LANDSCAPE ARCHITECTURE FOUNDATION

Simon and Helen Director Park
Methodology for Landscape Performance Benefits
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Environmental

Prevents over 990,000 gallons of stormwater from entering the city's combined sewer system, saving $200 in annual storage and pumping costs. This also helps avoids a projected $3.9 million in future capital costs to upgrade stormwater infrastructure, such as constructing a larger combined sewer overflow (CSO) tunnel.

Used biofiltration and infiltration equation[1]:

[annual precipitation (inches) * (feature area (SF) + drainage area (SF)] * % of rainfall captured] * 144 sq inches/SF * 0.00433 gal/cubic inch = total runoff reduction (gal)

Calculations:

Annual precipitation: 36.06 inches
Features area: 986.32 SF
Drainage Area: 44496.91 SF
% rainfall captures: 95%

(36.06*(986.32+44496.91)*0.95)*144*0.00433 = **992,878.29 gallons**

The City of Portland recognizes two avoidance costs for incorporating stormwater infiltration strategies with combined sewer systems (CSS). First, the annual operations and maintenance costs to convey stormwater through the existing CSS. The city measures this by applying a rate of $0.0001 per gallon treated and $0.0001 per gallon pumped. This equates to an annual O&M avoidance cost of $0.0002 per gallon. Secondly, the City recognizes an avoidance future capital cost of stormwater infrastructure. The cost-effectiveness point for projects/programs that remove stormwater volume from the CSS ($4 per gallon) is also considered as the avoidance cost of constructing a larger CSO tunnel.[2]

Storage and pumping cost avoidance:
992,878.29 gallons * 0.0002 dollars/gallon = $198.50 or ~$200

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[1] American Rivers, Center for Neighborhood Technology. 2011. The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Social and Environmental Benefits. http://www.cnt.org/repository/gi-values-guide.pdf
[2] R.M. Roseen, T.V. Janeski, J.J. Houle, et al. Forging the Link: Linking the Economic Benefits of Low Impact Development and Community Decision. University of New Hampshire Stormwater Center, Virginia Commonwealth University, and Antioch University New England. July 2011
http://www.unh.edu/unhsc/sites/unh.edu.unhsc/files/docs/FTL_Chapter3%20LR.pdf
in American Rivers, the Water Environment Federation, the American Society of Landscape Architects and ECONorthwest. 2012. Banking on Green: A Look at How Green Infrastructure Can Save Municipalities Money and Provide Economic Benefits Community-wide.
http://www.asla.org/uploadedFiles/CMS/Government_Affairs/Federal_Government_Affairs/Banking%20on%20Green%20HighRes.pdf

CSO Upgrade cost avoidance:

992,878.29 gallons * 4 dollars/gallon = $3,971,711.73 or ~$3.7 million

Limitations of Methodology:

Considering evaporation and other hard-to-estimate losses, the estimated % rainfall captured is difficult to accurately estimate.

The multipliers used to calculate cost avoidance are based on long-term estimates for upgrading Portland's CSO and not specific estimates for this project.

Saves over 70,000 gallons of potable water each year by eliminating the need to use potable water for irrigation. This saves the city about $300 annually by eliminating the need to use potable water for irrigation.

Total potable water saved from avoiding irrigation costs = water need for irrigation + water lost from evaporation

water lost from evaporation = average feet inches of evaporation per year * size of irrigation area

3.28 feet – average annual feet of evaporation per year[3]
1927 SF – total irrigation area

Water lost from evaporation = 3.28 feet/year * 1927 sqft = 6331.05 cubic feet/year or **47,359 gallons/year**

Water needed for irrigation (@ 20 weeks of irrigation at 1 inch per week) = total irrigation area * 20 weeks * 1 inch = 1927 sqft * 20 week *1 in/sqft/week = 5,549,760 cubic inches/year or **24,024 gallons/year**

Total potable water saved from avoiding irrigation costs = **47,359 gallons/year + 24,024 gallons/year = 71,393.85 gallons or ~ 71,000 gallons**

City of Portland Portable Water Cost[4] = $3.44 / CCF (hundred cubic feet)

71,393.85 gallons / 748 = 95.45 CCF
95.45 CCF * $3.44 = $328.34 or ~ $ 300

The 24 trees associated with the project store 2081 pounds of carbon and sequester 258 pounds of carbon per year.

