Utah State University

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2012

Park Avenue & US 50 Redevelopment Streetscape Performance Benefits Assessment

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Available at: https://works.bepress.com/bo_yang/51/
Overview
The town of South Lake Tahoe experienced undisciplined development, which created traffic congestion, limited connectivity to recreational assets, and negatively impacted the scenic and environmental quality of Lake Tahoe and the region. In response, strict environmental regulations were developed, which subsequently ceased development activities. Faced with serious environmental and economic problems, residents, officials, and developers jointly revised development regulations and worked to strategically deploy development monies to give the town a new future. Today, the town's Park Avenue Corridor with its wide sidewalks, interconnected plazas, consistent architecture, gondola, intermodal transit center, street furniture, and integrated stormwater management is a national model for redevelopment that promotes economic vitality, improves the natural environment, and creates a strong sense of place.

Sustainable Features
- Visual clutter, including outdoor billboards, irregular street walls, and eclectic architectural styles, was replaced with consistent building massing, signage, awnings and overhangs, which protect and enhance views of the Carson Range.
- Building setbacks along US 50 were increased to 50 ft. This minimum setback helps preserve views and ensures that the roadway receives solar exposure between 10am and 3pm throughout the year.
- Sidewalk widths were increased from 6 ft to 12-15 ft to create a comfortable, safe, and enjoyable environment for pedestrians. Driveway curb cuts were reduced from 15 to 2, eliminating many points of conflict between pedestrians and vehicles. Street trees, planted areas, and street furniture such as benches, trash receptacles, and street lights were added. As a result, the area has become a walking destination.
- Overhang areas were incorporated into new buildings to provide shelter from rain, snow, and direct sunlight, creating a more pleasant year-round experience for pedestrians.
- Open space, trails, bike paths and parks were created to increase recreational opportunities. These include a 0.3-mile, 50-ft wide public promenade, the 1.4-acre Gondola Plaza, and an ice skating park. All of them are connected through a dense pedestrian network that serves hotel...
guests, shoppers, and tourists. Plazas are full of amenities, such as kiosks, directories, fire pits, swimming pools, a playground, and ample seating.

- A new 1.3-acre Intermodal Transit Center consolidates public and private transportation systems totaling 11 bus lines. The 4,610 sf building has a visitor information center, ticketing services, and public restrooms.

- The new 10,000-ft Heavenly Gondola connects Park Avenue with the Heavenly Ski Resort, increasing access to year-round recreation and reducing traffic congestion, particularly in the winter. With the capacity to transport 3,000 people per hour, the gondola provides access to the ski resort for 20% of winter visitors.

- Two stormwater detention basins were created to manage runoff from up to a 20-year, 1-hour storm event. A 1-acre, onsite detention basin treats around 20% of the total runoff and is located at the northeast corner of the intersection of US 50 and Pioneer Trail. A 3-acre, offsite detention basin treats the remaining 80% of runoff and is located west of Park Avenue between Black Rock Road and Meadow Road.

- The new facilities included an automatic snowmelt system with the capacity to handle 170,778 square feet of sidewalks and plazas. Runoff from snowmelt in the plazas is collected, conveyed, and treated in the stormwater system. Because of the savings in labor, equipment and fuel, the snowmelt system paid for itself in just four winters.

- 112 mature Jeffrey pine trees were preserved on the site. The native Jeffrey pine provides vital wildlife habitat due to the food value of its seeds and nesting value of tree cavities or sheltered branches.

- Dwarf, non-mowed turf varieties like Aurora Hard Fescue and Mokelumne Fescue cover 5.9 acres of the project since they require little maintenance. High-traffic groomed-turf areas were used only minimally to reduce irrigation and fertilization needs.

- Irrigation was installed and is managed to minimize runoff to stormwater management facilities. In potential runoff areas, edging materials are 1 in higher than the surrounding grade to contain any excess irrigation water.

- The fertilization plan requires Biosol or an equivalent organic nitrogen fertilizer to be used at a rate not exceeding 1.3 lbs per 1,000 square feet per year. This is a 58% reduction in the normal application rate for groomed turf. Fertilizer is applied with a drop type spreader to minimize broadcasting on adjacent beds and walks. Onsite wells monitor groundwater for nitrogen loading.

**Challenge**

The design team was charged with crafting an environmentally sustainable vision for South Lake Tahoe’s future that would revive portions of the community that were derelict. Previous ill-planned development had led the Tahoe Regional Planning Agency (TRPA) to implement stringent development regulations, which required preservation of viewsheds and limited land coverage in order to reduce stormwater runoff and its subsequent impacts on the water quality and clarity of Lake Tahoe.

