Sellwood Bridge Project

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Abstract

The project reviewed and analyzed in this paper is the replacement of the Sellwood bridge in Portland, Oregon. After a study was conducted on the bridge in 1999, it was recommended that the bridge should be replaced due to structural deficiencies and a lack of appropriate facilities. This study reviews and analyzes the challenges faced on the project, how these challenges were dealt with, how the Program Manager has successfully managed the project, and finally the success factors of the project. It was established that the structured decision making process followed on the project effectively integrated the opinions of the public, and federal, state, and county representatives. By using the public's input as the first step of this process, public consensus on major decisions was achieved successfully at an early stage of the project. This aided in acquiring federal and state funds, obtaining the final Environmental Impact Study (EIS) within 4 years, and ensuring that no major disruptions were experienced throughout the project to date.

1 Introduction

1.1 Sellwood Bridge Background

The Sellwood Bridge was constructed in 1925 to replace the Spokane Street Ferry, which shuttled passengers across the Willamette River between Sellwood and West Portland. The distinguished bridge engineer, Gustav Lindenthal, designed the bridge. It is a 1972-foot long steel and concrete bridge crossing the Willamette River south of Portland, Oregon. The bridge employs a unique four span continuous truss design that makes it the only bridge of its kind in Oregon[1]. The bridge is composed of three span types, four main steel deck truss spans, two steel-girder approach spans adjacent to either end of the truss, and Reinforced Concrete-Deck Girder (RCDG) approach spans. The bridge carries two lanes of traffic on a 24-foot-wide roadway, has a sidewalk along the north side, and currently carries about 30,000 cars and light trucks per day. The bridge has a current load posting of 10 tons. Prior to the current load posting, approximately 1300 trucks crossed the bridge daily [1]. Due the fact that the funds to build the bridge came from a $4.5 million local bond measure, there was public protest at the time of its construction which resulted in its costs being cut back and a scaled down design comprised of various limitations. Today, the Sellwood is the busiest two-lane bridge in the state [2].

1.2 Prior Work

1.2.1 South Willamette River Crossing Study (1999)

Below are some points examined in a 1999 South Willamette River Crossing Study(SWRC), which included the Sellwood Bridge[3]:

- Keeping the Sellwood Bridge in its current configuration,
- Upgrading it to meet current seismic, vehicular, bike, and pedestrian standards,
- Closing the bridge to auto traffic, but leaving it open only for bikes and pedestrians,
- Replacing the bridge with a 2-lane or 4-lane facility,
- Making modifications to the Ross Island Bridge in an effort to reduce bottlenecks at the west end of that bridge and to increase the Ross Island Bridge to three lanes each way,
- A new crossing in Clackamas County,
- Increasing transit services and other programs that would reduce travel demand on the Sellwood Bridge.

The study recommended the following[3]:

- Preserve the existing Sellwood Bridge or replace it with a 2-lane bridge with better service for bike and pedestrian travel,
- Consider improvements to the Ross Island and I-205 bridges in a different study,
- Increase motor vehicle capacity on regional facilities, such as McLoughlin and Highway 224,
- Mitigate traffic on Tacoma Street, Highway 99E in Milwaukie, and on Highway 43 in Lake Oswego,
- Increase transit services and improve bicycle and pedestrian facilities in the corridor,
- Bring more jobs to Clackamas County.

The SWRC study estimated the cost to maintain the existing Sellwood Bridge in its current condition for the next 100 years would be comparable to the costs of replacing the bridge completely. Preserving it would cost $40 million, replacing with a 2-lane new bridge would cost $45-$59 million. The study estimated the cost of a four-lane Sellwood Bridge to be as low as $59 million and as high as $106 million in 1998 dollars [3]. Due to safety reason and services, the SWRC study determined in 1999 that the bridge needed to be upgraded or replaced.

1.3 Short-term solutions

In June 2004 after the discovery of the cracks in both the east and west concrete approaches, cracks were restrained with steel clamps and the weight limit for vehicles traveling across the bridge was reduced from 32 tons to 10 tons. This limit caused the diversion of 94 daily TriMet bus trips (a loaded bus weighs about 19 tons), which formerly crossed the bridge. A 2005 engineering study recommended short-term safety improvements for the bridge, which resulted in epoxy being injected into cracks in the girders and columns.

The follow were the major deficiencies with the current bridge[4]:

- Buses and trucks are restricted from using the bridge,
- There are narrow lanes and sidewalks, with no shoulders,
- There are no bike facilities and poor connections to the trail system,
- The bridge is not designed to withstand earthquakes,
- There are tight turns at west end approach, and
- Most importantly, there is an unstable slope at west end.

1.4 Geological challenges affect the bridge structure

In addition to these design limitations, the bridge also has topographical challenges. The west end of the bridge was constructed on fill material and is located in an area that is geologically unstable. The bridge suffered pressure on the west end due to the fact that the hillside above the bridge is slowly sliding toward the river. In the late 1950s, the hillside moved several feet toward the bridge, resulting in a section of the bridge being removed and foundations reinforced. The west end interchange with Highway 43 was completely re-built in 1980. Since then, ground movement has caused the west end approach girders to crack. The bridge is also not designed to withstand a significant earthquake [4].

2 Project Data Collection

For this paper there were two main sources of obtaining information, firstly from the Sellwood Bridge website [5] and secondly by interviewing two members of the Multnomah County project team. The website has a great quantity of information that helped to obtain a better understanding of what has happened on the project and what still needs to be done. The following information was available on the website:

- Each phase of the project was described in detail and additional documentation was available for each of these phases. The documentation included open house summaries and comments, decisions of hearings, press releases and news articles, surveys, newsletters, and the Final EIS,
- A description of how the public was involved on the project, including a list of all public events, and Community Advisory Committee (CAC) and Public Stakeholder Committee (PSC) meetings,
- Contact details in order to setup interviews with project team members.

Once the online information was gathered, interpreted, and analyzed, questions were created relating to the project management aspects of the projects that could not be answered from the available information. Interviews were then setup with the Program Manager as well as the Public Information Outreach Manager for Multnomah County. Since the Program Manager had an overall understanding of the project and interacted directly with the Project Managers, the questions focused on Project Manager characteristics, project structure, project constraints, and the main challenges faced on the project. For the Public Information Outreach Manager, the questions focused more on the communication and coordination aspects of the project, as well as what challenges were faced. One hour interviews were conducted two weeks apart for each of these managers.

3 Project Overview and Scope

3.1 Project Phases

The project phases mentioned on the Sellwood Bridge project website [4] were aligned with the project lifecycle mentioned by Meredith and Mantel [6], as illustrated in **Error! Reference source not found.**.On the Sellwood Bridge project, as is the case on many other projects, there were times at which these phases overlapped. Certain planning activities were still taking place when design started, and so are design activities still taking place during the construction phase. Majority of interaction with the community took place during the first three phases.

