Final Report of The Wetland BoardWalks and Trail

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Customer's Original Need, Project Objective, and Final Requirements:

Being the most heavily-used trail in the Stone Valley Recreation Area, the boardwalk installed back in the 80's has seen its fair share of wear and tear. The result being warped boards, shifting base supports, and loose structural elements. Overtime, this has caused great damage to the structural integrity of the boardwalk and made it unsafe to walk on. The existing boardwalk is also not spacious enough to comfortably host wheelchair rest areas and interpretive signage that are crucial for many families that visit Stone Valley. In addition, due to the high traffic seen by this particular trail, the new boardwalk needs to be safer as it currently has a half-foot high lip on each edge instead of railings. Lastly, the existing boardwalk lacks sufficient lighting sources which means users could get lost or hurt themselves in an accident making the trail dangerous to use at night.

The project objective is to install a new 1/4 mile boardwalk that is durable, safe, weather-resistant, ADA accessible, has 2.5ft railings, emergency blue-box phones and is 20% wider than the existing one within the agreed upon budget and project schedule of 6 weeks from the start date.

As stated in the RFP, the customer's 3 main final requirements are removal of existing boardwalk, boardwalk replacement trail, signage replacement and wetlands viewing area. Removal of the existing boardwalk requires closing the boardwalk and adjacent trail in a manner that protects the surrounding wildlife and wetlands area. The boardwalk trail replacement requires securing the necessary lighting and construction permits in order to begin construction of the boardwalk and viewing area as well as installation of emergency lights. Lastly, the signage needs to be replaced/installed throughout the boardwalk trail to provide directions to the wetland boardwalk, adjacent trails, parking areas, etc. In addition to this, the contractor must also provide construction details to sufficiently complete the project and indicate methods of construction. Lastly, the contractor will be responsible for site logistics such as coordinating staging, parking traffic control, clean up and haul-off, and all other site related issues.

Description of Project:

The 4 stages of the Stone Valley boardwalk project are demolition and removal of existing boardwalk, construction of the new boardwalk, construction of railings & viewing areas, installation of lighting and updating signage. Demolition of the existing boardwalk is the first necessary step for creating a more durable and spacious ADA accessible boardwalk trail. Some of the goals for a successful removal of the boardwalk are getting it accomplished quickly, removing the previous components sustainably and safely, and preparing the area for the new boardwalk to be placed. The timeline for removing the existing boardwalk is critical, especially to meet the 6-week requirement of the project. In order to get the task accomplished quickly, the team must properly close the trail and tape off the surrounding area two weeks prior to demolition. This will begin by notifying the patrons of the park that this area will be closing on a certain date by using the park newsletter program. After notifying the public, the construction team will begin to block off the trail on the day that construction begins. Signage will also be

brought in to warn patrons from entering onto the boardwalk. In addition, signs will be placed in the nearby parking lot, as well as parking spaces closed off. Now, the demolition and removal of the existing boardwalk can begin. While the public is being notified and the existing boardwalk is being removed, the structural engineer, project manager, and a biologist will inspect the area to develop a construction, railing, viewing area, lighting and signage plan. The team will collaborate to devise their plan for where to construct the boardwalk to maximize safety and minimize damage to the wetland environment. The structural engineer and biologist will then bring their plan to the authorities to apply for a permit. This will allow for the two specialists to give their reasoning for the efficacy of the project. Once the boardwalk has been successfully removed and disposed of by the contracted waste management company and the construction permit has been received, then the structural engineer and construction team will begin the process of building the boardwalk. Building the boardwalk will be the most time-consuming of the 4 stages in this project. Before any construction takes place, a pre-construction meeting will be held, led by the project manager and structural engineer to brief the construction team on how the boardwalk is going to be built. The team will also be using the laydown areas provided by the SVRA to store all of the equipment and material throughout the course of the project. Construction begins by placing the concrete supports that the team has chosen to use, for their durability, in the wetlands area. After the concrete supports have set, pressure-treated boards will be placed along the trail. The main trial is going to be built first, with the railing and viewing areas being tackled after. Once the main trail has been built, the structural engineer will conduct a series of tests to verify that it is safe for patrons and begin the installation of railings. Next, the viewing area will be constructed, with concrete supports going in first, followed by the wooden boards. Once these viewing areas have been built, the remaining railings will be installed followed by more testing done by the structural engineer. Then, an educator will be contacted to begin the process of updating signs along the trail. This will be done in conjunction with adding emergency lighting throughout the trail once the railing and viewing area have been built, then the team can contact the waste management company to begin cleaning up the area along the trail. Once the educator has created and updated the signage for the boardwalk, the team can start placing these signs throughout the trail with the presence of the educator to notify them where each sign goes. Once all signage has been placed, the team can clean up the area so the structural engineer and project manager can do some final inspections. Once the boardwalk has passed these final inspections, it is ready for patrons to begin using it. The team will utilize the park newsletter to then inform all park members that the boardwalk trail is now open, and park employees will be stationed to take on the upkeep from this point forward.

