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Faculty of Engineering and Built Environment

ENGG3500, Managing Engineering Projects

Major Assessment Item

Speers Point Park Water Playground

Extension Project:

Project Management Plan

Parts A and B

By QUANTUM MECH

(Matthew Amos, Mitchell Blanch, Samuel Davidson, Jake Hunter

Darby O'Sullivan, Tim Schultz, James Tochowicz)

15th May 2017

Contents

1. Introduction

Within this project, Quantum Mech in coordination with the Lake Macquarie City Council (LMCC) aims to design and oversee construction of a Speers Point Variety Park extension in the form of a water park. The addition of this extension seeks to improve the quality of life for nearby residents, increase park use during Summer months and provide additional business and commerce for the Lake Macquarie community. Quantum Mech will deliver the constructed water park design, along with the technical design report, maintenance report and risk assessments drafted around the designed water park.

2. Project Charter

This Charter formally authorises Quantum Mech Pty. Ltd. to design, construct and commission a new water park for Speers Point Variety Park (SPVP). A project plan will be developed and submitted to the Project Sponsor for approval. The project plan will include: scope statement; schedule; cost estimate; budget; and provisions for scope, resource, schedule, communications, quality, risk, procurement, and stakeholder management as well as project control. All resources will be assigned by the Project Sponsor, Kay Fraser, Local Mayor of the Lake Macquarie District.

2.1. Project background and business need

The purpose of the Speers Point Water Park is to further enhance the intrinsic and utility values of the surrounding areas. The existing community pool, sports grounds, lake and playground add significant value to the local community as well as to the local tourism and service industries. By extending the existing area to include a water park, the local service and tourism industries, as well as the local community will further benefit from higher patronage numbers, higher land values, and better health standards.

2.2. Project goals/objectives

The project goals and objectives include the following:

- Design, Construction and Commission of a new water park for SPVP within: budget, timelines and regulations;
- Inclusion of a water recapture system capable of recapturing at least 60% of all used water;
- Increase in visitor count to SPVP of at least 5% on pre-water park levels; and
- Minimal disruption to existing recreational infrastructure and visitor numbers during construction.

2.3. Project scope

The Project Manager, Mitchell Blanch, is hereby authorised to interface with management as required, negotiate for resources, delegate responsibilities within the framework of the project, and to communicate with all contractors and management, as required, to ensure successful and timely completion of the project. The Project Manager is responsible for developing the project plan, monitoring the schedule, cost, and scope of the project during implementation, and maintaining control over the project by measuring performance and taking corrective action.

Requirements. As mentioned in the Requirement of this project, the requirements of the project are as follows:

- Design to comply with all relevant Australian Standards;
- Construction will be undertaken in a safe manner and will also comply with relevant regulations;
- High water efficiency will be considered during design; and

- Project will be completed on time and on budget.
- Minimum disruptions to the public during construction

Deliverables. The deliverables for the project are as follows:

- Technical design report;
- Maintenance report;
- Risk assessments; and
- A physical, functioning water park.

Inclusions. The project scope includes all areas of planning, design and construction.

Exclusions. Excluded from this project scope is any consideration for further development or organised inspections following the parks implementation.

Assumptions. It is assumed that the project will be funded through a combination of the local council budget and through the NSW State Government's Speers Point Variety Park rejuvenation project fund, since the project fits the general criteria for funding approval from that fund. There are limited assumptions for this project as most matters have already been well defined through extensive interaction with stakeholders.

Constraints. Constraints on the project include the allowed budget of $1,000,000, the time frame of approximately two years, and the available space at SPVP to build the water park, shown below in Figure 1.

Figure 1 - Approximate area for water park construction.

2.4. Significant milestones

Significant project milestones are mentioned in Section 7.5 of this document and include: Client acceptance of design; Excavation works complete; All supplied materials on site; Completion of slab ready for playground installation and final acceptance of total delivered project by Council.

2.5. Project budget summary

The budget for the project shown in **Error! Not a valid bookmark self-reference.** is inclusive of all scope aspects relevant to each section including materials, handling, reporting, meetings and profit. This budget summary does not allow for any exclusions from the scope, and any exclusions that are to be covered will raise a variation outside of this budget.

The costs for the project below have been estimated based on hourly rates and material costs using the expected project lifespan outlined in Appendix D – Project Gantt Chart.

Table 1 – Summary of project budgeting.

Component	Budget Allocation
Project Management	$170,000.00
Design	$240,000.00
Construction	$540,000.00
Commissioning and handover	$50,000.00
Total	$1,000,000.00

2.6. Key stakeholders

Stakeholders will be identified by how they are affected by this project, how much influence they have on the project, their impact on the projects resources and if they benefit from this project. Project team members will then identify the key stakeholders who are greatly impacted by this project and who have the most influence. When the key stakeholders are identified, the Project Manager will obtain their feedback on how much participation they want on this project. These key stakeholders will require thorough communication and management so they are kept up to date and have their concerns addressed. This will be further assessed in Section 6 (Stakeholder Management).

3. Project Management Approach

3.1. Project management methodology

The chosen management methodology for the project is that of the Waterfall Method, due to the project being inclined towards a regimented, detailed approach. Due to Quantum Mech's extensive experience with this project methodology from previous projects and in-house access to Waterfall-suited *Zoho Projects* software, this methodology was shown as the most beneficial approach to effective project completion.

