space per unit increases costs by about 12.5% , and two parking spaces increase costs by about 25%.”[22] Going from a large expensive house to a more affordable house, garage costs tend not to go down as much as the cost of the rest of the house, so parking is a larger portion of total house cost and more of a burden on lower income households. However, parking costs tend to go down by steps, one for each space. Also, the cost for a two bedroom unit with two spaces for two drivers is similar to that of a one bedroom unit with one space for one driver.

B. **Affordable Modular Construction.** Michelle Kaufman has pioneered affordable green housing by manufacturing modules in factories. Her costs are $185 per square foot. (We

[20]Jia 1998: Wenyu Jia and Martin Wachs, “Parking and Affordable Housing,” *Access* 13, Berkeley: University of California Transportation Center, Fall 1998, pp. 22-25

[21]Bertha, Brian. 1964. “Appendix A,” in Wallace Smith, *The Low-Rise Speculative Apartment,* Research Report 25, Center for Real Estate and Urban Economics, Institute of urban and Regional Development, University of California, Berkeley, California.

[22]Litman, Todd. 2006 November 24. *Parking Requirement Impacts on Housing affordability.* Victoria Transport Policy Institute. Can be downloaded from www.vtpi.org

need to get it down to about $114/sq ft.) Factory construction protects building materials inside, not exposed to weather, mildew, and warping. Leftover can be stored for the next building. Three are no weather delays. Quality control is better. Safety is better using large jig tables for building what would otherwise require climbing up on framing. Building is faster, about one month for a single family house. Transportation to the site is slow; assembly on site is fast and finish work takes six weeks. Costs are 20 percent below conventional on-site construction.

C. Some subsidy may be possible. The City of Livermore helped Livermore Village with a loan, an application to CA HCD for assistance to new homebuyers, and an MTC TLC grant for nearby pedestrian improvements. (HAPA files) The Center for Creative Land Recycling makes forgivable loans for site clean up. (email, QV, engineering)

D. In a conventional development, the combination of comparables, a predictable market, and interested investors assures adequate investment in preliminary calculations to see if an investment pencils out. None of these conditions exist for a latent market such as that for Quarry Village. Yet the market research can not be done without realistic prices. HAPA has benefitted from the advice of a few top engineers and developers willing to visit the site and lend their expertise. HAPA has researched many different costs, paid for some civil engineering, especially for cut and fill volumes, and created a proforma.

E. The financial analysis is on the website under Investor Information, Financial Spreadsheet and Operating Cost Spreadsheet. The spreadsheets have a large amount of detailed financial information which can be downloaded in Excel format. The operating costs are designed to meet the requirements of the California Department of Real Estate (DRE). We used the DRE forms, a copy of how the forms were filled out by a comparable development (Renaissance Walk), and the DRE Manual. We then estimated investment costs by month and we hope to have an accounting specialist analyze the various construction and real estate loans that would finance the project. So far we have done a discounted cash flow analysis of the return on the total capital investment. With more refined numbers we can be more accurate about prices. Hopefully, by late January 2006 we can go public with reasonable prices.

XV. Organization.

A. The Hayward Area Planning Association (HAPA) is a 501(c)(4) non-profit under California law, so contributions directly to HAPA are not tax deductible. HAPA, however, does all of its accounting through its fiscal agent, the San Francisco Study Center, which is a 501(c)(3). Contributions to HAPA in care of the Study Center are tax deductible.

B. Given that HAPA has no desire or need to engage in profit-making activity, yet needs to get resources from investors, we have set up the QV Corp, which bars HAPA from making money and allows investors an attractive return. QV Corp is an S Corporation which can make private offerings of stock in successive issuances as need arises. The price, minimum purchase, and number of shares would be spelled out in the private offerings. For example, if HAPA needed $800,000 for the development team to apply to the City of Hayward, we might sell stock at $1 per share, minimum purchase $50,000, until $800,000 was raised.