Degree to which Scope Met Objectives:

The original scope of the project was determined at the beginning of the project based on the customer's needs. After completing the boardwalk and handling issues that arose along the way, it is important to look back on what aspects of the project scope were accomplished. To the delight of the team and the stakeholders, many aspects were successfully completed. Among the broad components of the project scope was to design a more stable boardwalk while preserving

the surrounding nature. This goal was ultimately accomplished, largely due to the work of the structural engineer and biologist. The structural engineer confirmed the boardwalk's durability, and the biologist made sure that no wildlife was permanently damaged. Other aspects of the project scope were to include a wheelchair-accessible viewing area of Lake Perez, add signage around the trail to learn about the area, and increase the height of the railings for added safety. Much like the broad scope of the project, these smaller components were all accomplished. The viewing area was such a vital part of the project scope that it demanded its own section of the project schedule. Adding the railings was an important aspect that greatly increased the safety of the boardwalk area. In addition, the signage around the boardwalk was included at the end of our project schedule, and allows for patrons to learn about the area throughout their walk. Another important aspect of project scope was making our boardwalk weather resistant. Pressure-treated wooden planks were used, and the signage and emergency lighting throughout the trail was made to resist weather from a strong storm. One aspect of our project where the project scope was not met was in using wood chips on the trail where necessary. As the team was concerned, they may have washed away from inclement weather. Therefore, the team kept the wooden boardwalk throughout the whole trail.

Budget:

The original project budget was estimated to be around $850,000. This value was estimated by saying that the labor cost would be 30% of the total, material cost would also be 30%, equipment/facilities cost about 15%, travel cost as 10%, and documentation also as 10%. Demolition and installation estimates used the total square footage and linear footage of the old and new boardwalk per specific rates. For example, based off of other boardwalk installations similar to our boardwalk, at a rate of $92 / SQFT, the total cost would be around $670,000. Adding all of the other costs mentioned before, the estimated total was brought around $850,000. Due to our money-saving strategies and properly managed resources, the cost of the project came in below the estimated cost. The cost of the project was a total of almost $719,000, $131,000 less than the original budget. The project was originally overbudgetted. This was due to the fact that the projected costs of the equipment/facilities and documentation were not as expensive as expected. For the facilities cost, we were able to keep most of all the material on-site, rather than an offsite facility. This saved us lots of money, resulting in a cheaper project.

Schedule:

The project schedule achieved what was laid out in the original objective. The project had a requirement of completing the project in 6 weeks after the start date and within that timeline the project schedule checked off everything that the project objective mentioned with time to spare. The project schedule was able to be completed 3 days prior to the maximum limit of 30 days. This was due to the sophisticated strategies we thought of to determine how many days each task was going to take and how long we wanted to allocate to each summary task. These strategies included discussing each task within our team to determine how long we believed the

task would take to complete. Also, doing research upon the different tasks we created to see the average time period it took to complete a task such as “inspect the site,” which we determined would take 2 days. From the discussions we had and the input we were able to collect from the research we conducted we were able to create our project schedule that meets the objectives of this project and stayed below the maximum limit of days to complete the project.

Actual vs. Anticipated Benefits:

Throughout the duration of the project, the team ran into many challenges that had to be resolved to result in a successful project. One of the most difficult challenges faced by the team was navigating the wetlands area. Before beginning the construction, the structural engineer and biologist conducted a survey of the area to make sure the boardwalk would not damage the surrounding wildlife, and vice versa. A challenge was encountered when the biologist noticed some delicate plants that were native to the area, and endangered from modern development. The team chose to wind the trail around that area, causing a larger material cost and labor time, to preserve the area. The area now features signage explaining the wildlife in that sector, and is expected to be one of the highlights of the trail. Another challenging aspect of the project scope was to make the trail wheelchair accessible. This was exceptionally difficult to accomplish for the viewing area, because there were stairs that lead to the area. The team chose to include an accessible ramp in the viewing area to make it ADA compliant, even though adding the ramp increased the cost of the project. Since it was an important aspect to the project stakeholders, we decided to follow through with that decision. The team ran into some challenges with the budget because no contingency budget was allocated on the project. Therefore, when unforeseen circumstances arose, it caused the budget to be increased. For example, the team did not allocate payment to the biologist in the budget. When the team realized the area needed to be surveyed by a specialist in order to preserve the wildlife, it caused the budget to increase. Having a contingency budget in this situation would have solved this issue.

Future Considerations:

The lessons learned from the project is that we could have communicated consistently throughout the project. Providing weekly or biweekly updates of how the project is going, and gaining quick feedback from the customer that could be used to correct any work performance right away. Also, working more closely with stakeholders such as construction, demolition and installation workers as well as material suppliers to create a more accurate RFP budget.