**Solution**

The design team convinced the TPRA officials that some development regulations conflicted with the goals of preserving the scenic and environmental quality. Together, they revised the regulations to accommodate taller development (height limit increased from 32 to 76 ft) with smaller footprints and higher total building square footages. To preserve views to the mountains and Lake Tahoe, these buildings have a setback distance of 50 ft from the highway, which effectively decreases their apparent heights. To reduce the impacts of stormwater runoff on the lake, pretreatment vaults, water quality detention basins and constructed wetlands were incorporated.

**Cost Comparison**

- By using 5.9 acres of slow-growing turfgrass instead of conventional high-maintenance turf and requiring that Biosol or an equivalent organic nitrogen fertilizer be applied instead of conventional fertilizer, fertilizer use is reduced by 70%, saving an estimated $880 annually.

**Lessons Learned**

- A public/private partnership and public investment in redevelopment at this scale can successfully encourage additional private development. As improvements and installations were constructed, surrounding land owners almost immediately started improving their properties, as well.

- A $9 million parking structure was built on the eastern edge of the project, hidden from view in an effort to reduce the negative visual impact that parking structures typically cause. The
structure, which was paid for with city bonds, is not generating the projected revenues for two reasons: (1) Because it is not highly visible, first-time tourists to the area do not know that the structure exists, and thus they park in nearby surface lots. (2) There is a fee to park in the structure, whereas nearby lots are free. Many tourists and skiers park in the free lots -- sometimes for an entire day -- occupying spaces meant for patrons of local businesses.

By constructing a scale model of the site using the existing regulations, the design team was able to convince the TRPA that the regulations they had established would be counterintuitive to the agency’s goals and objectives. The model illustrated three essential principles: (1) The building height limit of 32 ft encouraged greater land coverage, eliminating space that could be used to create plazas, parks, and pedestrian areas. (2) Taller buildings and larger setbacks from the road could preserve and enrich mountain views. (3) TRPA’s prohibition of below-grade construction prevented concealment of parking. Without the visual aid of the model, the design team’s claims would not have been accepted by the agency, and the resulting design would have been drastically different.

Project Team
Master Plan: Design Workshop, Inc.
Transportation Consultant: LSC Transportation Consultants, Inc.
Master Plan Architects: Cottle Graybeal Yaw Architects
Architects: Jung Brannen, Inc., Theodore Brown and Partners
Collaborator: Lew Feldman, Shaw and Devore, LLC

Role of the Landscape Architect
The landscape architect developed the master plan for the site and led a team of architects, civil engineers, transportation planners, market researchers, and economists to develop the urban design plan, gondola terminal, pedestrian and vehicular streetscape, and five public open spaces. The landscape architect also negotiated with the regional planning agency and assisted in rewriting regulations.

Case Study Brief Prepared by:
Research Fellow: Bo Yang, PhD, Assistant Professor, Utah State University
Research Assistant: Yue Zhang, MLA candidate, Utah State University
Research Assistant: Pamela Blackmore, BLA candidate, Utah State University
Firm Liaisons: Allyson Mendenhall, Richard Shaw, and Dori Johnson, Design Workshop
October 2012

References & Resources
Design Workshop: Park Avenue Redevelopment
ASLA Colorado Chapter Honor Award for Planning and Urban Design, 2010
California Redevelopment Association: Heavenly Village Project
Park Avenue/US 50 Phase 1 Redevelopment

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Landscape Performance Benefits and Methods

- **Reduced the peak month Average Daily Traffic (ADT) and annual ADT on Park Avenue by 24% and 23%, respectively, between 2001 and 2009.**

Traffic volumes in South Lake Tahoe vary with the season. Generally, the traffic is highest during the mid-summer periods (July and August). Winter traffic levels tend to be lower than summer traffic levels. California Department of Transportation (Caltrans) data show that the highest peak-month Average Daily Traffic (ADT) volumes in South Lake Tahoe were found in the Park Avenue and US 50 intersection. Park Avenue is the busiest roadway in South Lake Tahoe. It serves residential traffic as well as recreational traffic associated with the various hotel and retail uses located in the Stateline area. It also connects US 50 with the Lakeside Marina and commercial centers.