C. Investors would be committed to the business plan in the private offering, which would be regulated by a proforma. The proforma will determine the number of units that must be sold to justify breaking ground, and if too few units are sold in a year, a fall back project would proceed, so that investors have manageable risk. The fall back plan would be a smaller number of condos, mixed use, and inconspicuous parking.

D. Using QV Corp funds, QV Corp would employ a development team with a development manager. Our initial team will consist of a land planner, an attorney, a geotechnical engineer, a civil engineer, an architect, and a proforma specialist. Longer term, we could have specialists like a Phase I consultant, a project and construction manager, advertising and marketing consultant, and condominium management firm. We already have a surveyor for surveys and elevations.

E. QV Corp would buy an option from Caltrans and purchase the property with an A&D loan and additional funds from a mezzanine loan or sale of stock. QV Corp. would sell condominiums, gradually transferring full ownership until the last condo is sold. QV Corp. will continue to cover its warranty obligations before dissolving. The owners will own their condos and the common property, and manage the common property through a QV Homeowners Association.

F. Assuming the QV Homeowners Association ran the project, it would have corporate subsidiaries or contractual relationships to fund and run the Village Bus and the commercial building. The QV Homeowners Association would have to hire professional managers. Two apartments could be built as the third floor of Village Center and be a housing benefit for a manager and assistant manager. Resale or subletting to renters by original condo owners would have to be regulated to require approval by management or an HOA committee to screen renters similar to that for the original owners.

G. The QV HOA will have to establish and enforce rules: basically, pay the homeowners association fee; take care of the condo; and be a good neighbor. It would have to have the ability to foreclose on owners who break serious rules, following procedures for due process.

XVI. **Benefits of QV**. This discussion enlarges the benefits section of the website.

A. **Consumer demand for sustainability.** QV provides a **comprehensive, holistic alternative** to the dominant urban system of sprawl and auto dependency. The many additional benefits discussed below detail the advantages of an alternative neighborhood system. The market does not meet consumer demand for car-free and low-car-use housing. If absorption is fast enough and prices are high enough, QV would show the viability of an alternative system and the ability of developers to construct such developments profitably.

B. **Community.** QV encourages development of liveable, inclusive neighborhoods. The design provides opportunities for more **social interaction** than car-based neighborhoods while respecting diversity and privacy. QV balances between car dependency and social density. In suburbia, social interaction is inhibited by people interacting in vehicles rather

than socially and by the distances among houses, reducing potential for interaction with neighbors. This problem is more common in newer neighborhoods than older. In socially dense areas like Hong Kong or Manhattan, social interaction is again inhibited by sheer numbers of people to interact with, usually in settings that inhibit informal conversation. QV uses courtyards and quiet, traffic-free walkways to foster knowing one's neighbors. Village Square, residents' association, and community events support social interaction. Round-the-clock security adds an extra dimension of safety, reinforcing social ties. There are no parked vehicles to delay pedestrians and bicyclists. All these elements combine to support a sense of community with respect for diversity and privacy.

C. **Environment.** QV reduces greenhouse gases, air pollution, water pollution, solid waste, and noise, and protects agricultural, open space, wildlife areas. On site, QV restores native plant diversity and bird life.

D. **Energy and pollution: Land use.** QV buildings, lighting and appliances, landscaping, mixed use, and other components greatly reduce fossil energy use and related pollution.

E. **Energy and pollution: Cars.** A great reduction in fossil energy and pollution results from less car use compared to alternative suburban development. Less car use reduces air pollution from emissions and water pollution from storm runoff from paved surfaces. QV is so energy efficient it reduces pollution and fossil fuel use by approximately 70 percent. A component of car use is congestion. QV reduces congestion by reducing car traffic. Another component is driving around looking for a parking space, also reduced.

F. **Indoor air pollution.** Indoor air pollution or sick building syndrome causes last productivity, colds, asthma attacks, headaches, and fatigue. QV will use green materials and ventilation systems to minimize indoor air pollution.