The Waterfall method divides the project into sequential, cascading stages. The regimented flow of these stages rejects revision and reduces potential scope-creep throughout the project. This method encourages rigorous and detailed design and planning stages within the project,

reducing costly defects and oversights further in the project lifecycle. As the project has a significantly defined scope: detailed by the LMCC in terms of required waterpark design, as well as lesser forecasted scope change past design and planning stages, the project is well suited to the Waterfall method.

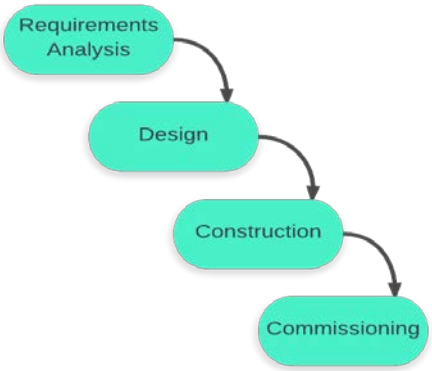


Figure 2 - Simple Waterfall Project structure

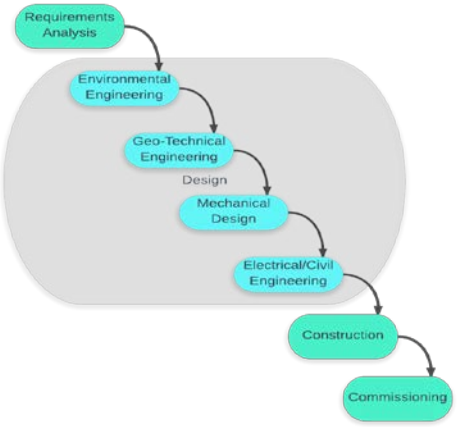


Figure 3 - Project Waterfall structure with expanded design

In Figure 2, the practical Waterfall procedure for the project is pictured. Each stage can be decomposed to show sequential tasks within the stage, as seen for the design stage in Figure 3. The distinct fragmentation of the project stages allows for insight into component progress and easy identification of sources of delay throughout the project.

3.2. Strategy and procedures to achieve project goals/objectives

To effectively, cohesively and continually achieve project goals during the lifetime of the project, a range of strategies under the Monitoring and Controlling Process Group must be employed.

Project management software. Throughout the duration of the project, Quantum Mech will be using the *Zoho Projects* software. This tool provides computer-aided project scheduling, reporting and collaboration allowing for the management of communications and control of project objectives and tasks. Using digital tools within the project is integral for version control and effective logging and insight into goals which have been achieved, are yet to be achieved and strategies for working towards these goals.

Regular updates and advisory meetings. Monthly project update meetings will elicit project progress, issues and advice to aid in achieving project objectives as directly shaped by internal and external shareholders. These meetings will include the project management team, contractors, representatives for the LMCC and professional experts as required. This correspondence will both ensure project goals and objectives remain in-line with the expectations of the LMCC as well as regularly measuring project progress to allow for any correctional measures to be employed.

Quality assurance/control audits. To continually ensure project outputs are of acceptable standard, the expert judgement from at least three third-party sources will be employed to assess the quality and overall conformance to the project goals and objectives through the project's lifecycle.

4. Scope Management

4.1. Project scope statement

4.1.1. Introduction

This project scope statement outlines the scope of this project which will be used in conjunction with the development of the project. This statement provides an outline, although other sections within this document will go into more detail. However, this statement will specify the deliverables and considerations required to achieve such deliverables in line with Quantum Mech's and all relevant stakeholder's objectives. From this a Work Breakdown Structure (WBS) can be established.

4.1.2. Project purpose and justification

The main purpose of this project is the expansion of the SPVP playground, with the aim of further increasing visitors from the local and surrounding communities. This increase in foot traffic will bring financial benefits for local businesses, increasing the inevitable development of the Speers Point area and thus resulting in higher land values. We have already engaged the local community with this project to ensure their comfort with the development and we will continue to engage with these and other relevant stakeholders throughout the project.

4.1.3. Scope description

The SPVP Water Playground Extension Project includes the planning, design, construction and commission processes of a functional water playground intended to service the community. It has already been outlined by the Project Sponsor that this water park will focus on safety and water retention. There will be regular meetings with stakeholders during the design and construction stages to ensure this project is accepted by all involved.

4.1.4. High level requirements

This project will be undertaken with close consideration of the following high level requirements:

- Design will comply with all relevant Australian Standards;
- Construction will be undertaken in a safe manner and will also comply with relevant regulations;
- High water efficiency will be considered during design; and
- Project completed on-time and on budget.

Note this does not include all requirements, only the considerations ourselves and relevant stakeholders foresee as a high priority.

4.1.5. Boundaries

This project will include planning, design and construction as mentioned. Although the scope at this stage does not include consideration for further development or organised inspections following the parks implementation.

4.1.6. Strategy

The dedicated management strategy selected by Quantum Mech for this project is the waterfall method. This structured method defines explicit stages in the project which require tight control throughout implementation. It is proposed that this task will operate on a critical path structure, and through dedicating a Project Manager throughout the project (as displayed in Appendix D – Project Gantt Chart) we predict reliable results from utilising the waterfall method.

4.1.7. Deliverables

The Project Manager will be responsible for ensuring all deliverables are produced on time and to an acceptable standard as by Quantum Mech and the Project Sponsor. At this stage, the following deliverables for the project include: A technical design report; A maintenance report; All risk assessment; and a functioning water park

4.1.8. Acceptance criteria

To gain acceptance the project deliverables will meet all defined tasks stated within the contract of work. Project acceptance will come from the Project Sponsor once these tasks have been met.

