

The X Filed and Building Construction Site Approval

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Abstract — *The Facility Division is currently having an engineering problem considering a site approval for construction. The engineering department need to analyze two locations and determine which one is better for the construction of The X Field and Building, taking into consideration the budget constraint of \$2 Million. The methodology used during the site approval process was a feasibility analysis to compare the topography and utilities connections of the location, cost analysis to estimate the labor and material cost of constructing in each site respectively, pros and cons analysis, and a weighted decision matrix. After analyzing the data and following the stablished methodology the engineering department determined that site #2 is the best location for the site approval for construction. Now, the design phase of the project can begin.*

Key Terms — *decision process, feasibility analysis, construction planning, cost analysis, pros and cons analysis, site approvals, weighted decision matrix.*

INTRODUCTION

Site approvals is an engineering management problem very common in construction planning. The Site Approval process is extremely important when determining location feasibility, cost, pros & cons, and getting conclusions. Therefore site approvals greatly help to make correct decisions in a construction project. Currently there is an engineering management problem considering a site approval for The X Field and Building construction. This construction is important and needs to be completed before December 31, 2020. Extensive precaution needs to be taken on the

location selection for this construction, because of a constraint of \$2,000,000.00 budget for construction.

Currently there are two possible sites for The X Field and Building Construction. The main objective of this project is to provide enough information in order to make the correct site selection and approval so the design and construction phase can begin.

ANALYSIS APPROACH

Feasibility Analysis

The feasibility analysis performed included a topography analysis, site preparation analysis, and a utility connection analysis. For the topography analysis the contour maps of both locations were analyzed. A site survey was performed to determine the elevations in the terrain and calculate how much dirt work needs to be performed in order to make the location flat and appropriate for construction.

The site preparation for this construction will include grading, excavation, and compacting. The analysis of the maps and the site survey will be very helpful to determine if these actions are possible in the location and how easily is to perform it.

To make sure that the location has water, sewer, and electricity connections available for the construction the utility plans were analyzed and a site survey was performed.

Cost Analysis

The cost analysis to be performed will provide labor and material cost estimation in order to determine if the construction in both sites respectively will be feasible under the \$2,000,000.00 budget constraint.

Additionally, to determine if the construction can be feasible under the \$2,000,000.00 budget constraint, the cost will be analyzed in order to determine which location is more cost effective for construction.

Pros and Cons Analysis

Both stakeholders and users will meet with the engineers to analyze the pros & cons of each location. This pros & cons will serve as criteria for the Weighted Decision Matrix.

Weighted Decision Matrix

After analyzing all the pros & cons of each location respectively and having developed and discussed the criteria with the stakeholders and the users, the weights for each criterion in the decision matrix will be established.

RESULTS

Feasibility Analysis

Site 1 will not require buying of ground because the area location for the construction in this site is almost flat. However, there is concrete in the ground that need to be removed before construction. Excavation, grading, and compacting is possible in this site. Water and electrical connections are available in this location. However, the sewer line that shows in the plans is actually unusable and filled with concrete.

Site 2 will have heavy dirt work, but instead buying ground we can use the ground present in the terrain. The plan is to move the ground all over the area of construction in order to make it flat. This location provide availability for water, electricity, and sewer connections.

Cost Analysis

After analyzing the data, the calculated estimated cost to construct The X Field and the Building in Site 1 is \$1,402,546.95. This makes the location feasible for construction under the budget constraint of \$2 Million. The calculations performed for the cost analysis are presented in

Table 1, including the labor and materials required for the construction.

Table 1
Site 1 Cost Analysis

Description			Total
	Labor	Materials	
Site Construction	\$6,686.00	\$17,928.00	\$24,614.00
Concrete	\$5,116.00	\$10,476.00	\$15,592.00
Finishes	\$10,336.00	\$7,984.00	\$18,320.00
Building	\$100,000.00	\$900,000.00	\$1,000,000.00
OH&P (15%)			\$158,778.90
Bonds (2.5%)			\$26,463.15
Unforeseen (15%)			\$158,778.90
Total Estimate			\$1,402,546.95

After analyzing the data, the calculated estimated cost to construct The X Field and the Building in Site 2 is \$1,433,359.89. This makes the location feasible for construction under the budget constraint of \$2 Million. The calculations performed for the cost analysis are presented in Table 2, including the labor and materials required for the construction.

Table 2
Site 2 Cost Analysis

Description	Labor	Materials	Total
Site Construction	\$13,140.00	\$12,301.00	\$25,441.00
Concrete	\$4,618.00	\$8,097.00	\$12,715.00
Finishes	\$16,150.00	\$12,475.00	\$28,625.00
Building	\$115,000.00	\$900,000.00	\$1,015,000.00
OH&P (15%)			\$162,267.15
Bonds (2.5%)			\$27,044.53
Unforeseen (15%)			\$162,267.15
Total Estimate			\$1,433,359.83

Table 3
Site 1 Pros & Cons

Pros	Cons
Flatter site	Distance
Parking	Service Compromised
Lower cost	utility connections

After meeting with the stakeholders and the users the following pros of construct in Site 2 were determined: the area is closer to their current operational building, the services they provide will not be compromised, and the location have availability to water, electric, and sewer connections. However, this location does not have close parking included and the construction will have a higher cost. The criteria developed for Site 2 can be observed in Table 4.

Table 4
Site 2 Pros & Cons

Pros	Cons
Close Proximity	No parking
Service uncompromised	Higher cost
utility connections	

Pros and Cons Analysis

After meeting with the stakeholders and the users the following pros of construct in Site 1 were determined: area is flatter, it has close parking included, and the construction will have lower cost. However, this site is distant from their operational working building. This distance will cause delay in the services provided. In addition, this location does not have sewer connections which means that a lot of piping will be needed to connect it to a distant sewer. The Pros and Cons criteria is presented in Table 3.

Weighted Decision Matrix

Using the criteria of the Pros and cons analysis, a weighted decision analysis was developed. Constant communication with the stakeholders and the users were helpful make sure of using the correct weights for each criterion according its importance. In Table 5 the criterion, its respective weights, and the total points each site obtain respectively can be observed.

Table 5
Weighted Decision Matrix

Criteria	Weights	Options			
		Site 1		Site 2	
		Score	Total	Score	Total
Cost ≤ \$2,000,000 (cost effective)	5	5	25	4	20
Parking	2	5	10	1	2
Location	4	3	12	5	20
Utilities	4	4	16	4	16
Mission (uncompromised)	5	2	10	5	25
Running track	1	0	0	0	0
Total			73		83

managers to make sure that what was presented in the maps was in fact present in the locations. The research for market price performed during the cost analysis was an excellent tool to determine the feasibility of the locations regarding the constraint of construction under \$2,000,000.00.

This paper will help project managers to develop the appropriate methodology and criteria that will help them select the best option location for construction. Definitely there is more to follow in regarding to the site approval topic. In the future it will be very beneficial to have more accurate plans of the considered locations. This will help to make the process easier and more precise.

CONCLUSION

After rigorously considering all the requirements for construction, Site 2 have been selected for construction. The main objective of this project have been accomplished, which was find the correct location for a construction site approval. Using all the information from the analyses and investigations and applying it in the decision matrix, it is clear that the best option for construction is Site 2 which obtained 83 points while Site 1 just obtained 73 points. Now that the decision have being made and the site approval for construction is completed, the design phase can begin.

This paper has been very useful to understand the site approval process. For example, in this engineering management problem the detailed analyses of both locations maps and the site survey was an extremely helpful tool to compare and determine the better locations with is Pros. In addition, this methodology analysis helps project