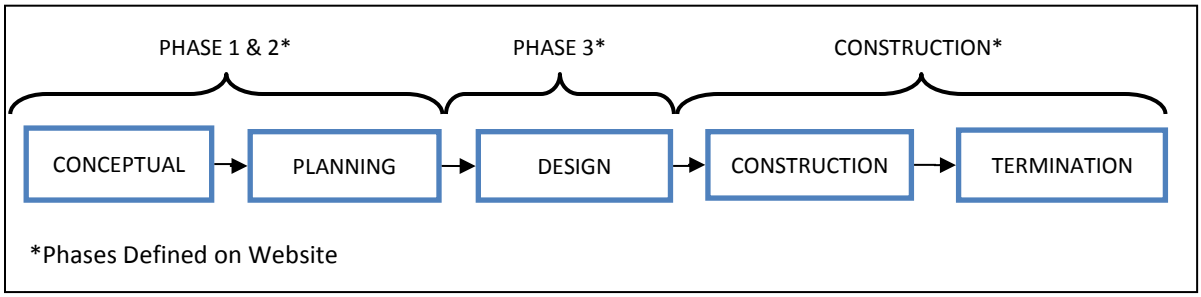

Figure 1: Project Lifecycle and Associated Phases on Website

The Project was delivered in a model called Construction Manager/General Contractor (CM/GC).Typically public infrastructure projects are delivered in a model called Design Bid Build (DBB). This model is where a company hires a consultant to design the project or the company designs the project in-house, and then advertises the project for construction companies to bid on. The company

with the lowest price and meeting certain predefined criteria usually is selected to construct the project. In the CM/GC model, the construction contractor is selected at 30% design and helps during the design phase. Therefore instead of a bid price on the construction of the project, there was a negotiated price with the selected construction contractor.

3.1.1 Phase 1: Planning Under National Environmental Policy Act (NEPA) (2006 – 2010)

The first phase of the project, as defined on the website, was the planning phase under the National Environmental Policy Act (NEPA). The reason for following a NEPA planning process was because the project involved federal funds as well as Multnomah County and its local, state, and federal agency partners. For the Sellwood Bridge project, Multnomah County prepared an Environmental Impact Statement (EIS) to comply with NEPA, which summarized the major environmental impacts, outline issues, reasonable alternatives, and a preferred alternative for the project.

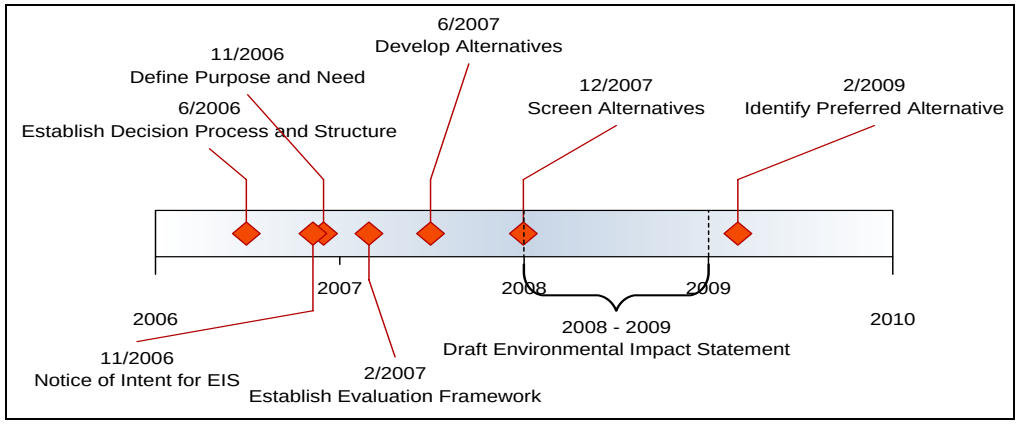

Figure 2: Project Lifecycle and Associated Phases on Website

In this phase the project was guided by a structured decision-making process with input from the following main groups[7]:

- The Public - the public represented their perspectives during public meetings and through online surveys,
- Community Task Force (CTF) - the task force included leaders of neighborhoods on both sides of the bridge, local and regional business group representatives, and advocates for commuters, pedestrians, transit users, and bicyclists. The group consisted of a total of 20 members. Their responsibilities were to represent their group's perspectives, communicate project progress with their groups, and work to develop consensus during the decision process,
- Policy Advisory Group (PAG) - the group included elected and appointed officials of local agencies and jurisdictions (Multnomah and Clackamas county Chairs and Commissioners, City of Portland Mayor, Trimet General Manager, Oregon Senator, and representatives from Oregon Department of Transport (ODOT) and the Federal Highway Administration(FHWA)).
- Project Management Team (PMT) - the team included Multnomah County and consultant project managers, and key staff resources from Metro and City of Portland. The team was responsible for managing the project's scope, budget, and schedule; direct, produce and

guarantee the quality of technical and public involvement work, and finally to provide staff support to the PAG.

- Consultant Team - CH2MHill were selected as the main contractor, managing the development and evaluation of project alternatives and preparing the draft EIS. TY Lin International was selected to design the bridge.

The decision process was organized into six major decision milestones as identified on the above timeline. According to the Public Information Outreach Manager, extensive public outreach occurred prior to each of these decision points to ensure that the public was involved in the process in a meaningful way. Additionally, the public had the opportunity to comment on issues before the various project groups made recommendations at each decision point.

The six major decision milestones can be summarized as follows[4]:

1. *Establish Decision Process and Structure*
   This milestone ensured understanding and agreement about how decisions were made, what process will be followed, and the roles and responsibilities of the various groups.
2. *Define Purpose and Need*
   For this milestones the Purpose and Need Statement was recommended by the CTF and adopted by the PAG.
3. *Establish Evaluation Framework*
   For this milestone the evaluation framework set criteria and quantitative performance measures for gauging the effectiveness and feasibility of alternatives. It was used to determine how well they solved the problems identified in the project Purpose and Need Statement, and how well they performed against the broad range of stakeholder values.
4. *Develop Alternatives*
   For this milestone the CTF reviewed concepts that met the threshold criteria. Some of the concepts were viewed as clearly inferior, and the CTF recommended elimination of these alternatives. The PAG considered CTF's recommendations and adopted a Range of Alternatives to advance for further analysis. The various combinations of alignment, cross-section, and interchange elements totaled 124 different alternatives.
5. *Screen Alternatives*
   For this milestone the alternatives were evaluated using the Evaluation Framework to see which ones performed better. As part of this step, a small group of selected alternatives were analyzed in more detailed and the PAG adopted five alternatives to be considered in the Draft EIS.
6. Select Preferred Alternative
   For this milestone further data developed for the Draft EIS was used to re-evaluate the remaining alternatives against the Evaluation Framework. The public was asked to participate in the selection of a Preferred Alternative. In January and February 2009, the CTF and PAG recommended and selected a Preferred Alternative (originally called Alternative D) which was approved by the partner agencies (Multnomah County, City of Portland, Metro, ODOT and Clackamas County) in early 2009.