4.1.9. Constraints and assumptions

This project is constrained by both the allowed budget and the funding source as this project is to be funded by the NSW State Government and this project is planned to operate over approximately a 2-year period. There are limited assumptions for this project as most matters have already been well defined through extensive interaction with stakeholders.

4.1.10. Cost analysis

The cost estimate of this project is $1,000,000 and has been accepted by the Project Sponsor. To date, only the proposal and stakeholder meeting costs will be subtracted from this budget. Throughout the development of the project all additional costs will be adjusted and the estimate may be revised in accordance, this will be discussed with key project stakeholders. From a prior cost benefit analysis, we based the costings on a 35% net benefit with allowance for unavoidable negative costings.

4.2. Work breakdown structure

Figure 4 provides the general Work Breakdown Structure (WBS) for this project.

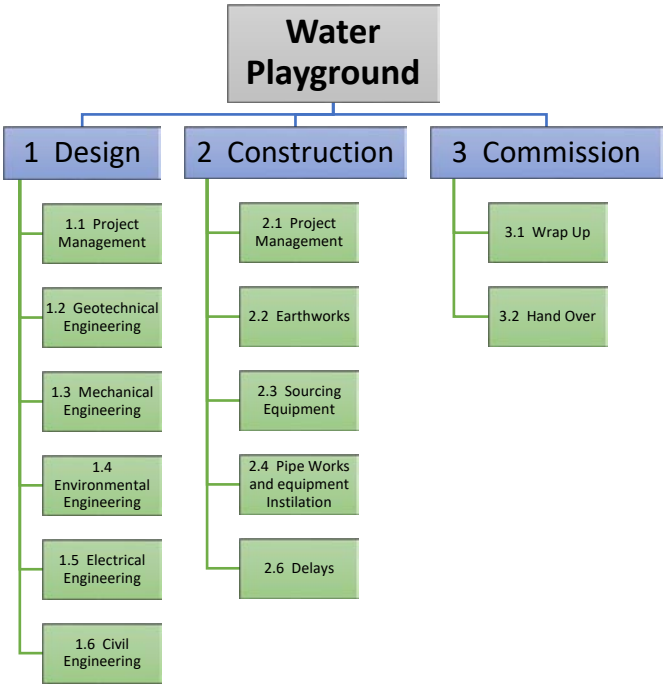


Figure 4 - Work Breakdown Structure diagram.

4.3. Scope control plan

To manage the scope of this project we have prepared this report, including all relevant information to define all aspects of this project. These include this project scope statement, the requirements management plan and traceability matrix (Section 5 of this document) and relevant performance data included within the ZOHO software we have selected for this project (specified in Section 7 of this report). These inputs will be continually compared with the actual performance produced by relevant design and construction teams. Ideally there will be no variation of the baseline scope as specified from the inputs mentioned within this report.

To assure the project produces the level of detail required, it is crucial all work related is undertaken in line of this report. The output to be compared with the mentioned inputs include work performance information and evaluations as well as all processed change requests, project

management plan updates and project documentation revisions. If there is any variation required, then, once approved, the Project Manager can implement the change via thorough communication with all relevant stakeholders.

5. Requirement Management

5.1. Requirement management plan

5.1.1. Introduction

The requirements for the SPVP water park project are outlined in Section 2.3 of this document. As the requirements for the project are dynamic and prioritisation often changes through the project life cycle, the requirement analysis plan outlined below aims to help keep monitor and control of these requirements throughout various phases of the project.

5.1.2. Planning, tracking and reporting of requirements

The initial requirements for the project are outlined in the project scope. These requirements are collected through a variety of tools and techniques. The main way that project requirements are created is to adequately achieve the success criteria and goals for the project and hence the project requirements are highly influenced by the project charter and scope sections. The main way in which the requirements for this project will be reported and tracked is through a requirement traceability matrix which can be found in

Appendix A Requirements traceability matrix.. The main way that this will be done is through stakeholder meetings so that all opinions can be adequately satisfied. It is also at the discretion of the Project Manager to call a specific project requirement meeting if they feel that it is needed.

5.1.3. Personnel responsible for requirements

The initial requirements for the project are outlined in the project scope. These requirements are collected through a variety of tools and techniques. The main way that project requirements are created is to adequately achieve the success criteria and goals for the project and hence the project requirements are highly influenced by the project charter and scope sections. The main way in which the requirements for this project will be reported and tracked is through a requirement traceability matrix which can be found in

Appendix A Requirements traceability matrix. The main way that this will be done is through stakeholder meetings so that all opinions can be adequately satisfied. It is also at the discretion of the Project Manager to call a specific project requirement meeting if he feels that it is needed.

5.1.4. Personnel responsible for requirements

The main personnel in charge of the project requirements will be the Project Manager. It will be their responsibility to ensure that all requirements are being completed and that all stakeholders are adequately satisfied with the requirements. It is also the responsibility of all relevant stakeholders to make sure they are constantly analysing the requirements that affect them to ensure they are completed to an acceptable standard. The project manager is also responsible for the continual updating of the requirement traceability matrix. The personnel that are responsible for each requirement are also listed in the matrix.

5.1.5. The prioritization of the requirements

The initial prioritisation of requirements will be completed in the planning phase of the project. Throughout the project, as the status of requirements change the priority of the requirement may also need to change. The prioritisation processes will again take place during project meetings. This process may also involve the creation of new requirements as the project

progresses. The priority is either defined as low, intermediate or high, and will be continuously updated on the requirement traceability matrix.

