

Chapter Six: Life Cycle Cost Analysis

Life cycle cost analysis is an economic tool used to calculate the total costs of a facility alternative over its useful life. Instead of looking at just the cost to design and construct a facility, life cycle cost analysis looks at the total cost which includes the costs to operate and maintain the facility including costs to repair and replace important building systems estimated over its estimated life. For facilities, the analysis looks at all quantifiable capital and operating costs of facility alternatives over their estimated useful lives and compares all costs on a same- year dollar bases. Critical to the analysis is the timing of when those costs occur to allow for discounting costs that occur in the future to a present day value or a common date. The purpose of this section is to describe the analysis methodology and to present the analysis results.

Life Cycle Cost Analysis (LCCA) Methodology

There are three components to a life cycle cost analysis. The first component is estimating the initial and future costs. The second component is time – both the timing of when the costs will be incurred and the time frame for the analysis. The third component is the calculation of the present value of all initial and future costs. Each component is described below.

Initial Costs

The costs are divided into two categories; the initial costs and the future costs. The initial costs are all costs incurred prior to the occupation of the new facility. The future costs are those incurred after occupation of the facility.

The initial costs are the capital costs for design, permitting and construction, the capital financing costs and the offsetting revenues. The capital costs for each scenario were developed by the project consultant. The cost estimating methodology is described in Chapter Three: Cost Estimate Methodologies and Assumptions. The capital cost for each scenario is detailed in Chapter Two: Scenario Descriptions.

A capital financing plan was developed for each scenario based on a design and construction phasing schedule as described in Chapter Three. The schedule assumes a general contractor/construction manager (GC/CM) project delivery method. For scenarios constructing up to 10 courtrooms as in Scenarios 1-5, design starts in 2009 with construction concluding in 2013. For scenarios constructing more than 10 courtrooms as in Scenarios 5.5 & 6, design starts in 2009 with construction concluding in 2015.

The capital financing plans assume that following voter approval of an excess levy in 2010, the county will issue general obligation bonds starting in 2011. Long term financing was assumed at five percent interest rate for a 20 year period with a one percent financing transaction cost. It assumed that interim financing will be provided with short-term tax exempt rate of three percent. Each scenario financing plan was then converted into a series of repayment costs over a twenty year period. In addition to a capital financing plan, potential offsetting revenues have been identified for each scenario. These revenues fall into two categories: 1) the sale or long term lease of land available at the site, and 2) the rent of space vacated at the King County Courthouse as a result of the

Superior Court Targeted Juvenile and Family Law Facilities Master Plan

relocation of judicial positions and related staff to the Alder site. Both revenue assumptions are described in Chapter Three.

Future Costs

The future costs, incurred after occupation of the facility, include facility operating and maintenance costs, security and equipment costs, major maintenance replacement costs and residual value. These costs are detailed in Chapter Three. The life cycle cost model uses an estimated \$15.07 per square foot for future costs. Future costs for each scenario vary by the size of the planned facility.

- \$10.94 per sq. ft. facility operating and maintenance (O&M) costs,
- \$ 1.65 per sq. ft. security and equipment costs, and
- \$ 2.48 per sq. ft. major maintenance costs.

Lease costs and rental revenues have been included in the analysis. Some scenarios require off-site leased space as the KCCH does not have sufficient space for growth in family law courtrooms. Some scenarios vacate significant space in the KCCH as replacement courtrooms are built at the Alder site.

Residual Value, a potential future expense, is the net worth of a building at the end of the analysis time frame. Since the LCCA analysis includes a period of 60 years with a significantly depreciated asset coupled with the affect of discount rate, residual value even if computed would be negligible. Consequently, a zero residual value has been used.

Time

The second component of a life cycle cost analysis is time. The study time frame covers the design and construction period as described in the paragraphs above and the intended life of the facility. For this analysis, the intended life of the facility has been set at 60 years. The base year is 2011 with the period of analysis extending to 2070.

Calculation of Present Value

The third and last component of the life cycle cost analysis the calculation of the present value of all initial and future expenses. Present value is defined as the time-equivalent value of present or future cash flows as of the beginning of the base year. Future expenses are “discounted” based on a discount rate. For this analysis the real discount rate is used. This rate excludes the rate of inflation and is defined as the rate of interest reflecting the county’s (i.e., county taxpayer’s) time value of money. Basically, a given amount of money available today has a higher value than the same amount available at a later day. Money available today could be invested or spent in an alternative use by taxpayers. The discount rate is intended to reflect this value. As costs are incurred at varying times, it is important that they be converted to their value at a common point in time. For this analysis the base year is assumed to be 2011 and the discount rate applied to the cash flows is seven percent, King County’s established OMB standard rate.

Once all pertinent costs have been identified and discounted to their present value, the costs are summed to generate the total life cycle cost.

Superior Court Targeted Juvenile and Family Law Facilities Master Plan

Life Cycle Cost Analysis Results

A LCCA was completed for each of the six scenarios as well as on a Baseline scenario. The Baseline scenario continues the current facility operations over the project life. A total Net Present Value (NPV) for the entire analysis was determined. The NPV was then further defined as on NPV for capital costs and the NPV for non-capital costs. The annual equivalent NPV costs for the entire analysis as well as the capital and non-capital costs are presented. The annual equivalent represents the stream of payments, expressed in current dollars that have the same value as a lump sum payment. The summary of the results are reported in Table 52 below.