G. **Water use and water pollution.** QV will reduce water use and water pollution. One estimate of per capita water use was 160 gallons per day from 3 units per acre and 100 gallons per date from 7 units per acre.[23] QV is about 47 units per gross neighborhood acre. A major cause of water pollution is storm run-off from impervious surfaces. Auto-oriented development has a large impervious area per capita in streets, parking, driveways, and roofs.[24] QV dramatically reduces potential impervious area per capita, and will use a pervious paving material strong enough for fire trucks. QV will have a Storm Water Pollution Prevention Plan what will usually capture all storm water on site through absorption and in two retention ponds.

H. **Solid Waste.** QV will make segregation and recycling of waste materials easy. Landscape trimmings will be composted. It may be possible to have some domestic composting, depending on the commitment of residents.

I. **Noise.** No traffic means less noise. Buildings will have special sound-proofing between units, such as 2x4 studs offset on 2x6 plates, sheetrock mounted on sound-dampening

[23] http://water.lgc.org/water-workshops/upper-sacramento-valley/Meriam_Park_Water_Impacts_Gallo.pdf

[24] Todd Litman, Transportatin Cost and Benefit Analysis – Water Pollution, http://www.vtpi.org/tca/tca0515.pdf I could find no data on per capita impervious area by land use type.

furring trips, sound insulation, careful sealing of pipe chases, and ceiling techniques that minimize noise from adjacent units.

J. **Open space, habitat, and wildlife.** Quarry Village uses one tenth or less of the land area usually used by sprawl for housing, with major savings in paved area, built area, and efficient organization of land uses. QV uses 24 acres for neighborhood purposes that could easily take 250 acres in suburbia, saving farmland and open space. Less traffic also means more wildlife. With landscaping in native plants, and water retention, Quarry Village will have much more abundant bird life than it does currently. QV will also be safer than car-oriented development for the deer who live in the woodland along the creek on the north side of the project.

K. **Resources.** Building QV will conserve material resources compared to conventional development. Go to www.thegreenguide.com.

1. Quarry Village uses substantially less construction material roads and parking.

2. Construction of multiple units uses less building material for the same interior space.

3. Green building technologies and sustainable building materials will be more sustainable. See discussion of SIPs above.

4. Sustainable wood has FSC Forest Stewardship Council label. Reclaimed materials come from mounainlumber.com, endurawood.com, tamalpais.com, terramai.com. Wood substitutes: bamboo atm plyboo.com

5. Recycled plastic outdoor furniture eco-furniture.com, decking fencing trex.com.

L. **Economy.** The QV system is a more productive, cost-effective urban system than suburbia.

1. QV will provide training and green jobs in all the technologies of QV–green site design, green neighborhood policy, landscaping, site improvements, green buildings, solar technologies, green building materials, green business.

2. QV is more economically efficient because it provides much more housing on the same amount of land, lowers land development costs that serve the car, and has efficiencies from multiple structure buildings. Most costs of cars are dramatically reduced. Construction costs for streets, parking, and driveways are cut. Direct costs of car ownership and operation are reduced. Indirect costs for car use are lower–accidents, public costs of streets and roads and traffic services, parking costs, loss of value from productive uses of unneeded right-of-way, and environmental externalities.

3. QV is more economically efficient because it has a market for parking, which is usually bundled with living space,

4. QV uses water, energy, and other resources more efficiently, reducing external costs, but without reducing, and possibly improving, mobility and the quality of life,

5. Additional household savings come from less car use, not owning a car, and lower utility bills.

6. QV will have some cost increases. Costs may increase due to zoning requirements for thicker walls and for sprinklers not imposed on other housing. Green building increases costs for solar roofs, conservation by design, and energy star appliances, but these costs should be more than offset by lower operating costs, totaling to lower life cycle costs. QV has costs of providing security, Ecopass and other features not usually provided by other housing. These costs also increase value, creating a net benefit.

7. While QV is competitive with other new construction with similar amenities, it will be more expensive than old, amortized complexes with fewer amenities.