Utilized i-Tree Eco v5 data collected on site.

[3] http://www.usbr.gov/pn/agrimet/monthlyet.html
[4] http://www.portlandoregon.gov/water/29415

Individual Tree Characteristics in Director Park

Series: series1, Time Period: 2013

Tree ID	Species Name	DBH (inch)	Height (ft)	Ground Area (ft2)	Tree Condition	Leaf Area (ft2)	Leaf Biomass (lb)	Leaf Area Index	Carbon Storage (lb)	Gross Carbon Seq (lb/year)	Structural Tree Value ($)	Street Tree	Native To State
1	Red sunset red maple	4.0	24.0	201.29	Poor	868.54	10.01	4.32	38.65	5.45	268.0	YES	NO
2	Red sunset red maple	4.0	24.0	201.29	Excellent	868.54	10.01	4.32	38.65	7.25	432.0	YES	NO
3	Yellowwood	7.0	24.0	201.29	Excellent	755.41	11.57	3.76	113.56	13.25	882.0	YES	NO
4	Yellowwood	7.0	24.0	201.29	Excellent	755.41	11.57	3.76	113.56	13.25	882.0	YES	NO
5	Yellowwood	7.0	24.0	201.29	Excellent	755.41	11.57	3.76	113.56	13.25	882.0	YES	NO
6	ash spp	4.0	29.9	50.59	Excellent	234.55	4.32	4.67	34.06	6.02	419.0	YES	NO
7	ash spp	4.0	29.9	50.59	Excellent	234.55	4.32	4.67	34.06	6.02	419.0	YES	NO
8	ash spp	4.0	29.9	50.59	Excellent	234.55	4.32	4.67	34.06	6.02	419.0	YES	NO
9	Liberty elm	7.0	24.0	201.29	Excellent	878.55	12.26	4.37	97.55	11.40	828.0	YES	NO
10	Liberty elm	7.0	24.0	201.29	Excellent	878.55	12.26	4.37	97.55	11.40	828.0	YES	NO
11	Liberty elm	7.0	24.0	201.29	Fair	878.55	12.26	4.37	97.55	11.40	679.0	YES	NO
12	Liberty elm	7.0	24.0	201.29	Excellent	878.55	12.26	4.37	97.55	11.40	828.0	YES	NO
13	Liberty elm	7.0	24.0	201.29	Excellent	878.55	12.26	4.37	97.55	11.40	828.0	YES	NO
14	Liberty elm	7.0	24.0	201.29	Fair	878.55	12.26	4.37	97.55	11.40	679.0	YES	NO
15	Liberty elm	7.0	24.0	201.29	Excellent	878.55	12.26	4.37	97.55	11.40	828.0	YES	NO
16	Liberty elm	7.0	24.0	201.29	Excellent	878.55	12.26	4.37	97.55	11.40	828.0	YES	NO
17	Liberty elm	7.0	24.0	201.29	Excellent	878.55	12.26	4.37	97.55	11.40	828.0	YES	NO
18	Liberty elm	7.0	24.0	201.29	Excellent	878.55	12.26	4.37	97.55	11.40	828.0	YES	NO
19	Liberty elm	7.0	24.0	201.29	Excellent	772.53	10.78	3.84	97.55	11.40	828.0	NO	NO
20	Liberty elm	7.0	24.0	201.29	Excellent	772.53	10.78	3.84	97.55	11.40	828.0	YES	NO
21	Liberty elm	7.0	24.0	201.29	Excellent	772.53	10.78	3.84	97.55	11.40	828.0	NO	NO
22	Liberty elm	7.0	24.0	201.29	Excellent	772.53	10.78	3.84	97.55	11.40	828.0	NO	NO
23	Liberty elm	7.0	24.0	201.29	Excellent	772.53	10.78	3.84	97.55	16.82	690.0	NO	NO
24	Liberty elm	7.0	24.0	201.29	Excellent	772.53	10.78	3.84	97.55	11.40	828.0	NO	NO
	TOTAL			4,379		18,128	255		2,081	258	17,415		