Table 52 Life Cycle Cost Analysis – Alder Scenarios

	Alder Courtrooms - 2032	NPV	Capital	Non-capital	Annual Equivalent		
					NPV	Capital	Non-capital
Scenario 1	7	\$90.3	\$45.8	\$44.6	\$6.6	\$3.4	\$3.3
Scenario 2	10	\$107.5	\$60.7	\$46.8	\$7.9	\$4.5	\$3.4
Scenario 4	8	\$96.8	\$53.0	\$43.8	\$7.1	\$3.9	\$3.2
Scenario 5	11	\$114.2	\$66.3	\$47.9	\$8.4	\$4.9	\$3.5
Scenario 5.5	17	\$141.2	\$85.3	\$55.9	\$10.4	\$6.3	\$4.1
Scenario 6	21	\$159.4	\$100.7	\$58.7	\$11.7	\$7.4	\$4.3
Baseline	7	\$50.3		\$50.3	\$3.7	\$0.0	\$3.7

Generally, the preferred alternative should be the alternative with the lowest annual equivalent cost that can provide the required benefit. As shown in Table 47 all scenarios have an annual equivalent cost greater than the Baseline with Scenario 1 having the lowest annual equivalent cost. Four scenarios, Scenarios 1 through 5, have a lower capital NPV as they use existing courtrooms in the KCCH. These same scenarios have a lower non capital NPV than the Baseline. Even though these scenarios incur off-site leasing costs, lower non capital costs are in large part due to the estimated lower operating and maintenance costs for the new facilities. Both Scenario 5.5 and 6 non-capital costs have been offset by rental revenues received for vacated space in the KCCH. It is assumed that 18,000 sq. ft. will be vacated in Scenario 5.5 and 40,000 sq. ft will be vacated in Scenario 6.

To complete the LCCA, a sensitivity analysis was performed. A sensitivity analysis is a technique used to identify which input values have the greatest impact on the economic evaluation. The analysis simply changes the value of one input up or down, holding all others constant, and then recalculates the net present value.

As shown in Table 48 below, the first sensitivity analysis retains for county use all available land at the Alder site. The value of the land sale ranges from \$6.4 million for Scenario 6 to \$16 million for Scenario 1. This change increases the NPV for all scenarios. For Scenarios 1 through 5 the increase is from eight to 12 percent. For Scenarios 5.5 and 6, the increase was from three to four percent. The scenario ranking by NPV remains unchanged. However, scenarios 1 through 5 became more expensive relative to Scenarios 5.5 and 6 as the loss of offsetting revenues had a greater impact on their total cost.

Superior Court Targeted Juvenile and Family Law Facilities Master Plan

The second sensitivity analysis lowers the real discount rate from seven percent to two percent (the approximate cost of tax exempt long-term borrowing). Higher discount rates reduce the NPV of future costs and therefore favor scenarios with lower initial costs and higher future costs. Lowering the discount rate to two percent makes future costs more equal to initial costs and thus favors scenarios with high initial costs and lower future costs. As detailed in Table 53, lowering the discount rate to two percent increases the NPV for all scenarios by more than 90 percent. The scenario ranking by NPV remains unchanged.

A fourth sensitivity analysis lowers the KCCH rental value to \$0 to mirror the potential that rental of the KCCH may not be possible with portions of the facility left vacant.

Table 53 Life Cycle Cost Analysis – Alder Scenarios – Sensitivity Analysis

NPV (Millions\$)	LCCA Analysis	Sensitivity Analysis I	Sensitivity Analysis II	Sensitivity Analysis III	Sensitivity Analysis IV
		Defer Land Value	Low Discount rate	Low construction Inflation	w/o \$24 in rental values
Assumptions					
-Construction inflation near term	15.76%	15.76%	15.76%	0.00%	15.76%
-General inflation	3.00%	3.00%	3%	3%	3%
-Real discount rate	7.00%	7.00%	2%	7%	7%
Scenario 1	\$90.3	\$101.3	\$172.3	\$83.1	\$86.2
Scenario 2	\$107.5	\$116.9	\$206.6	\$98.0	\$105.5
Scenario 4	\$96.8	\$107.0	\$187.0	\$88.4	\$94.3
Scenario 5	\$114.2	\$123.1	\$218.7	\$103.7	\$112.7
Scenario 5.5	\$141.2	\$147.1	\$279.5	\$127.7	\$144.4
Scenario 6	\$159.4	\$163.7	\$308.6	\$143.5	\$167.4
Baseline	\$50.3	\$50.3	\$120.9	\$50.3	\$46.2

Interpretation of the LCCA and some limitations

The results from the LCCA for the six scenarios provide valuable information that should be considered in concert with other quantitative and qualitative measures. Further, there are cautions in interpretation of the relative size of each scenario and possible assumption that the lowest LCC (Life Cycle Cost) is necessarily better.

Although the six scenarios have been packaged in a manner attempting to provide equivalent capabilities relative to current and forecasted activity levels, each scenario has unique qualitative factors that should be considered in concert with quantitative factors such as LCCA. Each scenario addresses the Operational Master Plan (OMP) objectives differently. For example, the scenarios with the smallest life cycle cost estimates continue the current Superior Court operations and housing of juvenile law matters separately from family law matters. The scenario with the highest life cycle cost estimate, requiring the largest new facility, completely addresses the facility objectives of the OMP.

Superior Court Targeted Juvenile and Family Law Facilities Master Plan

Quality of Estimates

While there has been a diligent effort to capture the significant cost (and any offsetting revenue) considerations for all scenarios and to estimate appropriate values for those projected costs, it is important to note that there are limitations in the level of completeness and accuracy.