5.2. Requirements traceability matrix

The requirements traceability matrix is the main tool that will be used to track, monitor and reassess requirements throughout the project lifecycle. This matrix will be continually updated during the completion of the process. The initial requirements matrix can be seen in Figure 5.

Project name	Speers Point Water Park				
Cost centre	1009776				
ID	Requirments Description	Rationale for inclusion	Owner (responsible person)	Priority	Status
1	Project being completed on time and on time	Key outcome for all stakeholders	Project Manager	High	Incomplete
2	Design to comply with all relevant Australian Stan	Legal requirment	Project Manager	High	Incomplete
3	Construction will be undertaken in a safe manner	Legal requirment	Project Manager	High	Incomplete
4	High water efficiency during design	Relates to the project goals for an environmentaly efficent park	Project Manager , Water Engineer	Intermediate	Incomplete
5	Minimum disruption to the public	Part of the project goals	Project Manager	Intermediate	Incomplete

Figure 5 - Requirements Traceability matrix.

6. Stakeholder Management

6.1. Stakeholder analysis

A stakeholder analysis was conducted so that the stakeholders could be categorised by how much harm potential and how much help potential they have on the project. Once all the stakeholders were identified, the project team evaluated their harm and help potential. The results of this then determined the level of power or influence they have on the project. The appropriate management approach, and level of communication and participation for each stakeholder was also decided.

Each stakeholder was assigned a number from 1 to 4 (low to high) on the level of harm and level of help they have on this project. Harm is the stakeholder's potential to threaten the project

while help is the stakeholder's potential for cooperation on the project. The results from this analysis is displayed in Table 2.

Table 2 - Harm/Help Potential Stakeholder potential

Organisation	Position	Harm Potential	Help Potential
Quantum Mech	Project Manager	2	4
Lake Macquarie Council	Mayor	2	3
Lake Macquarie Council	Technical Representative	4	4
NSW State Government	Premier	1	3
Speers Point Swim Center	Pool Manager	4	2
Speers Point Swim Center	Pool Lifeguard	3	1
Sal's by the Lake	Café Owner	3	3
Speers Point Public School	P&C	2	2
Resident of the Esplanade	Home owner	3	2
Environmental conservative	Concerned local	4	1

Using these ratings, a harm/help matrix (Figure 6) was created. This is shown below.

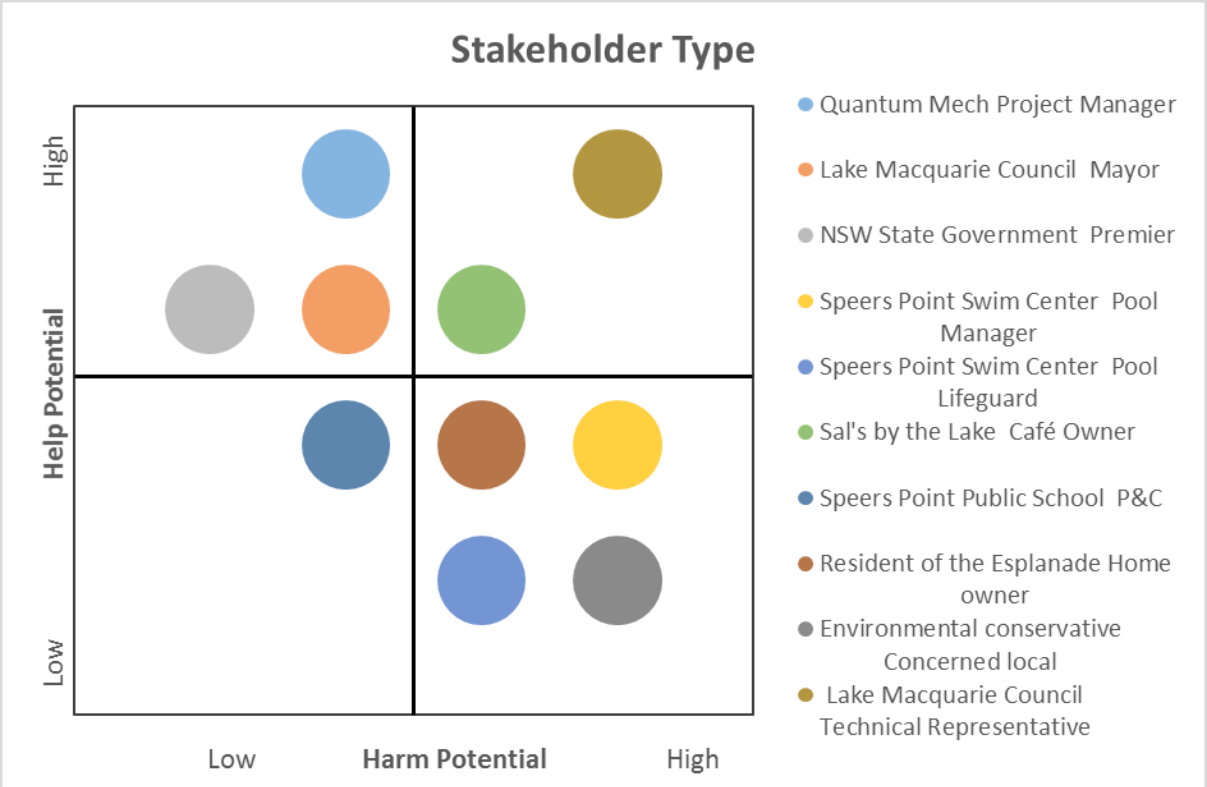


Figure 6 - Stakeholder potential impact diagram

This matrix illustrates the potential impact each stakeholder may have on this project.