Future considerations that might want to be considered in the future to enhance or expand the project results are a covered wetland teaching pavilion. Converting the new signage to have the capabilities of using solar technology for lighting to provide high visibility. Investing in educational technology to complement and enhance the knowledge that can be gained from coming to this boardwalk. For example, using Ipads (have to be weatherproofed and will need a power supply) to display information will allow patrons to easily update signage without the use of new materials as new plants and flowers bloom. Also, a weather station, digital sensors, trail

cameras, stream tables, and more for measuring environmental conditions, collecting and analyzing data and integrating scientific methods. Glow in the dark lining (similar to those on airplanes) on the edges to save costs on lighting and make the boardwalk more sustainable.

Deliverables:

1.) Deliverable 2: Work Breakdown Structure and Activities List
Information can be found in Figures 1-2 in the Appendix.
2.) Deliverable 3: Activity Durations and Critical Path
Information can be found in Figures 3-5 in the Appendix.
3.) Deliverable 4: Resource Requirements, Costs, Budget, and Risk Assessment Matrix
Information can be found in Figures 6-9 in the Appendix.

This is an additional list of deliverables that are important to mention as well.

a) Permits: provide copies of building permits
b) Boardwalk demolition plan (submitted in electronic and paper copy)
c) Boardwalk construction drawings (submitted in electronic and paper copy)
d) Design drawings and calculations: Provide drawings and all calculations used to arrive at the final design including a description explaining all work.
e) Existing boardwalk demolition
f) Boardwalk Trail new construction to include boardwalk, viewing area, emergency lighting and required signage
g) Statement of inspection results
h) Stakeholder site visit, walk through for final approvals
i) Final report

Final Acceptance Testing:

To verify the success of the team's boardwalk, testing was conducted to meet the acceptance criteria established by the stakeholders, shown in Table (1) Testing Descriptions which can be found in Appendix. Structural testing was conducted on the boardwalk and the railings, because safety of the boardwalk patrons is paramount to the team's success. The weather-resistance of the pressure treated wooden planks was also tested, to make sure that the boardwalk can withstand inclement weather. Lastly, Safety and electrical testing was conducted to verify that the emergency lighting is functional and safe to patrons.

Appendix:

Table 1: Testing Descriptions

	Structural Testing on the Boardwalk	Weather-Resistance Testing	Safety & Electrical Testing	Structural Test on Railing
Description of Test	A load of 1000 lbs was applied to an area of the boardwalk that is at the furthest point from a vertical support beam. This testing covers a safety factor of 5 considering a person weighing 200 pounds.	This test involves checking how the material of the boardwalk will perform in different weather conditions. This includes rain, snow, low and high temperature changes, etc.	This test will ensure all the wiring for electrical devices such as lighting and emergency boxes are properly waterproofed to prevent electrocution hazards and short circuits.	A load of 500 lbs was applied normal to the railing, at the furthest distance from the bottom of the railing. The value was chosen to allow for a safety factor of 2.5 from a person weighing 200 pounds.
Results	The wooden plank retained 98% of its rigidity throughout the duration of the load being applied.	The material of the boardwalk was able to outperform 4 out of the 5 different weather conditions that it was tested under. It did not perform well in the weather conditions for ice.	There was no loose wiring throughout the boardwalk after the final check and all the wiring was properly stored and waterproofed.	The aluminum cable railings retained 94% of its rigidity throughout the duration of the load being applied.
Long-term	Steady-state creep testing is being conducted in hopes of detecting a creep-related structural failure.	Wooden planks will be removed and tested occasionally to detect weather related failures before they are detrimental.	The wiring for lighting devices and emergency boxes will be checked annually at the same time these devices undergo their maintenance.	Steady-state creep testing is being conducted on the railings as well.