Over the summer of 2009, additional refinements were made to the Preferred Alternative based on agency and resident/business feedback.

3.1.2 Phase 2: Bridge Type Selection (2010 – 2011)

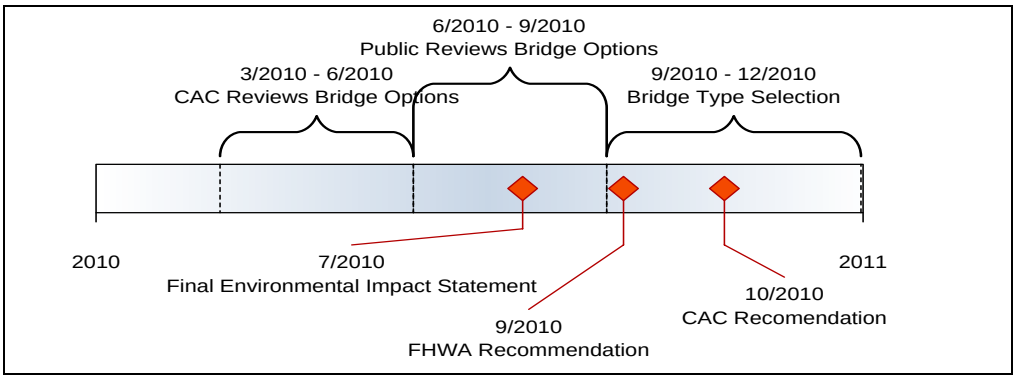

Figure 3: Timeline of Bridge Type Selection Phase

The second phase of the project, as defined on the website, consisted of the finalization of the EIS and the selection of the bridge type. The main groups involved during this phase were as follows[7]:

- The Public - as with the previous phase, the public represented their perspectives during public meetings and through online surveys,
- Community Advisory Committee (CAC) - this committee was very similar to the CTF from the previous phase, however the members were appointed by the Multnomah Board of County Commissioners,
- Public Stakeholder Committee (PSC) - the PAG from the previous phase was renamed to the PSC, with the same responsibilities.

Six different types of bridges were selected by the Community Advisory Committee (CAC) based on the following minimum set of requirements:

- The bridge was to cost less than $170 million,
- There were no long term closures of the current bridge during construction,
- The impact on the environment and residential/business property was minimized,
- There was no median, for operational and maintenance purposes, and
- Has a flexible roadway cross-section that has space for a future streetcar.

These different types of bridges were presented in an open house and an online survey for the public to voice their opinion. Once the public had their say, the CAC and PMT evaluated the public's input and made their recommendation. This was then given to the PSC, who either accepted or made changes to the recommendation, and then submitted to the Multnomah Board of Commissioners who had the final say.

Also discussed during the open house was what would be done with the existing Sellwood Bridge, the current design for the west side access, the bridge arrangement, and the funding plan. The preferred alternative for the bridge arrangement was 64-ft wide with two 12-ft vehicle lanes, two 6.5-ft bicycle

lanes, and two 12-ft shared sidewalks. The cost estimate of the project after the planning phase was $330 million. The source and amount of the funding is illustrated in **Error! Reference source not found.**.Federal approval of the Final EIS was required before federal funds could be used to design and construct the new bridge. The Final EIS was eventually approved by the FHWA in July 2010, two months before what was expected at the time of the open house discussion.

Table 1: Source and Amount of Funding[4]

Funding Source	Amount
Multnomah County Vehicle Registration Fee	$ 127 million
Clackamas County Vehicle Registration Fee	$ 22 million
City of Portland - New Revenue from the Oregon Jobs and Transportation Act	$100 million
State of Oregon	$ 30 million
Request for Federal Funds	$ 40 million
Previously Secured Funds remaining after Planning Phase	$ 11 million
Total	**$ 330 million**

3.1.3 Phase 3: Final Design (2010 – 2011) and Construction (2011 - 2016)

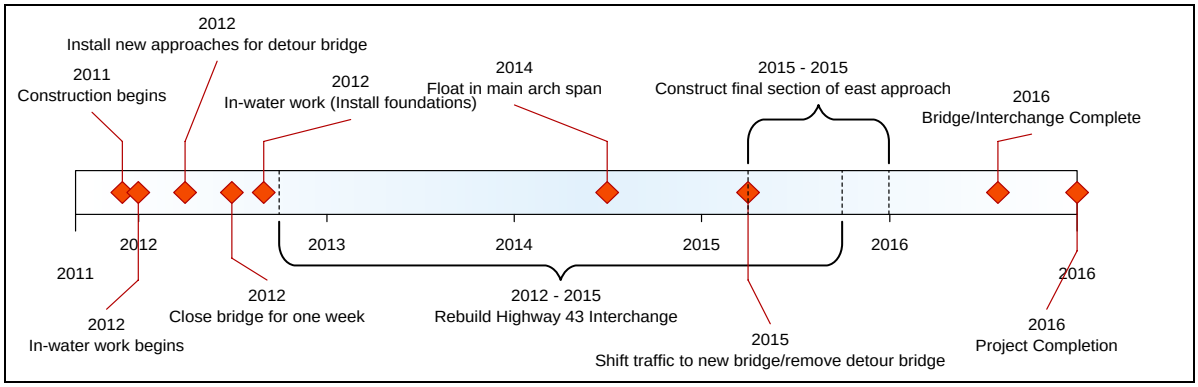

Figure 4: Phase 3 Timeline

Since the first two phases included the design of 30% of the project, the final design phase included the remaining 70% of the design. As was previously mentioned, the construction contractor was included from the 30% design stage onwards, and therefore was actively involved with the design. The construction contractor selected was a Joint Venture (JV) between Slayden Construction Group and Sundt Construction Company. The main groups involved during this phase were again the public, the CAC, and the PSC [4].

During this phase, three open houses and two public meetings took place, with the latest public meeting taking place on 14th March 2013. The discussions focused on updating the public on the project, reviewing the latest designs, and providing information about the construction phase. Additionally, the designs for the Macadam Bay Access and the Willamette Greenway Trail were discussed. The CAC met seven times during 2011, receiving updates on the project and Final Design phase, discussing the overall design scheme of the Sellwood Bridge, discussing project funding and cost saving ideas, and addressed a

variety of design issues. The PSC later approved the 60% design package and funding strategy. Also in 2011, the project received a $17.7 million federal Tiger grant to help close the funding gap. The reason why there was a gap in funding is because the Clackamas County voters rejected a $5 annual registration fee that was required to raise the $22 million shown in Table 1.

The CAC met six times during 2012, to discuss design features, cost management, access to the Macadam Bay floating home community, public art, and the signal at 6th and Tacoma. The CAC reported their recommended design features to the PSC, who made their recommendation to the Multnomah County Board (MCB). Most of the requested design features were retained at 90% design. Currently 97% of the project is under contract. The remaining 3% includes work on Macadam Bay and Freeman Motors, the Miles Place Trail, bridge electrical work, and the signal at 6th and Tacoma.