The design team, expanding on the community’s desire for a gondola to the Heavenly Ski Resort, proposed a Consolidated Transportation System (CTS) that unified public and private transit in South Lake Tahoe. The transit center is located near the base of the gondola, promoting pedestrian movement and allowing users to eliminate use of personal automobiles. The construction of this project started in 2001 and was completed in 2003. A comparison of historical Caltrans data on Park Avenue for the period from 2000 to 2009 is shown in Table 2. As illustrated in this table, significant traffic volume decreases for both peak month ADTs and annual ADTs were observed after construction. During 2001 to 2009, the peak month ADT on Park Avenue decreased from 50,000 to 38,000, which is a 24% reduction from 2001. The annual ADT decreased from 41,000 to 31,500, which is a 23% reduction from 2001, making the average annual change 2.9%.

<table>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Month ADT</td>
<td>38,000</td>
<td>41,000</td>
<td>43,000</td>
<td>43,000</td>
<td>43,500</td>
<td>45,000</td>
<td>46,000</td>
<td>50,000</td>
<td>50,000</td>
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</tr>
<tr>
<td>Annual ADT</td>
<td>31,500</td>
<td>33,000</td>
<td>35,000</td>
<td>35,500</td>
<td>36,000</td>
<td>37,500</td>
<td>37,500</td>
<td>41,000</td>
<td>41,000</td>
<td>41,000</td>
</tr>
</tbody>
</table>

Source: California Department of Transportation (http://traffic-counts.dot.ca.gov/)

The cause of the reductions is three-fold. The first is the implementation of the CTS. The second is the implementation of the Heavenly Gondola. The Gondola allows Stateline lodging guests who previously drove or rode shuttle buses to ski base areas, to instead walk a short distance to access the ski area. The last is recessionary years of 2007-2009 saw a reduction in tourism travel, declines in employment, reduced hotel occupancy, and population decreases resulting in reduced traffic volumes.
• **Reduces runoff from a 2-year, 24-hour rainfall event by 500,000 gallons by reducing the total impervious surface on the site by 20%.**

The clarity of Lake Tahoe has been a major concern for many years in the Lake Tahoe region. Since 1967, to test the clarity of the lake, a 25-cm white disk, called Secchi disk, has been lowered from a boat into the water. A measurement is taken of the depth that it is no longer visible, which is called the Secchi depth. This depth has been steadily decreasing. Particles and sediments being transported to the lake through stream and stormwater runoff are reducing this clarity.

To improve Lake Tahoe’s water quality, stormwater runoff was reduced on site by decreasing the amount of impervious surfaces and two stormwater detention basins were created. Impervious surfaces were replaced with landscaped vegetation that promotes infiltration. Before redevelopment, impervious surfaces covered 97% of the surface area. This project, as shown in Table 5, increased the landscaped area by 42.3%.

Table 5. Land coverage calculations.

<table>
<thead>
<tr>
<th></th>
<th>Existing total land area (SF)</th>
<th>Proposed total land area (SF)</th>
<th>Existing impervious area (SF)</th>
<th>Proposed impervious area (SF)</th>
<th>Existing landscape area (SF)</th>
<th>Proposed landscape area (SF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area</td>
<td>1,637,773.06</td>
<td>1,487,124.20</td>
<td>1,437,980.45</td>
<td>1,153,904.06</td>
<td>199,792.61</td>
<td>346,170.38</td>
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<tr>
<td>Percent change</td>
<td>9.2% reduction</td>
<td>19.8% reduction</td>
<td>42.3% increase</td>
<td></td>
<td></td>
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</tbody>
</table>

Source: Adapted from Park Avenue Development Proposed Land Coverage Calculations L5.3. (Design Workshop)

To calculate the runoff reduction, a curve number (CN) of 98 (e.g., with percent of impervious cover similar to paved parking areas, roofs, driveways) was used. The hydrologic soil group does not impact the CN when the percentage of impervious surfaces are high (for instance, Hydrologic soil A, B, C and D all have the same CN for paved parking areas, roofs, and driveways). The rainfall depth used was 2.97 inches, which is taken from the National Oceanic and Atmospheric Administration (NOAA) Station Fallen Leaf, which is the closest to the site (http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca) (Harris & Dines, 1998). The 2-year, 24-hour rainfall event was used.