Figure 1: Boardwalk Installation Project Schedule

Task Mode	Task Name	Duratio	Start	Finish
	Stone Valley Boardwalk Replacement	**27 days**	**Mon 5/17/**	**Tue 6/22/2**
	Stone Valley Boardwalk Replacement	**27 days**	**Mon 5/17/21**	**Tue 6/22/21**
	Engineering Designs and Permits	**6 days**	**Mon 5/17/21**	**Mon 5/24/21**
	Inspect the site	2 days	Mon 5/17/21	Tue 5/18/21
	Develop Boardwalk Construction plan & apply for perr	3 days	Wed 5/19/21	Fri 5/21/21
	Develop Railing and Viewing Area Plan and Submit for	2 days	Wed 5/19/21	Thu 5/20/21
	Develop a demolition plan and Submit for Approval	2 days	Wed 5/19/21	Thu 5/20/21
	Develop Lighting and Signage Plan and Submit for App	1 day	Wed 5/19/21	Wed 5/19/21
	Obtain construction and lighting permit	1 day	Mon 5/24/21	Mon 5/24/21
	Obtain Lighting and Signage plan Approval	1 day	Thu 5/20/21	Thu 5/20/21
	Obtain customer approval for railing and viewing area	1 day	Fri 5/21/21	Fri 5/21/21
	Obtain customer approval for the demolition plan	1 day	Fri 5/21/21	Fri 5/21/21
	Obtain customer approval for the construction plan	1 day	Mon 5/24/21	Mon 5/24/21
	Existing Boardwalk Demolition	**5 days**	**Wed 5/19/2**	**Tue 5/25/21**
	Notify public & close trail and surrounding areas	1 day	Wed 5/19/21	Wed 5/19/21
	Demolish existing boardwalk	2 days	Mon 5/24/21	Tue 5/25/21
	New Boardwalk Construction	**7 days**	**Wed 5/26/2**	**Thu 6/3/21**
	Prepare the construction site	2 days	Wed 5/26/21	Thu 5/27/21
	Conduct a pre-construction meeting	1 day	Wed 5/26/21	Wed 5/26/21
	Install the new boardwalk	3 days	Fri 5/28/21	Tue 6/1/21
	Test the new boardwalk	2 days	Wed 6/2/21	Thu 6/3/21
	Boardwalk Railing and Viewing Area Construction	**4 days**	**Wed 6/2/21**	**Mon 6/7/21**
	Conduct boardwalk railing pre-installation & pre-construction meeting	1 day	Wed 6/2/21	Wed 6/2/21
	Install railings & construct the viewing area	2 days	Thu 6/3/21	Fri 6/4/21
	Test railings and viewing area	1 day	Mon 6/7/21	Mon 6/7/21
	Boardwalk Emergency Lighting and Signage	**7 days**	**Fri 6/4/21**	**Mon 6/14/21**
	Prepare the boardwalk for installation of lighting & sig	2 days	Fri 6/4/21	Mon 6/7/21
	Conduct pre-installation meeting	1 day	Fri 6/4/21	Fri 6/4/21
	Install emergency lighting & update signage	3 days	Tue 6/8/21	Thu 6/10/21
	Test emergency lighting & verify signage	2 days	Fri 6/11/21	Mon 6/14/21
	Final Inspections, Approvals, and Report	**6 days**	**Tue 6/15/21**	**Tue 6/22/21**
	Pass structural tests and inspections	2 days	Tue 6/15/21	Wed 6/16/21
	Clean and remove all material from the site	2 days	Thu 6/17/21	Fri 6/18/21
	Conduct the final stakeholder site visit and obtain cust	1 day	Mon 6/21/21	Mon 6/21/21
	Submit Inspection Results and Final Report	1 day	Tue 6/22/21	Tue 6/22/21