3.2 Project Structure

A simplified reporting structure for the project is illustrated in Figure . A more detail organizational structure for the Multnomah County project team and the Slayden-Sundt JV construction team can be found under the Appendix B and C. The project team reported to their respective managers, who in turn reported to the Program Manager. The owner representative was an engineering firm, David Evans and Associates, that was hired to aid the small Multnomah County project team. The owner representative Program Manager aided the Multnomah County Program Manager with his responsibilities. Members from the owner representative were spread out throughout the Multnomah County project team. The Multnomah County Program Manager reported to the Multnomah County Chief Operating Officer, who in turn reported to the Multnomah County Chair. Based on this project, Multnomah County follows a Pure Project Organization structure, with dedicated individuals on this specific project.

The Owner Representatives provided the following functions listed below [8]:

- High level leadership,
- Project management services ,
- Centrally direct, manage and coordinate issue identification, evaluation and resolution for County elected officials, internal and external stakeholders, the project team and the public,
- Represent and promote County interests,
- Lead an integrated project team of County staff and owner representative personnel,
- Ensure the project is completed on time and within budget, etc.

The responsibilities during the design stage of the project for the Owner Representative and the County are shown in Table 2.

Table 2: County and Owner Representative Responsibilities during Design [8]

Activity	County	Owner Representative
Project Leadership and Strategy	Lead	Co-Lead
Key Meeting Leadership	Support	Lead
Interchange and Civil Design	Support	Lead
Bridge Design	Lead	Support
Project Controls and Cost Estimating	Support	Lead
Contract Development	Support	Lead
Right of Way	Lead	Support
Environmental Permits	Support	Lead
Public Involvement	Lead	Support

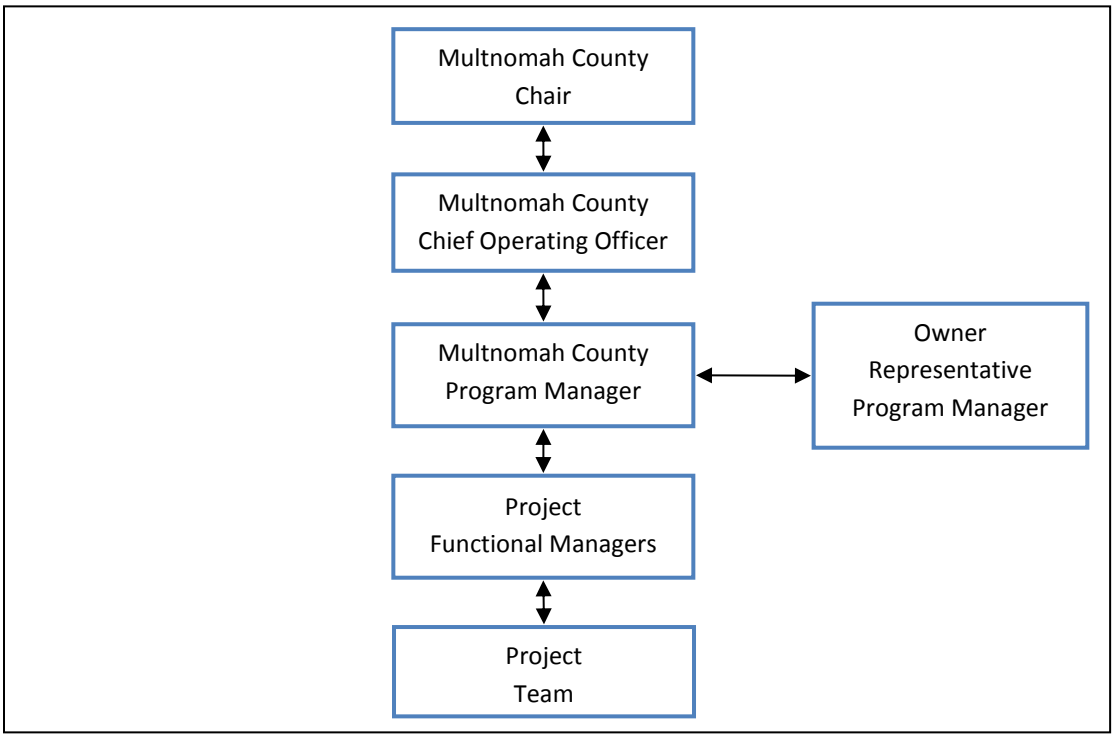

Figure 5: Project Reporting Structure

4 Project Interpretation and Analysis

4.1 Leadership and Decision Makers

In this project, there are several decision makers as shown in Figure . The final decision maker is the Multnomah County Board (MCB), consisting of four commissioners and the chair. Any major decision that was made on the project, such as the bridge location and type, had input from the public, was reviewed and proposed by the CTF, approved and adjusted by the PAG, and finally accepted by the MCB. Since the PAG consisted of federal, state, and other county representatives, all parties were consulted

when a decision was made. The EIS was one of the important aspects of the project that required approval from a federal agency before construction could take place or property could be bought. Once the PAG made their decisions, they would never go back and change it. In the end, the Program Manager bridges the gap between the MCB and the project team.

There are some common leadership styles such as charismatic, participative, situational, transactional, transformational, autocratic, democratic, and laissez faire [9]. In this project, we consider the project leadership as a combination of transactional, participative, and democratic styles. In the transactional leadership perspective, the Sellwood project leaders create structures that clearly describe what is required of their subordinates. Transactional leadership style relies on organizational structures and processes to help resolve problems. As the Program Manager mentioned, the Sellwood project is well organized, thereby allowing the project team to solve problems effectively. In the democratic and participative leadership perspectives, the Sellwood project leaders follow a democratic process by voting on decisions and obtain participation from all the groups using the structured decision making process illustrated in Figure .