6.2. Stakeholder management plan

From the harm/help matrix established in the stakeholder analysis, each quadrant will be assigned different managerial plans. Stakeholders in the upper left quadrant are the key players. These key players have the highest influence on the planning and design stages of the project. Weekly meetings will be held for all key players, or upon request from a key player. Those who lie in the upper right quadrant must be kept satisfied. Any questions or concerns that they might have must be addressed adequately. These concerns will be reviewed by the Quantum Mech team. The Speers Point Public School P&C, located in the lower left quadrant will require minimal management. The stakeholders that fall in the lower right quadrant will be kept informed on the project's status at general meetings held monthly.

The harm/help matrix will be reviewed and updated throughout to project to address any new concerns or adapt management changes for the stakeholders.

Table 3 identifies each stakeholder, their assigned quadrant in the harm/help matrix, their major requirements and their main expectations for this project.

Table 3 - Stakeholder information summary table.

Position	Quadrant	Major Requirements	Main Expectations
Project Manager	Key Player	Successful project completion	Ensure Project is completed on time and in budget
Mayor	Key Player	Successful project with no negative press	The community appreciate and like the completed project. Leading to positive press and eventually re-election
Technical Representative	Keep Satisfied	Water Park meets all government standards and requirements	Identify and address their concerns
Premier	Key Player	Successful project with no negative press	Project is a positive within the broader State community leading to increased voter popularity
Pool Manager	Keep Informed	Park has small impact on this person's job	Will still be employed post project completion

Pool Lifeguard	Keep Informed	Park has small impact on this person's job	Will still be employed post project completion
Café Owner	Keep Satisfied	Park successfully delivers on its projected 5% increase in visitors therefore increasing foot traffic to the café	The construction of the water park will not impact on the business
P&C	Minimal Effort	Want to ensure the park offers a safe environment for the children to play in	The park will meet all safety standards and be appealing in nature
Home owner	Keep Informed	Unblocked view of the lake	That the park will increase noise to their residence causing them interruption
Concerned local	Keep Informed	Low impact on local environment	The park will use too much power/water causing interruption to local wildlife

7. Schedule Management

7.1. Schedule management methodology/approach

The project schedule will be created using ZOHO project. This program allows the activities to be created in a list form and durations to be assigned by estimate. These activities will then be sequenced to ensure that dependencies and therefore the work order is established correctly. Resources can then be estimated and assigned to conduct the required work within the project time frame.

7.1.1. Software.

Quantum Mech uses an online software package called ZOHO Project to ensure projects stay on track and finish on time and on budget. The software ensures that all problems/possible problems are reported in real time through the app. These problems along with the actual project schedule are monitored from within the app by the project manager. This tool allows for forward planning and highlights any program delays so that corrective action can be implemented.

7.2. Schedule monitoring and control plan

The schedule is to be reviewed weekly by the project management team in the schedule review meetings. These meetings will allow the review of any potential or past impacts to the schedule to be discussed. This will allow mitigation strategies to be discussed so the project can remain on schedule.

It is the responsibility of each task owner to provide an estimate to complete the day before the meeting is scheduled. In this case Tuesday by 10am for a Wednesday 10am meeting.

It is the responsibility of the project manager to facilitate the schedule review meetings each week and ensure any agreed upon changes or mitigation strategies are implemented. Any changes to the schedule will be discussed with the project sponsor for approval prior to implementation. If a delay is incurred that creates the need to increase the project duration, it will be communicated through the extension of time (EOT) form and delivered to Lake Macquarie City Council via email.

7.3. The critical path

The critical path is the sequence of tasks/activities that produces the longest overall time that cannot be decreased. The critical path is shown on the critical path Gantt chart in

Appendix E – Critical Path.

7.4. Activity list, sequencing and duration estimates

The activities their sequence and duration will be outlined by the project manager and discussed and approved by the relevant task owners. This will be achieved using the schedule management software as it provides a quick, efficient and visual way which works best for this management team. The activities, scheduling and duration estimates are in the activity list in Appendix C – Activity List.

7.5. Milestones

Project milestones will be as per the project schedule from ZOHO Projects. The milestones for this project are: Client acceptance of design; Excavation works complete; All supplied materials on site, Completion of slab ready for playground installation and final acceptance of project by LMCC.

7.6. Gantt chart

The Gantt chart provides a visual outline of the required tasks, how they are to be scheduled, how much time each task is expected to take and provide a fantastic tool for reviewing progress. The project Gantt chart is in Appendix D – Project Gantt Chart.

8. Risk Management

8.1. Introduction

8.1.1. Risk management approach

The approach taken to manage risks for this project include a methodical process by which the project team identified, scored, and ranked the various risks. Greater risks were added to the project schedule, ensuring that the assigned risk managers (defined below in 8.1.2) take necessary, timely steps to implement mitigation strategies during the schedule and update the team accordingly. During the closing process, the Project Manager will reflect on each risk and the associated management process to identify any improvements to be made for future projects. These improvements will be captured as part of the lessons learned knowledge base.

8.1.2. Risk management roles and responsibilities

During the project, the following general responsibilities will be given: The Project Manager chairs risk assessment meetings, team members serve as meeting recorder and timekeeper, as

well as key stakeholders and team members participating in the risk assessment meetings. The Project Sponsor may choose to participate in risk assessment meetings as required.

In addition to this, the Risk Breakdown Structure presented in Figure 7 identifies project team member responsibilities within key risk areas.