Figure 2: Boardwalk Installation Project Schedule with Total Slack

	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Successors	Late Start	Late Finish	Total Slack
0		**Stone Valley Boardwalk Replacement**	**27 days**	**Mon 5/17/2**	**Tue 6/22/21**			**Mon 5/17/21**	**Tue 6/22/21**	**0 days**
1		**Stone Valley Boardwalk Replacement**	**27 days**	**Mon 5/17/21**	**Tue 6/22/21**			**Mon 5/17/21**	**Tue 6/22/21**	**0 days**
2		**Engineering Designs and Permits**	**6 days**	**Mon 5/17/21**	**Mon 5/24/21**			**Mon 5/17/21**	**Tue 6/8/21**	**0 days**
3		Inspect the site	2 days	Mon 5/17/21	Tue 5/18/21		6,4,7,5,14,15	Mon 5/17/21	Tue 5/18/21	0 days
4		Develop Boardwalk Construction plan & apply for permits	3 days	Wed 5/19/21	Fri 5/21/21	3	12,8	Thu 5/20/21	Mon 5/24/21	1 day
5		Develop Railing and Viewing Area Plan and Submit for Approval	2 days	Wed 5/19/21	Thu 5/20/21	3	10,22,23	Fri 6/4/21	Mon 6/7/21	12 days
6		Develop a demolition plan and Submit for Approval	2 days	Wed 5/19/21	Thu 5/20/21	3	11	Wed 5/19/21	Thu 5/20/21	0 days
7		Develop Lighting and Signage Plan and Submit for Approval	1 day	Wed 5/19/21	Wed 5/19/21	3	9,26	Wed 6/2/21	Wed 6/2/21	10 days
8		Obtain construction and lighting permit	1 day	Mon 5/24/21	Mon 5/24/21	4	17	Tue 5/25/21	Tue 5/25/21	1 day
9		Obtain Lighting and Signage plan Approval	1 day	Thu 5/20/21	Thu 5/20/21	7	26	Thu 6/3/21	Thu 6/3/21	10 days
10		Obtain customer approval for railing and viewing area plan	1 day	Fri 5/21/21	Fri 5/21/21	5	22,23	Tue 6/8/21	Tue 6/8/21	12 days
11		Obtain customer approval for the demolition plan	1 day	Fri 5/21/21	Fri 5/21/21	6	15	Fri 5/21/21	Fri 5/21/21	0 days
12		Obtain customer approval for the construction plan	1 day	Mon 5/24/21	Mon 5/24/21	4	17	Tue 5/25/21	Tue 5/25/21	1 day
13		**Existing Boardwalk Demolition**	**5 days**	**Wed 5/19/21**	**Tue 5/25/21**			**Fri 5/21/21**	**Tue 5/25/21**	**0 days**
14		Notify public & close trail and surrounding areas	1 day	Wed 5/19/21	Wed 5/19/21	3	15	Fri 5/21/21	Fri 5/21/21	2 days
15		Demolish existing boardwalk	2 days	Mon 5/24/21	Tue 5/25/21	11,3,14	17,18	Mon 5/24/21	Tue 5/25/21	0 days
16		**New Boardwalk Construction**	**7 days**	**Wed 5/26/21**	**Thu 6/3/21**			**Wed 5/26/21**	**Thu 6/3/21**	**0 days**
17		Prepare the construction site	2 days	Wed 5/26/21	Thu 5/27/21	15,8,12	19	Wed 5/26/21	Thu 5/27/21	0 days
18		Conduct a pre-construction meeting	1 day	Wed 5/26/21	Wed 5/26/21	15	19	Thu 5/27/21	Thu 5/27/21	1 day
19		Install the new boardwalk	3 days	Fri 5/28/21	Tue 6/1/21	18,17	20,23,22	Fri 5/28/21	Tue 6/1/21	0 days
20		Test the new boardwalk	2 days	Wed 6/2/21	Thu 6/3/21	19	26,27,31	Wed 6/2/21	Thu 6/3/21	0 days
21		**Boardwalk Railing and Viewing Area Construction**	**4 days**	**Wed 6/2/21**	**Mon 6/7/21**			**Wed 6/9/21**	**Mon 6/14/21**	**5 days**
22		Conduct boardwalk railing pre-installation & pre-construction meeting	1 day	Wed 6/2/21	Wed 6/2/21	5,10,19	23	Wed 6/9/21	Wed 6/9/21	5 days
23		Install railings & construct the viewing area	2 days	Thu 6/3/21	Fri 6/4/21	22,19,5,10	24	Thu 6/10/21	Fri 6/11/21	5 days
24		Test railings and viewing area	1 day	Mon 6/7/21	Mon 6/7/21	23	31	Mon 6/14/21	Mon 6/14/21	5 days
25		**Boardwalk Emergency Lighting and Signage**	**7 days**	**Fri 6/4/21**	**Mon 6/14/21**			**Fri 6/4/21**	**Mon 6/14/21**	**0 days**
26		Prepare the boardwalk for installation of lighting & signage	2 days	Fri 6/4/21	Mon 6/7/21	20,7,9	28	Fri 6/4/21	Mon 6/7/21	0 days
27		Conduct pre-installation meeting	1 day	Fri 6/4/21	Fri 6/4/21	20	28	Mon 6/7/21	Mon 6/7/21	1 day
28		Install emergency lighting & update signage	3 days	Tue 6/8/21	Thu 6/10/21	27,26	29	Tue 6/8/21	Thu 6/10/21	0 days
29		Test emergency lighting & verify signage	2 days	Fri 6/11/21	Mon 6/14/21	28	31	Fri 6/11/21	Mon 6/14/21	0 days
30		**Final Inspections, Approvals, and Report**	**6 days**	**Tue 6/15/21**	**Tue 6/22/21**			**Tue 6/15/21**	**Tue 6/22/21**	**0 days**
31		Pass structural tests and inspections	2 days	Tue 6/15/21	Wed 6/16/21	20,24,29	32,33	Tue 6/15/21	Wed 6/16/21	0 days
32		Clean and remove all material from the site	2 days	Thu 6/17/21	Fri 6/18/21	31	33	Thu 6/17/21	Fri 6/18/21	0 days
33		Conduct the final stakeholder site visit and obtain customer fina	1 day	Mon 6/21/21	Mon 6/21/21	32,31	34	Mon 6/21/21	Mon 6/21/21	0 days
34		Submit Inspection Results and Final Report	1 day	Tue 6/22/21	Tue 6/22/21	33		Tue 6/22/21	Tue 6/22/21	0 days