Social

Between 2010 and 2012, an average of 1495 people visited the park daily during summer months (June through September). Over the same period, average daily winter visitation (November through February) was 376 users. Summer visitation increased 19% between 2010 and 2012 and winter visitation increased 50%. Theses figures do not include event attendance.

Director Park Events Coordinator shared event and general attendance data with us. These attendance numbers reflect counts throughout each hour of people in Director Park and on the cafe terrace. Attendance for events is not included in these numbers and is tracked separately. Attendance is tracked during the hours Park Hosts are scheduled in the park. For questions about attendance, please contact the City of Portland parks and Recreation Department.

Use data was collected on site in summer 2013 using the Public Space, Public Life (PSPL) survey method developed by Jan Gehl12. The PSPL survey method includes both bicycle/pedestrian counts and a stationary survey. Park users were observed on three separate site visits during summer 2013 (two week days and one weekend day) collecting information about use duration and time, user age, gender, purpose (recreation or work), type of activity (necessary, optional, social), position (sit/stand), location within the park, and other pertinent information.

Necessary activities include those things that people would do regardless of the quality of the space. For example the mail carrier will deliver the package, the business executive will walk to her office. Optional activities these are those activities that people choose to do and—importantly—where they choose to do them. For example sitting in a sunny place to eat their lunch or reading a book. Social activities occur when people interact spontaneously when they are engaging in necessary or optional activities. Gehl shows that more successful public spaces have a higher number of optional and social activities. Pedestrian/bicycle counts (including direction) was collected on all four edges of the park (on both

park sidewalk and adjacent sidewalk).

Benefits of methodology:

Offers potentially compelling metrics about social performance

Accepted as rigorous method by professional and academics

Does not require IRB review

Offers valuable learning for research assistants

Limitations of Methodology:

Absence of baseline data means data from such a short-term study has questionable statistical power

Data collection is time intensive (although this can be reduced through group work)

Objective outcomes are not always positive (i.e. – benefits)

Further findings from PSPL survey not included in benefits section:

There is a 150% increase in pedestrian movement on weekend days compared to weekdays on sidewalks adjacent to the park. The north edge of the site makes up 30% of all pedestrian movement while the west edge makes up only 4%.

Necessary activities make up less than 4% of all activity and 87% of optional activities are also social activities. 23% of park users enter the park cafe. In the summer months, the busiest time in the park is between 11am and 2pm. During this period the average length of stay in the park decreases from 14 minutes to between six and seven minutes. 62% of park users are 20 to 30 years old, followed by 19% between 60 and 75 years. 87% of children and 7% of adults made use of the fountain.

The moveable furniture at Director Park is the most popular seating choice, with 72% of park users choosing moveable furniture when a choice is available. Of those park users who choose moveable furniture, 97% adjust the position of furniture.