Runoff volume in acre-feet was calculated for each impervious cover, and then the difference was calculated and converted to gallons. The CN formulas used are:

\[ S = \frac{(1000/CN)-10}{(P-0.2xS)^2} \]

\[ Q = \frac{(P-0.2xS)}{(P+0.8x2.2)} \]

where

\[ S = \text{potential maximum retention in inches} \]

\[ P = \text{rainfall depth in inches from a 24-hour duration storm} \]

\[ Q = \text{depth of direct runoff in inches} \]

Total existing runoff: 7.4 acre-feet; New runoff after redevelopment: 5.85 acre-feet
Runoff reduction: 7.4 – 5.85 = 1.55 acre-feet * 325 851 gallons/acre-ft = 505,000 gallons

• **Increased the total visible area of the natural environment by 10%. For all views of the Carson Range that were blocked by new development, the design created new views in other areas of the project site.**

The scenic quality of the Lake Tahoe Basin was recognized as one of the most important assets of the region. Thus it was essential that the redevelopment did not block additional views to the surrounding landscapes. The project needed to meet “No net loss in views of the scenic resource (i.e. mountain and ridgeline).” Some views of the Carson Range were blocked by new buildings in the redevelopment plan. However, new views were opened up with the removal of the existing buildings on-site. With the replacement of all buildings except one along the east side of US 50 between the Embassy Suites Hotel and Park Avenue, this project changed the views significantly.
For all visible areas of the Carson Range lost because of this project, the designers had to ensure views to the Carson Range in other areas of the project site. Even with the increased height of structures in the new development, the designers were able to increase the quantity of visible area of the natural landscape. The process they followed, which was approved by the Environmental Impact Statement (EIS) consultant and Tahoe Regional Planning Agency (TRPA), is as follows:

The project team created a set of 26 three-dimensional computer-assisted design and drafting (CADD) simulations of the proposed design from specific viewpoints. These simulations were converted into line drawings, transferred onto transparency sheets and overlaid onto photographs of existing conditions taken from the same viewpoints. Then, using a planimeter, they measured the visible natural landscape area under the existing conditions and the proposed conditions. The net gain or loss was the difference between the measured existing visible areas and the potential visible areas of the natural landscape. To ensure accuracy, both areas were measured twice, and then averaged. The following table lists the averages.

As shown in Table 6, a net gain between Embassy Suites Hotel and Park Avenue is achieved in the project. A total area of 1,644 cm² is visible in the study area after the project was installed. The increased visible gain area is 9% or 145 cm².

Table 6: Park Avenue scenic resource view gain-loss evaluation

<table>
<thead>
<tr>
<th>Image</th>
<th>Before (cm²)</th>
<th>After (cm²)</th>
<th>Net gain (cm²)</th>
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<tr>
<td>1</td>
<td>64.75</td>
<td>143.00</td>
<td>78.25</td>
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<td>77.35</td>
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<tr>
<td>3</td>
<td>71.65</td>
<td>48.45</td>
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<td>77.75</td>
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<td>8</td>
<td>35.25</td>
<td>36.45</td>
<td>1.20</td>
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<tr>
<td>9</td>
<td>35.25</td>
<td>91.65</td>
<td>56.40</td>
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<tr>
<td>10</td>
<td>18.80</td>
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<td>67.05</td>
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<td>19</td>
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<td>46.20</td>
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<td>152.00</td>
<td>181.35</td>
<td>29.35</td>
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<td>26</td>
<td>14.40</td>
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<tr>
<td>Total</td>
<td>1499.25</td>
<td>1643.78</td>
<td>144.53</td>
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</table>

Adapted from: Park Avenue Development Project Draft, EIR/EIS, 1996, pp.316-317, Table 6.1 and 6.2.
Figures 3 and 4 demonstrate the simulation process used at viewpoint 1 (see Table 6) to determine whether visible area of the Carson Range would be lost or gained as a result of the redevelopment.

![Figure 3](image1.png)

Figure 3. Predevelopment Conditions from Viewpoint 1. Source: Draft EIR March 4 1996, p 265.

![Figure 4](image2.png)

Figure 4. Simulation of Proposed Project from Viewpoint 1. Source: Draft EIR March 4 1996, p 267.

- Increased the scenic quality of the roadway, as measured by the Tahoe Regional Planning Agency's Travel Route Rating, which increased from 7.5 in 1996 to 14 in 2006.

Another method used to evaluate the scenic quality of an area is the Travel Route Ratings. This system was adopted by the TRPA in 1971, is consistent with the Forest Service methods, and is an effort to rate the visual experience along a travel route for both natural and man-made
The system identifies distinguishable landscape segments differentiated from surrounding areas because of their individual scenic traits and gives each a corresponding scenic threshold.