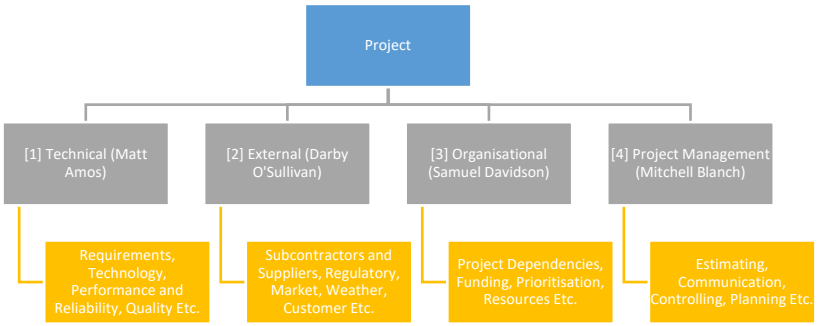


Figure 7 - Risk Breakdown Structure

8.1.3. Baseline reporting requirements

Risk management assessment will be an included part of each bi-weekly project team meeting. From this, a fortnightly technical risk report will be created and distributed to the project sponsor, upper management and key stakeholders for general oversight of the risk management process.

8.2. Top Three Risks and Risk Identification

8.2.1. Severe injuries

Safety is of upmost importance on this on this project and identified as a high impact risk. To prevent injuries, safety and risk management strategies will be developed and addressed in site inductions. Potential risks will be covered in daily toolboxes at site pre-entry procedures.

8.2.2. Cut to original agreed funding

Due to cuts to similar projects in New South Wales, funding from the park rejuvenation scheme could potentially be reduced for this water park. To avoid this risk, a contractual provision will be instated so that any unforeseen legislative change will be financially covered by the client.

8.2.3. Rain delays

Due to severe seasonal weather conditions, the project may extend the 4-day allowance for rain days. To minimise this risk, additional construction hours will be employed early in the project to allow for additional rain days.

8.2.4. Risk identification

An initial risk assessment meeting was conducted to provide an interim list of potential risks for the project. Regular stakeholder meetings will be used to further identify project risks.

8.3. Risk Prioritisation

All risks associated with the project will be assigned a risk rating, based on numerical probability and impact values. Information gathered regarding risk level justification, is recorded in the risk register for ongoing risk management.

Quantitative descriptive terms, ranging from low to extreme, were associated with each risk, derived from the risk matrix (Figure 8). Corresponding numerical values were also calculated based on the probability and impact. This matrix is used to assess the risk and help to prioritise risk mitigation strategies.

Risk Matrix							
Impact	Catastrophic	5	High	High	Extreme	Extreme	Extreme
	Major	4	Moderate	High	High	Extreme	Extreme
	Moderate	3	Low	Moderate	High	High	Extreme
	Minor	2	Low	Low	Moderate	High	High
	Insignificant	1	Low	Low	Low	Moderate	Moderate
			1	2	3	4	5
			Rare	Unlikely	Possible	Likely	Almost Certain
			Probability				

Figure 8 - Risk Matrix

8.4. Risk Mitigation

8.4.1. Risk mitigation approach

To correctly identify potential risks over the duration of the project, the Plan Risk Responses method outlined in Figure 9 will be used.

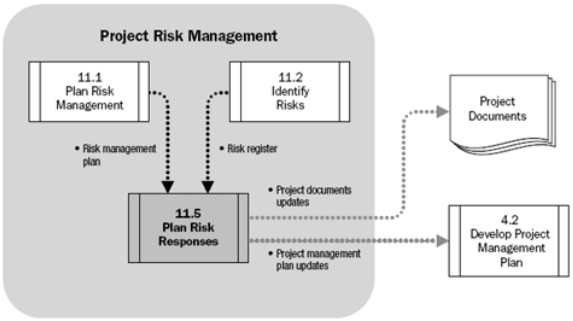


Figure 9 - Plan Risk Responses Data Flow Diagram

This method uses risk management plans and the risk register, along with Risk Responses tools and strategies, to produce updates to the project management plans and other documents.

Mitigation techniques within the risk register have been developed using tools and techniques, such as strategising, contingency plans and expert judgement.

Four major strategies used to develop risk management strategies and assign risk mitigations, listed in order of preference, include avoidance, transference, mitigation and acceptance.

8.4.2. Risk management strategies

Avoidance. Avoidance involves developing strategies that generally involve implementing project wide methods or changes to projects objectives to eliminate potential risks.

Transference. Risk transference is a strategy where the potential impact of the risk is shifted to a third party or the client. This strategy is used for risks out of the control of the project team, such as changes in government regulations and funding or latent conditions.

Mitigation. Risk mitigation requires a potential risk to be accepted and methods to be developed, decreasing the risk's rating. Most risks within the project are mitigated to have a reduced potential for occurrence.

Acceptance. Risk acceptance involves no action being taken to address a risk, evaluated to be unavoidable or of low consequence, and the potential impacts are accepted. This strategy may be used in cases where a risk is of low probability or of low cost-benefit to the project.

8.5. Risk monitoring control and reporting

Ongoing control and monitoring of risks ensures effective risk management throughout the project. Tools and techniques that will be used to ensure this occurs include:

Risk reassessment. This is where new risks are identified, current risk evaluated and any new risks identified as well as any outdated risks being closed.

Risk audits. Risk audits will be conducted at the discretion of the project manager to analyse and document the root causes of risks throughout the project, as well as the management.