Figure 3: Boardwalk Installation Gantt Chart

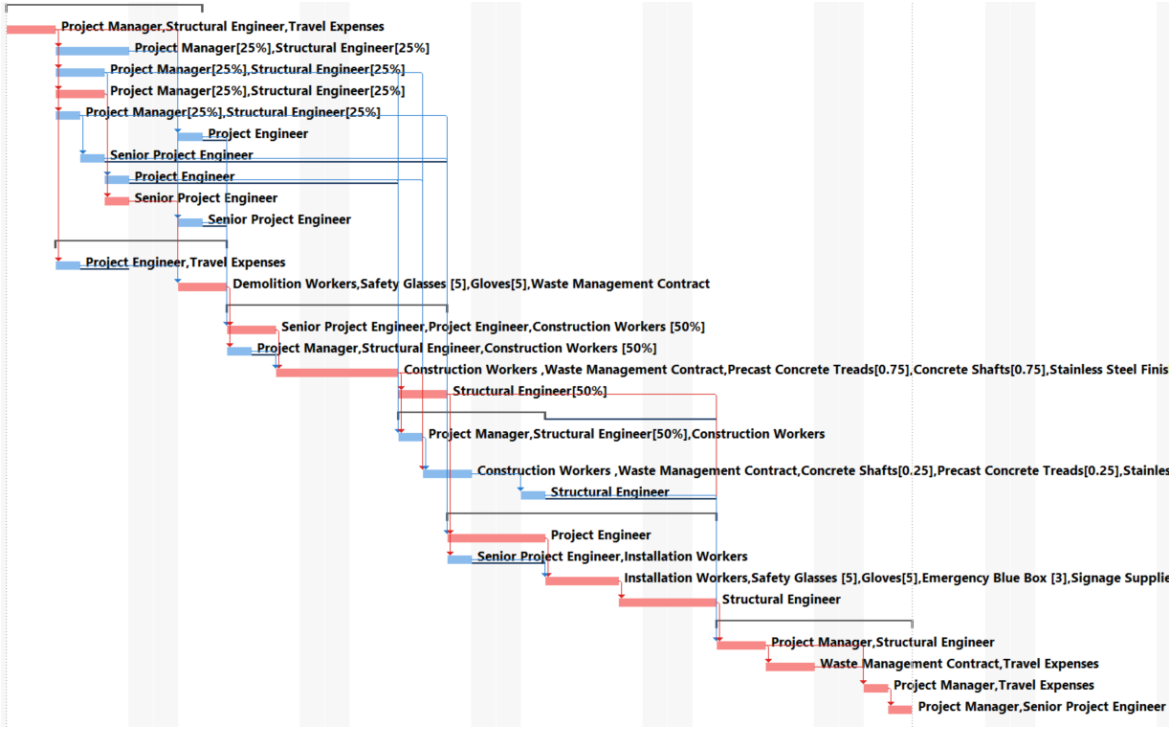


Figure 4: Critical Task Report

CRITICAL TASKS

• Status: Future Task

A task is critical if there is no room in the schedule for it to slip.

Learn more about managing your project's critical path.

Name	Start	Finish	% Complete	Remaining Work	Resource Names
Inspect the site	Mon 5/17/21	Tue 5/18/21	0%	32 hrs	Project Manager,Structural Engineer,Travel Expenses
Develop a demolition plan and Submit for Approval	Wed 5/19/21	Thu 5/20/21	0%	8 hrs	Project Manager[25%],Structural Engineer[25%]
Obtain customer approval for the demolition plan	Fri 5/21/21	Fri 5/21/21	0%	8 hrs	Senior Project Engineer
Demolish existing boardwalk	Mon 5/24/21	Tue 5/25/21	0%	32 hrs	Demolition Workers,Safety Glasses [5],Gloves[5],Waste Management Contract
Prepare the construction site	Wed 5/26/21	Thu 5/27/21	0%	40 hrs	Senior Project Engineer,Project Engineer,Construction Workers [50%]
Install the new boardwalk	Fri 5/28/21	Tue 6/1/21	0%	48 hrs	Construction Workers ,Waste Management Contract,Precast Concrete Treads[0.75],Concrete Shafts[0.75],Stainless Steel Finishing [0.75],Construction Nails [0.75],Hammer[5],Adjustable Wrench[5],Cordless Belt Sander[2],Cordless Circular Saw[2],Cordless Dril...
Test the new boardwalk	Wed 6/2/21	Thu 6/3/21	0%	8 hrs	Structural Engineer[50%]
Prepare the boardwalk for installation of lighting & signage	Fri 6/4/21	Mon 6/7/21	0%	16 hrs	Project Engineer
Install emergency lighting & update signage	Tue 6/8/21	Thu 6/10/21	0%	24 hrs	Installation Workers,Safety Glasses [5],Gloves[5],Emergency Blue Box [3],Signage Supplies [1]
Test emergency lighting & verify signage	Fri 6/11/21	Mon 6/14/21	0%	16 hrs	Structural Engineer
Pass structural tests and inspections	Tue 6/15/21	Wed 6/16/21	0%	32 hrs	Project Manager,Structural Engineer
Clean and remove all material from the site	Thu 6/17/21	Fri 6/18/21	0%	16 hrs	Waste Management Contract,Travel Expenses
Conduct the final stakeholder site visit and obtain customer final approval	Mon 6/21/21	Mon 6/21/21	0%	8 hrs	Project Manager,Travel Expenses
Submit Inspection Results and Final Report	Tue 6/22/21	Tue 6/22/21	0%	16 hrs	Project Manager,Senior Project Engineer