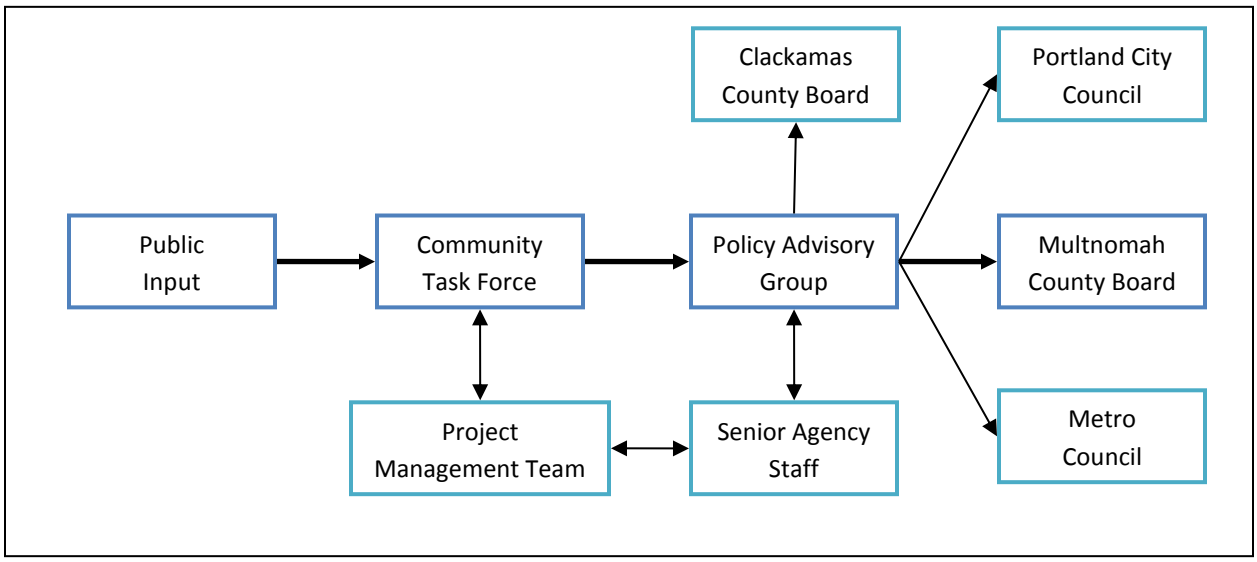

Figure 6: Structured Decision Making Process[10]

4.2 Communication

The program manager said, "If the community agrees on the solution, the money will follow". It was important to get community consensus as soon as possible on the project to show that there was a need for the bridge. Once the City of Portland and other funding sources noticed this need, they were more willing to fund the project.

The main form of communication with the public was by newsletters. About 25,000 newsletters were sent out to the community, each time a decision needed to be made, requesting the public to attend in order to express their interests. The newsletter specified that the community members could either attend a public meeting (or open house) or complete an online survey. Most community members did

not go to the meetings, neither did they complete the online survey, but at least they were aware of what was happening on the project. The highest response rate for the surveys was around 12 percent, with the lowest response rate around 4 percent near the end of the project. About 7 surveys were sent out in total during the first three phases. There was no need for surveys during the construction phase, since the decisions had already been made. However, complaints could still be sent to the project communication office, which mainly focused on issues of traffic congestion and noise. Most of the communications budget was therefore spent during the first three phases, with very little budget set aside for the construction phase.

There were three main types of meetings for community interaction. The first type was public meetings which only occurred around twice a year, where anyone could attend. These public meetings were either done where one person speaks to everyone at once, or in the form of an open house, where 3 hours are set aside and people can come and go anytime and discuss the project with a county representative. Generally, if it was a controversial topic then the public preferred the first approach where everyone would hear and discuss it at the same time. The second type was smaller CAC meetings, which sometimes occurred on a monthly basis. An external facilitator was used at these meetings since the CAC was more comfortable discussing their concerns with someone not related to the county. The final type was focused meetings, where certain topics were discussed with a specific group of members that were directly influenced by the topic at hand.

Even though these methods were effective on this project, the Public Information Outreach Manager mentioned that some experts believe that setting up meetings with the community was an old fashion approach. Instead the internet could have been used to get more people to participate. Also the public meetings would generally attract smaller groups of people who were most affected, and therefore would over represent their decisions. The people who mainly attended the meetings lived in the communities close to the bridge. The Public Information Outreach Manager's opinion however was that a mixture between the internet (online surveys) and public meetings was effective at obtaining the required information. The internet would get the opinions of the public using the bridge to commute and the public meetings would get the opinions of the public living close to the bridge. The method used to inform the public about the online survey was by placing a banner with the website address across the top of the bridge.

The communication during the different phases of the project can be summarized as follows. During the planning and design phase, communication with the community was used in order to get their input into the decision making process shown in Figure. During the construction phase, communication with the community was used to share information about the project, inform the public of any events that will be taking place (e.g. closing of the bridge), and finally to received complaints from the community about construction taking place. The important point made was that all communication could have taken place through the online survey and Sellwood Bridge website, however the public interaction was seen as critical to gaining public acceptance.

The communication throughout the project team followed the reporting structure illustrated in Figure . The Program Manager mentioned that this was a effective way of communicating on the project. The Public Information Outreach Manager would ensure effective communication between the project team and the public.

4.3 Program Manager

In this section we examine how effective the Program Manager is in using the complex and multifaceted skills of project management. A good project manager is one who has the ability to integrate personnel from many disciplines into an effective work team. In order to get results, the project manager needs to relate to the people he manages, the task to be done, the tools available, the organizational structure and the organizational environment, including the customer community [11].

A project such as the Sellwood Bridge project represents a huge challenge in management that requires skills in team building that provide an atmosphere conducive to teamwork, leadership that is a prerequisite for the success of a project and involves dealing effectively with managers and supporting personnel across functional lines, the ability to deal with conflict by applying effective conflict resolution, technical expertise necessary to understand the technology, planning that is absolutely essential for this large complex project, understand how the organization works and how to work with the organization, support management and allocate resources.

The county's Program Manager in this project underlines that it is important to maintain a good relationship with the people you are overseeing. When asked what he did as a Program Manager his response was clear and resonated with what is expected from a good project manager. He stated that as a Program Manager he brings the whole project together and coordinates between the different parties by keeping people focused and making sure they are doing the work needing to be done. He also ensures that there is staff on the project, coordinates with politicians at the county by keeping them informed on what is happening on the project, gathering funding and writing grants. He also coordinates with other departments within the county as well as the city of Portland to ensure the project gets what it needs (tools available). That also includes hiring contractors, hiring and keeping consultants coordinated, etc.

In addition, the project manager must understand the culture and value system of the organization he is working with. The Program Manager in this project was able to demonstrate a good understanding of his organization by having a clear knowledge of the organization structure and its politics, having frequent meetings with upper management including the City of Portland and the community where he provides them with updates on the project. That organizational knowledge has helped him to figure out where to go and get the resources necessary for the timely completion of the project.

During the interview, the county's Program Manager demonstrated leadership by knowing how to integrate different people in a project and doing so successfully. He stated that by working together with the community, it helps with raising funds for the project. In his own words: "If the community agrees on the solution, the money will follow". That demonstration of skills was also present in the fact

that if the project is at all stressful, that was not detected in the interview. Keeping calm and having a clear set structure in how to deal effectively with conflict that can arise on the project is one good way to deal with stress in such a demanding project. He showed confidence in his position, which can only be because he has the experience in the project management field to back it up and the fact that he has been managing this project since 2004.

His actions during the various phases of the project have shown that he has kept the momentum and project moving forward, even when things seemed like they can't be done. As an example, when the funding from Clackamas County was no longer available he was actively involved in obtaining the federals funds. As part of the PMT, he engaged both the community and top management in the project and they have kept interest in its development since its initial phase. His credibility has been demonstrated by the actions taken to succeed at each phase of the project as well as his people management and technical skills. In conclusion, the Program Manager on this project has proved that he possesses the technical background, leadership, sensitivity and credentials to be the top project manager that he is required to be in order for this project to succeed.