Variance and trend analysis. This process involves comparing the actual results to the planned objectivise throughout the project. Any deviations found in this process help lead to early identification and control of risks.

Reserve analysis. The project reserve budget will be impacted positively and negatively throughout the project timeframe. Comparing budget reserves available against amount of remaining project risk, ensures sufficient reserves are available and avoids resource deficit.

Ensuring adequate and timely identification and control of risks, risk management meetings will regularly be conducted throughout the project, discussing control and mitigation risks to stakeholders. The relevant project documents will also be updated as needed during the risk monitoring process.

9. Human Resource Management

9.1. Human resources plan

A human resources management plan has been integrated into Quantum Mech's Waterpark Extension Project to ensure the project team has a firm management foundation to ensure human resource activities are handled efficiently. This human resource management plan includes:

- Identifying and outlining the team members roles and responsibilities
- Project organization charts, such as the responsibility assignment matrix (RAM)
- Plan for development and management of project team:
    - Outlining how staff resourcing will be acquired and released
    - Presenting a resource identification calendar
    - Identifying training needs throughout project
    - Defining how performance reviews will be conducted
    - Defining the recognition and rewards system in place
    - Identifying compliance and Safety acknowledgements

The plan outlines necessary skills required throughout the project as well as satisfying these needs with either appropriate training or necessary resourcing. This plan also identifies team building strategies and the impact of the staff management plan on the project.

9.2. Project team roles and responsibilities

9.2.1. Roles

Identifying the roles and responsibilities for the Waterpark Extension Project is an essential component of the human resources plan as all members must understand their position within this project. These early definitions allow any project team members concerns or conflicts to be recognised and altered accordingly. Appendix G - Roles, responsibilities and authorities of each team member outlines the final roles, responsibilities and associated authorities of each team member as agreed on by each member prior to project task engagement.

9.2.2. Project organizational chart

The project team competency requirements can be assessed from applying a responsibility assignment matrix (RAM) to each work package. The type of RAM we have applied to this project is a RACI (responsible, accountable, consult and inform) matrix, this can be seen in Table 4.

Table 4 - RACI Matrix for project accountability and responsibility.

RACI Matrix	Person						
Activity	**Mitch**	**Matt**	**Sam**	**Tim**	**Jake**	**Darby**	**James**
Mechanical Design	A	C	I	R	C	C	C
Electrical Design	A	C	I	C	C	R	C
Civil Design	A	C	I	C	C	C	R
Environmental Study	A	C	I	I	R	I	I
Geotechnical Study	A	C	I	I	R	I	I
Implementation	A	I	R	C	C	C	C

Key:

R – Responsible for completing the work

A – Accountable for ensuring task completion/sign off

C – Consulted before any decisions are made

I – Informed of when an action/decision has been made

9.3. Plan for development and management of project team

9.3.1. Staff acquisition

Within this project, staff will be acquired both internally and externally. For example, the core project management team will consist of internal employees and as such work centrally at the Quantum Mech offices, or as part of a virtual team if this is infeasible. For external staff acquisitions, communication with the human resource department of the external organization is relied upon for sourcing staff from these providers.

In relation to the scheduling of staff acquisition, this will be tied to the staffing requirements of each task within the project. In terms of the criteria used to decide upon staff to acquire, a multi-criteria decision analysis is performed. Assessing the availability, cost, experience, ability and location of the potential staff member, weightings are applied to these areas based on the role in which the individual is being considered. This will allow for staff selection to be based upon quantitative measures directly related to positions within the project, thus

encouraging staff suitability on a role-to-role basis. The internal and external staff acquisitions, as well as the weightings for acquisition decision criteria over the project work items are described in Table 5.

Table 5 – Description of acquisition methods and decision criteria of the project.

Work Item	Acquisition Method	Provider	Acquisition Decision Criteria				
			Availability	Cost	Experience	Ability	Location
Project Management	Internal	Quantum Mech	0.20	0.10	0.30	0.30	0.10
Geotechnical Works	Internal	Quantum Mech	0.20	0.20	0.15	0.30	0.15
Mechanical Works	Internal	Quantum Mech	0.20	0.20	0.15	0.30	0.15
Environmental Works	Internal	Quantum Mech	0.20	0.20	0.15	0.30	0.15
Electrical Works	Internal	Quantum Mech	0.20	0.20	0.15	0.30	0.15
Civil Works	Internal	Quantum Mech	0.20	0.20	0.15	0.30	0.15
Playground Manufacture	External	Playgrounds ‘R Us	0.20	0.30	0.30	0.10	0.10
Earthworks	External	Smith Earthworks Pty Ltd.	0.30	0.30	0.10	0.10	0.20
Sourcing Equipment	Internal	Quantum Mech	0.25	0.15	0.20	0.10	0.30
Pipe Works and Equipment Installation	External	Harris Industrial Piping Pty Ltd.	0.30	0.30	0.10	0.10	0.20
Commissioning	Internal	Quantum Mech	0.20	0.20	0.15	0.30	0.15

On external work items within the project, the external staff provider will be responsible for appointing individual staff members relevant to the work item in which the provider is tasked with. Quantum Mech’s human resource department will liaise with the external provider’s human resource department and will provide advice on the suitability of selected staff members where necessary.

9.3.2. Resource calendars

To document time periods in which staff can work on the project, and effectively plan staffing requirements and project work scheduling, resource calendars are used. Figure 10 shows an extract from the resource calendar used within the project. By visually displaying staff member tasks per day and availability for each day within the project, scheduling tasks and assigning team members to these tasks can be systematically completed.