The scenic quality thresholds were set by the TRPA to gauge the scenic impact of future development. Each unit was evaluated and given a threshold number that represents a minimum scenic standard that all development in the unit must maintain or attain. This standard is a composite number based on six criteria: (1) man-made features along the roadway and shoreline, (2) physical distractions to drive along the roadways, (3) roadway characteristics, (4) view of the lake from the roadways, (5) general landscape views from the roadways and shoreline, and (6) variety of scenery from the roadways and shoreline. Each unit is given 1-5 points for each criteria based on how well they satisfy the criteria, with 1 representing poor scenic quality and 5 good scenic quality. This means that composite ratings for units can range from 5-30. Ratings are designated based on observation by trained scenic quality professionals.

The TRPA originally identified 46 roadway units and 33 shoreline units. Roadway units are areas visible by motorists travelling along major roads in the area. Shoreline units are landscape units seen from the lake. This Park Avenue project area falls within Roadway Unit 32 and 33. The threshold for this project was set at 15, but has been increased to 15.5. On the 30 point Roadway Unit scale, this project has its goal to achieve a minimum of 15.5 points. When the Environmental Impact Report (EIR) was being completed in 1996, the Roadway Unit had a rating of 7.5. In 2006, the unit rating reached 14 points. The TRPA has measured the composite travel route ratings since 1982. Table 7 gives the travel route rating points given for each criterion. Other factors that contribute to the increased rating are also described in this table.

The project site encompasses 33% of Roadway Unit 32. But the project occurs only on one side of the road. Therefore, half of the rating (half of 33% i.e., 16 %) for Unit 32, can be attributed to this project.

The description of the unit was given as “cluttered commercial with virtually no views out to the natural environment”. Additional comments about elements degrading the scenic quality of Roadway Unit 32 were: “The visual problems are those typical of strip development: sign proliferation, inadequate landscaping, and the visual prominence of the automobile. The overall effect is a visually cluttered and confusing environment that fails to take advantage of the scenic value of its natural setting” (Draft Environmental Impact Report, March 4, 1996. p 263). Figure 5 below shows the progression of the Travel Route Ratings of Roadway Unit 33.
Figure 5. Observed Travel Route Ratings of Roadway Unit 33.

- **Reduces fertilizer consumption by 70% by using slow-growing turfgrass and organic fertilizer, which saves an estimated $880 annually.**

The University of California Agriculture and Natural Resources recommend the fertilizer application rate for the traditional turfgrass as 1 lb per 1,000 square feet, 4 times a year (i.e., 4 lbs/1,000 square feet/year) (http://www.ipm.ucdavis.edu/TOOLS/TURF/MAINTAIN/fertamt.html). In comparison, this project uses approximately 1.3 lbs of Biosol or other organic fertilizer per 1,000 square feet/year.

The site has 5.9 acres (257,004 square feet) of dwarf turf grass (Aurora Hard Fescue, Mokelumne Fescue, or other types). Biosol costs around $83 for a 55 lb bag from a California distributor (http://www.ssseeds.com/ssseeds/display.php?key1=fertilizer&olimit=0&zid=1&lid=1&cartid=201210166152409). A 40 lb bag of traditional fertilizer from Lowe’s costs $54 (http://www.lowes.com/pd_90204-446-31115_0___?productid=3047138). Fertilizer cost savings is calculated below.

Traditional turfgrass fertilizer cost:
4 lbs/1,000 sq. ft/yr × (257,004/1,000) = 1,028 lbs
$54/40 = $1.35/lb; $1.35/lb×1,028 lbs = $1,387/yr

Dwarf turfgrass with Biosol fertilizer cost:
1.3 lb/1,000sq. ft/year×(257,004/1,000) = 334 lbs
$83/55lb = $1.51/lb; $1.51/lb×334 lbs = $504/yr

Fertilizer consumption reduction:
(1,028 lbs — 334 lbs)/1,028 lbs = 68%

Annual fertilizer cost savings:
$1,387-$504 = $883
Cost Comparison Methods

- By using 5.9 acres of slow-growing turfgrass instead of conventional high-maintenance turf and requiring that Biosol or an equivalent organic nitrogen fertilizer be applied instead of conventional fertilizer, fertilizer use is reduced by 70%, saving an estimated $880 annually.

See method for Performance Benefit #5.

References

1) California Department of Transportation, Traffic Data Branch. [http://traffic-counts.dot.ca.gov](http://traffic-counts.dot.ca.gov)


5) Park Avenue Development Project Draft, EIR/EIS, 1996.