4.4 Functional Manager

In the Sellwood Project, the county's Program Manager needs to provide complete task definitions, resource requirement definitions, major timetable milestones and the basis for performance measurement [11]. A functional manager is responsible for the project's deliverables. This is includes defining the how and where the task is to be done and providing enough resources to facilitate the success of the project.

The functional manager that we focused on was the Multnomah County's Communications Officer (Public Information Outreach Manager). He demonstrated full knowledge of his responsibilities as well as broad knowledge of the project. He established knowledge of his specialty by relaying the county's message to the community and the community feedback back to the county for the project. He demonstrated team spirit by working well with the Program Manager, helping him fulfill his tasks, making sure he did his job effectively, thus contributing to the project's success. He coordinates the meetings between the stakeholders in the project and assured that communication flows easily.

In the interview with the Public Information Outreach Manager, he was well aware of the project's resources and all the specifics about the project. By maintaining continuous rapport with the community he makes sure the deliverables are clear to everyone and that everyone understands what the project entails. He mentioned that the interaction with the community has helped ensure the success of the project. That clear communication has also helped clear up any design controversy, such as what affected the Columbia Bridge crossing project. One of the biggest disagreements on this project was where to build the bridge. By effectively communicating the county's idea to the community, the majority of the neighborhood ended up agreeing on the planned position of the bridge. This specific functional manager has shown that he possesses the qualities of a good team player by knowing what the project is about, knowing details of every part of the project for which he is responsible, and by going above and beyond to make sure that there is agreement between all parties involved.

4.5 Project Management Approach

In this section, the Sellwood project management is evaluated with respect to different stages in project life cycle. The different procedures followed for project initiation & selection, planning, execution & control and project closure are explained and evaluated for the Sellwood Bridge project.

Project Planning

When planning began in 2006, the Sellwood Bridge project faced many challenges. The bridge had serious structural problems, was inadequate for all traffic modes, and its owner, Multnomah County, and had only secured a few million dollars in federal funds for planning. There were political, physical, regulatory, financial and stakeholder challenges. These included the presence of homes within 20 feet of the narrow bridge and the location of the bridge within the City of Portland, a few blocks from Clackamas County, and connected to a state highway. To find common ground, Multnomah County designed a decision process that brought together diverging agency and citizen agendas. The process achieved consensus among the public, stakeholders, agencies and elected leaders at each milestone in the planning phase.

Multnomah County and its partner agencies in the Sellwood Bridge project received an award for the public process conducted during the project's planning phase. The Exemplary Human Environment Initiative awards recognize outstanding projects that make the transportation system work better for the people who used it while also protecting the natural environment. The planning phase of the Sellwood project was honored in the process improvements category. Federal Highway Administration(FHWA) cited the project for "*building public and agency consensus around improvements for a multi-modal, community-driven and environmentally-sensitive infrastructure project.*"

The award recognized the achievements of the bridge's owner Multnomah County and its public agency partners during the planning phase: the City of Portland, Clackamas County, Metro, TriMet, Oregon Department of Transportation and FHWA [12].

Project Execution & Control

A series of meetings were conducted to successfully execute and control the project. In the first phase (planning), around 32 meetings (2006 – 2009) were conducted which mainly included the PAG meetings and the CTF meetings. In the second phase (bridge type selection), 11 CAC meetings, 3PSC meetings and 1 joint CAC/PSC meetings were conducted. In the third phase (final design), 13 Community Advisory Committee (CAC) meetings and 2 Public Stakeholder Committee (PSC) meetings were conducted. All these meetings successfully contributed to the structured decision making process, that firstly ensured that everyone's' opinions were taken into account and secondly that it was executed successfully with minimal disagreement. Without this consensus on a project that affects so many people, it would be extremely difficult to execute and maintain control over the project.

Project Closure

Since the Sellwood Bridge project is an ongoing project, it is yet to reach this phase of the project life cycle.

4.6 Project Challenges and Solutions

The challenges faced throughout the project and the methods used to solve these challenges have been broken down into Social, Technical, Environmental, Economic, and Political (STEEP). The following were the challenges and solutions under each of these areas:

Social

One of the biggest challenges on the project was obtaining public consensus. Since the project has a major impact on the public, it was crucial to ensure their opinions were taken into account and the most appropriate solutions determined. It took a while to obtain public consensus and actually ended up delaying the planning phase. The following were the main three challenges faced in obtaining public consensus:

1. The location of the bridge. There were nine alternative bridge alignment concepts presented to the public during the planning phase, where some options required buildings to be taken down. The community living close to the current bridge did not want the bridge in the same location, while majority of the public had no problem keeping the bridge where it is.
2. The size of the bridge (how many vehicle lanes, bicycle lanes, and pedestrian lanes). Again people living close to the bridge did not want the traffic to increase due to more vehicle lanes, while people using the bridge on a daily basis wanted additional vehicle lanes. The outcome of the third online survey showed a 57% preference from all respondents for the 4-lane option, while for the respondents within ZIP code 97202 (resident close to the bridge) showed a preference of 60% for the 2-lane option [13],
3. The arrangement of the west side interchange. There were initially two alternatives for the west side interchange presented to the public during the third open house and online survey. These alternatives were a roundabout or a signalized intersection. From the associated online survey, 54% of the respondents preferred the signal, while 46% preferred the roundabout [13].

The approaches used to resolve these issues were as follows:

1. The position that the county wanted to place the new bridge was the lowest cost alternative and it was therefore important for them to obtain consensus from the public. Some local community members hired lobbyists and attorneys to oppose the position of the bridge. Fortunately, majority of the larger neighborhood that included this community agreed on the position of the bridge and the community followed. The bridge will be built in the alignment of the current bridge.
2. Since Multnomah County was the owner of the project they decided that the decision of the public paying for the bridge (Multnomah County residents) should be taken into account rather than the public only commuting over the bridge. It was therefore decided to select the 2-lane alternative.
3. For the fifth survey, an additional trumpet option was included and was by far the preferred alternative. 55.7% of all responses and 64.5% of the public within ZIP code 97202 preferred the trumpet option. However, a compressed signalized interchange was chosen in order to save money and shift the project away from the hillside, which was accepted by the public.

Technical

The Program Manager did not see any of the technical difficulties as challenges, since he said engineers take these problems and solve them. Some technical issues however were more challenging than others, which were:

1. The west hillside is a historic landslide. The west slope moved approximately 3 feet between 1925 and 1960. Measurements indicate that the slope continues to move between 1/8" and 1/4" per year. Mitigating this slide condition requires advance geotechnical engineering and construction. This work must be sequenced appropriately with other work on the project. In addition, approximately 14 acres of impervious surface will require water treatment in an area where water increases the tendency for the earth to slide [14],
2. The closure of the bridge to traffic should be minimized, however it is going to be built in the same location as the current bridge. It was initially planned that the bridge would be built in sections however there would still be times when the current bridge would need to be closed for long periods of time.