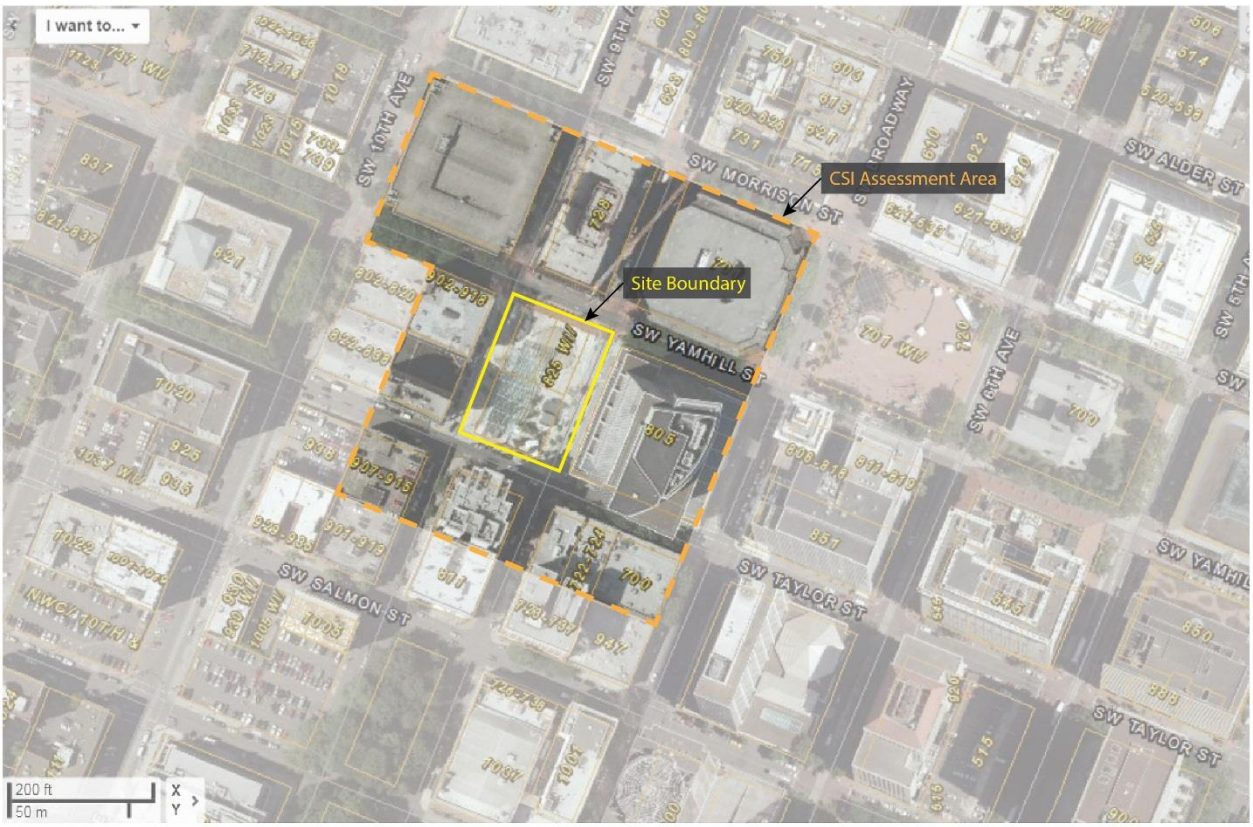
12 Gehl, Jan. 1971. Life Between Buildings: Using Public Space. Arkitektens Forlg.

Between 2010 and 2011, 228 events hosted at the park attracted over 73,000 people. In summer 2013, the park will host 53 free events open to the public. These included ice-cream giveaways, dance classes, music performances, and yoga classes. Between 2010 and 2013 the park generated $XX in revenue from event rentals.[e1]

Director Park Events Coordinator Alicia Hammock shared event data with us.

Economic

Bolsters local economy. Between 2009 (when the park was completed) to 2012—a period when the real estate market shrunk by 3%—the estimated market value of Director Park shrunk only 1%. Over the same period, the market value of two nearby plazas shrunk 10%. In spite of economic slow down, the assessed value of the surrounding properties within a half-block radius of the Park increased by 9%.



Using an assessment boundary definition of half a block, we used assessors' data from the City of Portland[5] to determine for the site property and the adjacent property (within a half black radius). This was

[5] http://www.portlandmaps.com/

benchmarked against the google real estate index[6]. The same procedure was used for the comparison sites. In this case used nearby Pioneer Plaza and O'Bryant Square.