M. **Health.** QV provides an environment that increases walking and dramatically reduces health risks from auto accidents, pollution, and a sedentary life style.[25]

1. Vehicle accidents will be lower.

2. More walking and less car-riding will improve cardiovascular fitness, reduce overweight, prevent diabetes, and generally improve physical health. and general health higher

3. Less traffic reduces local air pollution, particularly from particulates, which aggravate and may cause asthma.

N. **Affordable Housing.** QV provides affordable and high quality housing for CSUEB Hayward faculty, staff, and some students, workers, families, moderate income households, and all, ages, races, ethnicities, disabilities and household types.

1. QV realizes cost reductions of an estimated 15% to 20% relative to comparable new construction based on cars, while providing architectural quality and adequate mobility.
2. In March 2008, the Eight Orchids project in downtown Oakland near I-880 sold 41 condos at auction well below listed prices, reflecting the decline caused by the housing bubble. A one bed sold for $316,000; the asking price was $436,000 [QV= $$290,000]. A 3 bed 3 bath sold for $534,000; the asking price was $806,000 [QV= $380,000]. A 2 bed 1 bath sold for $374,000, more than 30% below the asking price [QV= $310,000]. In addition to bubble problems, the downtown Oakland market has a saturation and absorption problem due to a number of project coming onto the market in 2007-2008: AF Evans Development Inc. 86 units at Market Square II; Molasky Pacific 134 units at Ellington; Signature Properties 132 units at Broadway Grand. [SF

[25] Jasmine Syedullah, Oakland Pedestrian Safety Village, Alliance for Healthy Food and Activity Environments, 510-444-7738 x321, jasmine@preventioninstitute.or. Dr. Lawrence Frank, Assoc. Professor, School of Community and Regional Planning, Univ. of British Columbia, *Health and Community Design: The Impact of the Built Environment on Physical Activity.* These sources link urban design to air quality, walking, bicycling, and health.

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O. **Education.** QV will increase CSUEB Hayward enrollments with improved transit access and more affordable housing.

1. Sustainable enrollment growth requires better transit and more local affordable housing more than bigger roads. More housing based on focused growth would be important for the development of a campus residential community, which in turn could help create a CSUEB Hayward identity and recruit and retain CSUEB Hayward faculty.

P. **Transportation.** QV will perform much better than suburbia and even substantially better than smart growth or focused growth with no general loss of accessibility or mobility. Some trips will be more difficult but others will be easier, with great variation among households. Frequent and rapid bus service reaches many destinations efficiently. Even though walking speed and bus speed are slower than driving a car, the design concentrates enough purchasing power to provide common goods and services on-site, avoiding car trips. The slower speed of travel is balanced by the shorter distance of travel. QV will

1. Reduce vehicle trips, trip lengths, vehicle miles traveled (VMT), vehicle hours of travel, drive-alone trips, and congestion;
2. Encourage more pedestrian, bicycle and transit trips;
3. Maximize the efficiency of existing infrastructure and planned projects;
4. Mitigate pollution from mobile and neighborhood land use sources;

Q. **National Security.** QV reduces economic dependency on fossil fuels and on foreign oil supplies, vulnerability to supply disruptions, military costs of defending oil supplies, moral turpitude from supporting corrupt, violent, and authoritarian regimes. Reducing this dependency may also reduce related loss of life and wealth from such foreign entanglements.

1. If long-term, severe economic dependence on foreign energy, intervention in the affairs of oil-rich countries, association with non-democratic regimes, and two wars in Iraq had nothing to do with oil, this goal is not relevant.

R. **Regional Policy.** On Feb. 1 and March 6, 2008, Ken Kirkey, Planning Director for the Association of Bay Area Governments, sent memos with six performance criteria for "focused growth" in "Priority Development Areas" in planned for Bay Area cities: VMT, community improvement, housing choice, transportation choice, land-use compatibility, and sustainability. QV performed well, as discussed above.

1. "Community improvement" really should be "community involvement" to be consistent with the definition. HAPA has presented QV in a number of forums over the years and is currently participating in the 238 Land Use Study being conducted by the City of Hayward, which is scheduled to lead to plan designations and zoning by February 2009. The area is not part of a neighborhood (see III. A. 1. above).

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