Figure 5: Network Diagram

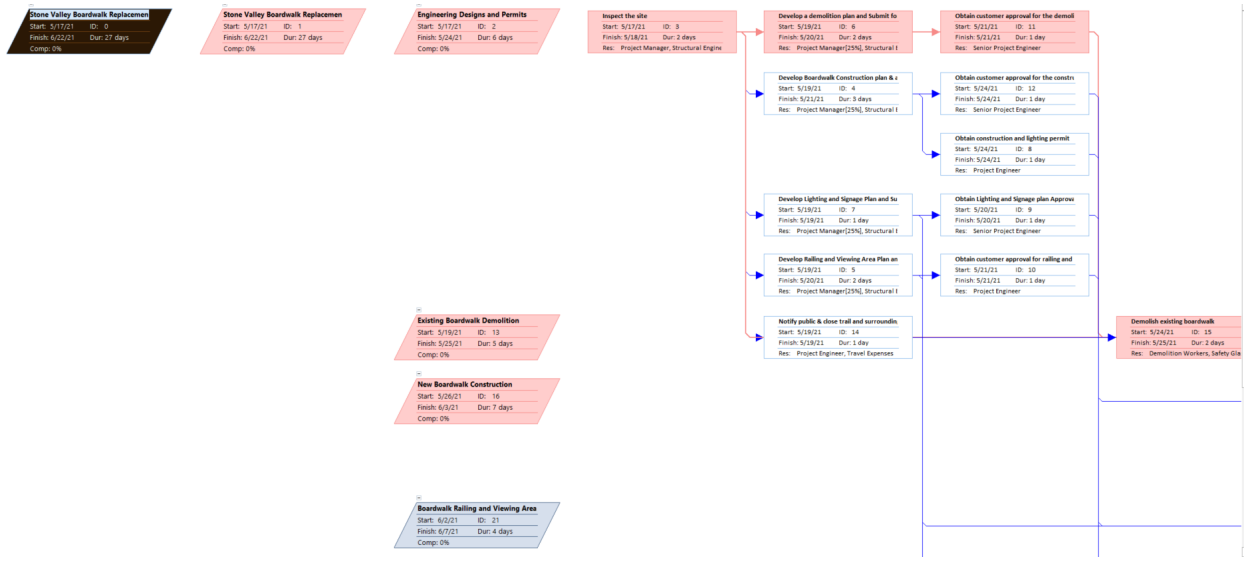


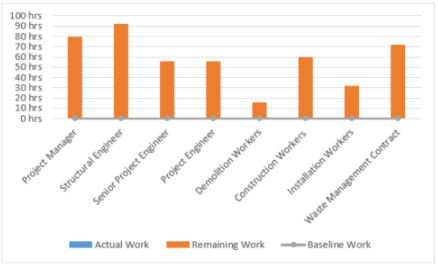
Figure 6: Overallocated Resources Report

Figure 7: Resource Overview Report

RESOURCE OVERVIEW

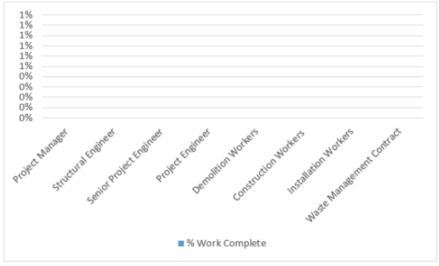
RESOURCE STATS

Work status for all work resources.



WORK STATUS

% work done by all the work resources.



RESOURCE STATUS

Remaining work for all work resources.

Name	Start	Finish	Remaining Work
Project Manager	Mon 5/17/21	Tue 6/22/21	80 hrs
Structural Engineer	Mon 5/17/21	Wed 6/16/21	92 hrs
Senior Project Engineer	Thu 5/20/21	Tue 6/22/21	56 hrs
Project Engineer	Wed 5/19/21	Mon 6/7/21	56 hrs
Demolition Workers	Mon 5/24/21	Tue 5/25/21	16 hrs
Construction Workers	Wed 5/26/21	Fri 6/4/21	60 hrs
Installation Workers	Fri 6/4/21	Thu 6/10/21	32 hrs
Waste Management Contract	Mon 5/24/21	Fri 6/18/21	72 hrs

Figure 8: Resource Usage Sheet

Project Manager	80 hrs	Work
Inspect the site	*16 hrs*	Work
Develop Boardwalk Construction plan & apply for permits	*6 hrs*	Work
Develop Railing and Viewing Area Plan and Submit for Approval	*4 hrs*	Work
Develop a demolition plan and Submit for Approval	*4 hrs*	Work
Develop Lighting and Signage Plan and Submit for Approval	*2 hrs*	Work
Conduct a pre-construction meeting	*8 hrs*	Work
Conduct boardwalk railing pre-installation & pre-construction meeting	*8 hrs*	Work
Pass structural tests and inspections	*16 hrs*	Work
Conduct the final stakeholder site visit and obtain customer final approval	*8 hrs*	Work
Submit Inspection Results and Final Report	*8 hrs*	Work
Structural Engineer	92 hrs	Work
Inspect the site	*16 hrs*	Work
Develop Boardwalk Construction plan & apply for permits	*6 hrs*	Work
Develop Railing and Viewing Area Plan and Submit for Approval	*4 hrs*	Work
Develop a demolition plan and Submit for Approval	*4 hrs*	Work
Develop Lighting and Signage Plan and Submit for Approval	*2 hrs*	Work
Conduct a pre-construction meeting	*8 hrs*	Work
Test the new boardwalk	*8 hrs*	Work
Conduct boardwalk railing pre-installation & pre-construction meeting	*4 hrs*	Work
Test railings and viewing area	*8 hrs*	Work
Test emergency lighting & verify signage	*16 hrs*	Work
Pass structural tests and inspections	*16 hrs*	Work