The dataset is based on the period 1997 through 2012. This is a relatively short period for a statistically powerful economic analysis.

The project period coincided with a greatest economic downturn in over 40 years, making an objective analysis more challenging.

Due to the proximity of Pioneer Plaza to Director Park, two of the same blocks are included in both calculations. This skews the comparison somewhat, especially given the high value of those particular blocks.

Other indicators such as improvement value and land value were less favorable, but this can be attributed to the small data set.

A more thoughtful analysis might also include an analysis using a larger assessment area.

Generates an average annual gross revenue of over $34,000. Between 2010 and 2013 the park generated $140,000 in revenue from event rentals--an average annual gross revenue over $34,000. Annual gross income increased 91% between 2010 and 2013.

Director Park Events Coordinator shared rental income and budget data with us. The café manager shared employment and transaction data

The park has an annual budget of $475,000. This supports the positions for of two full-time maintenance staff, an events coordinator, and numerous part-time park host positions. The park cafe also employs five full-time equivalent (FTE) employees.

Director Park Events Coordinator Alicia Hammock shared this information in an interview.

Stimulates economic activity. On a typical summer weekday there were 620 average daily transactions at the park cafe. This increases to 870 on weekend days. 23% of park users enter the park cafe.

The café manager shared transaction data in an interview. Percentage of café users was collected in the public life, public space survey (methodology described above).

Cost Comparison Methodology

Early iterations of the park's design included a 2,200 sf open space planted with turfgrass. After achieving a design for the park with hardscape that supported both the stormwater and flexible programming goals of the project, the designers were able to avoid the costs of installing and maintaining an irrigation system for lawns, and of the regular re-sodding, mowing, and irrigation they require. This saves the city over $2600 annually--a payback period of 10 years for the more expensive hardscape design.

[6] https://www.google.com/finance?cid=2055260

Cost of Lawn = annual cost to re-sod + annual cost of irrigation + annual cost of Mowing

$2690 = $1250 + $390 + $1050

Estimated13 cost of sod and installation for 2284.35 sqft = $1262.11 or $1250

Total potable water saved from avoiding irrigation costs = water need for irrigation + water lost from evaporation

water lost from evaporation = average feet inches of evaporation per year * size of irrigation area

3.28 feet – average annual feet of evaporation per year14
2284.35 SF – total irrigation area

Water lost from evaporation = 3.28 feet/year * 2284.35 sqft = 7502.18 cubic feet/year or 56,120 gallons/year

Water needed for irrigation (@ 20 weeks of irrigation at 1 inch per week) = total irrigation area * 20 weeks * 1 inch = 2284.35 sqft * 20 week *1 in/sqft/week = 28,480 gallons/year

Total potable water saved from avoiding irrigation costs = 56,120 gallons/year + 28,480 gallons/year = 84,600.46 gallons or ~ 84,600 gallons

City of Portland Portable Water Cost15 = $3.44 / CCF (hundred cubic feet)

84,600 gallons / 748 = 113.10 CCF

113.10 CCF * $3.44 = $389.07 or ~ $ 390

Estimated16 cost of mowing for 2284.35 sqft = $1052.40 or $1050

13 http://www.homewyse.com/services/cost_to_install_sod.html
14 http://www.usbr.gov/pn/agrimet/monthlyet.html
15 http://www.portlandoregon.gov/water/29415

Using a 3% interest rate, the higher cost hardscape alternative (with an estimated capital cost of $28,200) would have a10-year payback period when compared to the turf grass alternative.

Limitations of Methodology:

Cost avoidance estimates are based on a 20-week irrigation period at 1

inch of rain per square feet per week. In reality this this will fluctuate in time and amount of rainfall based on weather conditions.

Size of initial turfgrass area estimated from concept

Missing image: See file:///P:/Case%20Study%20Investigation%20(CSI)/CSI%202013/Case%20Study%20Files%20-%20FINAL/U%20Oregon/Director%20Park%20Methodology.pdf