The approaches used to resolve these challenges were the following:

1. The CM/GC (Slayden-Sundt JV) brought specialized experience in construction techniques dealing with these problem areas. The active landslide would be secured by a complex arrangement of retaining walls, and started in Spring 2013,
2. The same location of the bridge was chosen since it was the lowest cost alternative and the least impact on property. The existing bridge was shifted to temporary piers, only requiring one week of closure, while construction could continue to take place.

Environmental

There were several environmental challenges on the project that were either mitigate or eliminated. The following were the main three environmental challenges faced:

1. The biggest challenge was dealing with the in-water work windows. Biologists from the Oregon Department of Fish and Wildlife and the National Marine Fishery Service monitored fish runs and determine when construction would be the least impactful. Due to threatened species of fish in the river, when fish are running, generally no work can take place in the river. The time period when work was allowed was from the start of July until end of October. This affected the initial construction schedule that was planned.
2. The west slope of project is on a historically active landslide, which created a lot of problems with the existing bridge. A lot of effort was placed into securing the slide.
3. A total of 60 to 70 borings all over the project area were conducted in order to evaluate the underground conditions. Even though this was conducted, there were still unexpected conditions when digging up or drilling some areas.

The methods used to try eliminate or mitigate these issues were as follows:

1. The construction schedule had to be adjusted in order to cater for the in-water work window. The construction of the bridge foundations and other work requiring construction equipment to

enter the watercourses, were moved to this period and the other required work was rearranged to accommodate these changes.

2. Since the active landslide was the reason why the current bridge needed to be replaced, it was crucial to secure this from an early stage of the construction phase. The landslide stabilization began in Spring 2013.
3. The program manager did mention that there is always uncertainty with sub surface work and there is very little that can be done about it. Even if they did conduct more borings, there will always be some unpredictability.

Economic

There were two main economic challenges on the project that were dealt with effectively, which were:

1. Multnomah County had to go from a stage of no identified funding to where they had over $300 million.
2. Clackamas County voters rejected a $5 annual vehicle registration fee to raise $22 million to aid in the bridge funding[15]. An alternative source of funding was therefore required.

The methods used to deal with these issues were as follows:

1. As was previously mentioned, the Program Manager believed that if they could generate a solution that the public agreed upon, then the funding would follow. The project had a **need** (i.e. the bridge required rehabilitation or replacement), and the community agreed upon the **solution**, therefore the project was **attractive** to potential funders. Additionally, the Public Information Outreach Manager was enlightened by the old saying, "a picture is worth a thousand words". When trying to obtain funding, federal and state representatives were taken to the bridge every few months to show them how many cracks were forming in the bridge. This emphasized the requirement for the bridge to be replaced and aided in obtaining the funding,
2. As was previously mentioned, Multnomah County managed to obtain funding from a federal Tiger Grant to cover this gap.

Political

The main political challenges that were faced on the project were the following:

1. Since Multnomah County owned the project and obtained both federal and state funding, they had to abide by federal and state rules. This required close interaction with the federal and state representatives,
2. The final EIS was required before federal funds could be used to design and construct the new bridge and it normally takes up to 5 years to complete,
3. For building a new structure, a lot more permits are required compared to fixing an existing structure.

The approaches used to resolve these challenges were the following:

1. Multnomah County has a good relationship with the federal and state representatives and was therefore able to find solutions to challenges that worked for everybody. Additionally, federal

and state representatives were part of the PAG/PSC and therefore were able to firstly keep up to date with the project and secondly to voice their opinions,

2. Multnomah county started preparing the draft EIS early on the project and was able to obtain consensus on the preferred alternative early on. It took the county less than 4 years to get the EIS finalized, which was much quicker than other projects. This was mainly aided by the decision making process followed on the project that ensured all relevant personnel had their say, including the public.
3. The City of Portland representative for the project aided significantly in obtaining permits by interacting directly with all the relevant Portland agencies, such as Parks, Water, Environmental, Services, Planning, and Fire Bureau. Without this direct contact, obtaining permit would have taken a lot more time and possibly delayed the project.

4.7 Project Success Factors

There were several factors on this project that made it a success to date. The main factors that were analyzed from the responses during the interviews were:

1. The project has taken the publics' input into account for every major decision. As the Program Manager stated, the public consensus aided significantly in obtaining the required funding. This was emphasized by the Public Information Outreach Manager where he stated that another project, the Columbia River Crossing, was struggling to obtain funding due to the lack of agreement about the current design and plans. The Sellwood bridge project was of such great interest that it was not difficult to get legitimate public interest. Also once the MCB made a decision they would never go back and change it.
2. As was previously stated, the construction contractor was selected at the 30% design stage of the project and was therefore actively involved in the design. Any potential construction conflicts could have been noted long before the construction phase and would have been mitigated before construction started,
3. After the second phase of the project, the cost was estimated at $330 million. At the current stage of construction, the cost has reduced to $307 million. Although it was not planned, the properties required for the project were purchased during the recession, thereby saving some of the project costs. Certain design changes and the fact that the price of the required materials reduced, also resulted in additional savings,
4. The county used an in-depth selection process when selecting the owners representative, construction contractor, and design contractors. As the Program Manager stated, even if the contractors worked well individually, it was critical for them to work well together. The county focused on determining how the contractors would collaborate based on previous experience, interviews with the contractors, and through a fishbowl exercise. During this exercise, the contractors would work on a problem solution and the county would gauge their team work skills. According to the Program Manager, this was a good predictor of what actually happened,
5. As was previously stated, the county managed to obtain a finalized EIS within four years, which was earlier than planned and earlier than other projects had achieved. This success can be broken down to the fact that the decision making process was established early in the project

and once these decisions were made they were never changed. There was a consensus among what was required by all individuals associated with the project early on which simplified the EIS process,

6. The STEEP aspects of the project were re-evaluated every time a decision was required, through the structured decision making process. The public, CAC, PSC, and MCB all contributed their ideas about the decisions, taking into account social, technical, environmental, economic, and political perspectives that they saw as relevant,
7. The Program Manager has a diverse background, with a BA in History and Philosophy and a BS and MS in Civil Engineering. He has also been the county's Program Manager/Project Manager for 16 years. His diverse educational background as well as being on the project since it was just a recommendation, compounded by the years of experience, proves that he has both the technical, interpersonal and managerial aspects to be a great project manager,
8. The Sellwood Bridge was a "must do" project. There was no two ways about it. The bridge was obsolete and constituted a danger for the community. Also, the community was fully involved from day one, making them feel part of the project thus, ensuring that because there is a need, the money followed.