Senior Project Engineer	56 hrs	Work
Obtain Lighting and Signage plan Approval	*8 hrs*	Work
Obtain customer approval for the demolition plan	*8 hrs*	Work
Obtain customer approval for the construction plan	*8 hrs*	Work
Prepare the construction site	*16 hrs*	Work
Conduct pre-installation meeting	*8 hrs*	Work
Submit Inspection Results and Final Report	*8 hrs*	Work
Project Engineer	56 hrs	Work
Obtain construction and lighting permit	*8 hrs*	Work
Obtain customer approval for railing and viewing area plan	*8 hrs*	Work
Notify public & close trail and surrounding areas	*8 hrs*	Work
Prepare the construction site	*16 hrs*	Work
Prepare the boardwalk for installation of lighting & signage	*16 hrs*	Work
Demolition Workers	16 hrs	Work
Demolish existing boardwalk	*16 hrs*	Work
Construction Workers	60 hrs	Work
Prepare the construction site	*8 hrs*	Work
Conduct a pre-construction meeting	*4 hrs*	Work
Install the new boardwalk	*24 hrs*	Work
Conduct boardwalk railing pre-installation & pre-construction meeting	*8 hrs*	Work
Install railings & construct the viewing area	*16 hrs*	Work
Installation Workers	32 hrs	Work
Conduct pre-installation meeting	*8 hrs*	Work
Install emergency lighting & update signage	*24 hrs*	Work
Waste Management Contract	72 hrs	Work
Demolish existing boardwalk	*16 hrs*	Work
Install the new boardwalk	*24 hrs*	Work
Install railings & construct the viewing area	*16 hrs*	Work
Clean and remove all material from the site	*16 hrs*	Work

Figure 8: Resource Usage Sheet (Continued)

Travel Expenses		Work
Inspect the site		Work
Notify public & close trail and surrounding areas		Work
Clean and remove all material from the site		Work
Conduct the final stakeholder site visit and obtain customer final approval		Work
Concrete Shafts	1	Work
Install the new boardwalk	*0.75*	Work
Install railings & construct the viewing area	*0.25*	Work
Precast Concrete Treads	1	Work
Install the new boardwalk	*0.75*	Work
Install railings & construct the viewing area	*0.25*	Work
Stainless Steel Finishing	1	Work
Install the new boardwalk	*0.75*	Work
Install railings & construct the viewing area	*0.25*	Work
Construction Nails	1	Work
Install the new boardwalk	*0.75*	Work
Install railings & construct the viewing area	*0.25*	Work
Hammer	8	Work
Install the new boardwalk	*5*	Work
Install railings & construct the viewing area	*3*	Work
Adjustable Wrench	8	Work
Install the new boardwalk	*5*	Work
Install railings & construct the viewing area	*3*	Work
Cordless Belt Sander	4	Work
Install the new boardwalk	*2*	Work
Install railings & construct the viewing area	*2*	Work
Cordless Circular Saw	4	Work
Install the new boardwalk	*2*	Work
Install railings & construct the viewing area	*2*	Work
Electrical Wires	0	Work
Cordless Drill	4	Work
Install the new boardwalk	*2*	Work
Install railings & construct the viewing area	*2*	Work
Drill Bit Set	4	Work
Install the new boardwalk	*2*	Work
Install railings & construct the viewing area	*2*	Work

Cordless Jigsaw	4	Work
Install the new boardwalk	*2*	Work
Install railings & construct the viewing area	*2*	Work
Level Meter	6	Work
Install the new boardwalk	*3*	Work
Install railings & construct the viewing area	*3*	Work
Posthole Digger	4	Work
Install the new boardwalk	*2*	Work
Install railings & construct the viewing area	*2*	Work
Safety Glasses	20	Work
Demolish existing boardwalk	*5*	Work
Install the new boardwalk	*5*	Work
Install railings & construct the viewing area	*5*	Work
Install emergency lighting & update signage	*5*	Work
Gloves	20	Work
Demolish existing boardwalk	*5*	Work
Install the new boardwalk	*5*	Work
Install railings & construct the viewing area	*5*	Work
Install emergency lighting & update signage	*5*	Work
Speed Square	6	Work
Install the new boardwalk	*3*	Work
Install railings & construct the viewing area	*3*	Work
Cable Railings	1	Work
Install railings & construct the viewing area	*1*	Work
View Area Materials	0	Work
Emergency Blue Box	3	Work
Install emergency lighting & update signage	*3*	Work
Brackets	2	Work
Install the new boardwalk	*1*	Work
Install railings & construct the viewing area	*1*	Work
Signage Supplies	1	Work
Install emergency lighting & update signage	*1*	Work

Figure 9: Cash Flow Report