5 Conclusion

There have been several challenges on this project that have been dealt with effectively. One commonality between the success factors of the project and the solutions to these challenges has been the structured decision making process that was followed. By actively involving all the relevant personnel during the decision process has ensured that everyone is aware of the current situation on the project and trust has been gained by the fact that once a decision was made it was never changed. The critical factor about the decision making process was that the first step was obtaining public input. The county was aware that public consensus was important to the success of this project and created an effective process of achieving this successfully. By obtaining public consensus early on, acquiring funding was easier, finalizing the EIS was simplified, and no major issues have been encountered preventing the bridge from been built.

This study has reviewed and analyzed the challenges faced on this project, how these challenges were dealt with, and how the Program Manager has successfully managed this project. It was determined that effective communication was critical to the success of this project to date and that the diverse background of the Program Manager has aided him in interacting with federal, state, county, and public representatives at different stages of the project.

6 Recommendations and Future Work

6.1 Limitations and Assumptions

The main limitations and assumptions on the project were the following:

- There were only two managers interviewed on the project and they were both part of Multnomah County. In order to provide a more accurate account of what happened and what is

going to happen on the project, it would be advisable to interview project managers from the design and construction teams, and maybe council members to obtain their opinions,

- The only information available was from the website and the two interviews. From this information we could not determine all the reasons why the cost of the project reduced by $23 million from the planning phase until the end of the design phase,
- The website was unclear on exact dates at which specific eventsshould take place and the two managers were not willing to share a detailed schedule for the project. It thereforewas difficult to determine if the project was meeting its deadlines,
- The two managers were unwilling to share information about any other challenges that were not known by the public and any challenges that they foresee in the near future. It is understandable why they would not want to share this information, however it would have supported our discussion on the STEEP challenges and solutions.

6.2 Future Work

The following are possible future extensions to the project:

- Update this study at the end of the Sellwood Bridge project and determine what challenges were hidden and only noticeable when the project was completed,
- Compare the Sellwood bridge project to the Columbia Bridge Crossing and determine why one project has been a success and the other one hasn't,
- Interview additional project managers from the constructor, design, and owner's representative teams,
- Complete a more in-depth analysis focusing on what directly and indirectly affected the budget, schedule, and scope, if the information is made available.

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Appendix A: Scoring Method for Construction Contractor Selection

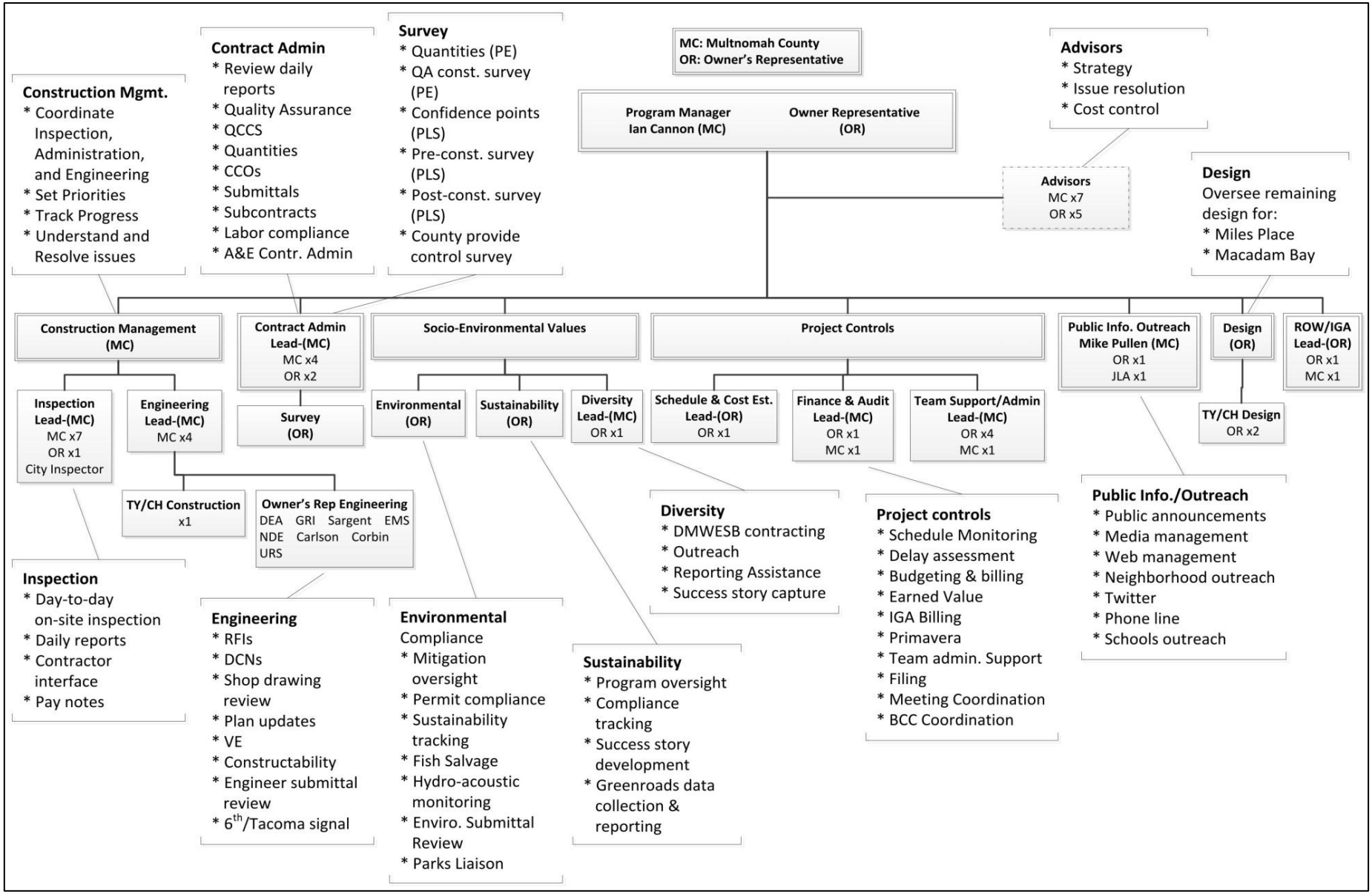
Table 3: Scoring Method for Construction Contractors

Category	Points
Category I: Corporate Qualifications	5 Points
Category II: Proposer Experience	10 Points
Category III: Organization and Key Personnel	15 Points
Category IV: Project Approach	20 Points
Category V: Sustainable Practices	10 Points
Category VI: Diversity Plan	10 Points
Category VII: Pre Construction Services Price	10 Points
Category VIII: CM/GC Fee	20 Points
Total Points	**100 Points x Number of Evaluators**

Table 4: Maximum Possible Points from Evaluation[SA2]

Method	Maximum Points
Written	100 Points
Oral Interview	75 Points
Total	**175 Points x Number of Evaluators**

Appendix B: Multnoham County Project Team Structure



Appendix C: Construction Contractor Project Team Structure