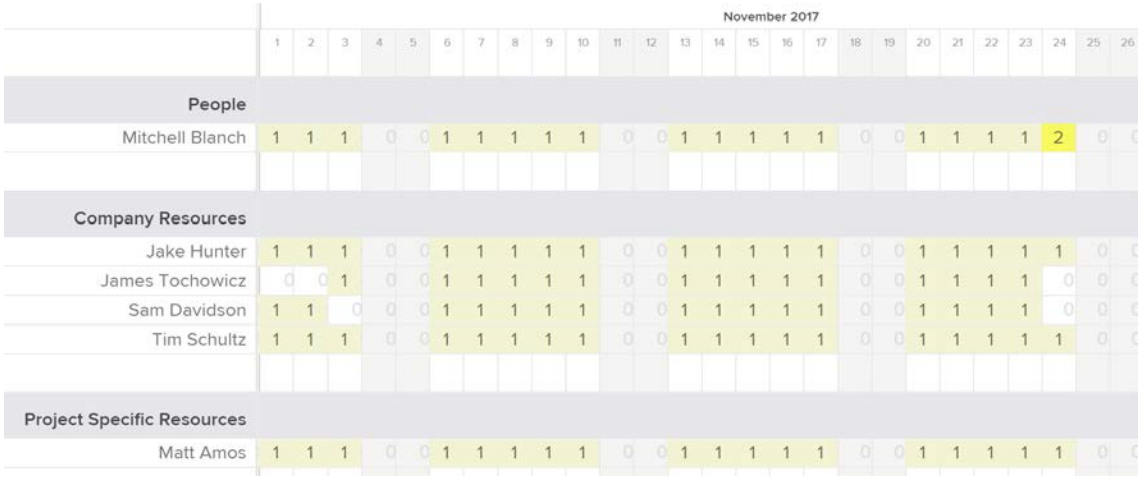


Figure 10 - Excerpt from Quantum Mech resource calendar for the month of November 2017.

9.3.3. Staff release plan

The staff release strategy throughout the project is strongly tied to the project schedule outlined within the schedule management plan. As project tasks are nearing completion, low-level staff will be released from the task team where less man-hours are required for the task. When the task is completed, the senior team members assigned to the task are unassigned and the task team is closed.

Where these members are removed from the task team towards completion, they can be moved onto other task teams if required (as defined by the Work Breakdown Structure and Resource Calendar). When staff members are displaced from a task team and no other task requires the

staff resource, the staff member will be placed onto another project within Quantum Mech or released altogether.

9.3.4. Training needs

In terms of training within the project, considerations for both the core project management team as well as other members of staff. Monthly training sessions will be held focusing on relevant areas throughout the project, as described in Table 6. In addition to this, an internal mentoring program will be put in place to pair junior members of the team with senior members to benefit from established insight and knowledge in specific areas of expertise. Quantum Mech also provides an avenue for employees to apply for external training courses if required. Funding for such external training will be provided upon assessment based on project relevance and relevance to the staff member's role within the project.

Table 6 – Core project management team monthly training schedule.

Date	Training Focus
31/8/17	Documentation
28/9/17	Communication
26/10/17	Safety
30/11/17	Dispute Resolution
25/1/17	Public Relations
22/2/17	Quality
29/3/17	Human Resources
26/4/17	Testing
31/5/17	Staff Release
28/6/17	Reflection

For project-specific training needs, a complete site induction will be completed on the 25th of October, ready for the first day on site on the 1st of November. Competency assessments will then be performed on the 1st of November to ensure staff are adequately trained to access the worksite. If workers are assessed to be incompetent to work in this environment, specific external training packages will be required prior to commencement of work on the project worksite.

9.3.5. Recognition and rewards

Monthly performance reviews of the core project management team will be undertaken by Matthew Amos to evaluate and provide feedback on the merit of work provided.

Based on the monthly performance reviews, top performing team members will be rewarded with nominations for industry awards, (relevant to the industry in which the nominated individual works within), by the Quantum Mech CEO.

If an individual's work is considered particularly exemplary or exceptional, gift vouchers or monetary bonuses may be provided.

9.3.6. Compliance

Upon acquisition into the project team, staff members will undergo an induction where internal standards of compliance will be introduced and the staff understanding of these standards will be examined. This induction will also reiterate required external industry compliances, such as compliance with Engineers Australia's standards for any staff employed in an engineering role.

In terms of compliance with internal standards, particularly of the Quantum Mech Code of Conduct (outlined in Section 12), monthly performance reviews will also serve to evaluate staff compliance. Before this occurs, managers are encouraged to review staff work and behaviour

in alignment with Quantum Mech internal standards. If any discrepancies are found in terms of compliance with internal standards, these will be discussed with the staff member and a second induction will be completed if deemed necessary. If continued non-compliance occurs, staff member training and experience will be reviewed the possibility of staff release will be discussed.

In terms of compliance with external compliance, Quantum Mech enforces standards set by the industries in which staff members occupy. To continually ensure compliance with external standards, Quantum Mech offers funding for industry-based compliance training based on staff member requirement and project need. In addition to this, industry compliance experts will be contracted to review situations in which potential breaches to industry standards are found.

9.3.7. Safety

Within the staff induction upon entering the Quantum Mech team, safety information regarding equipment and procedures regarding the Quantum Mech offices will be encompassed within an attached safety induction. Thus, this safety induction will be compulsory for all employees of Quantum Mech.

Along with this, all members working on project worksites will be required to undergo a site safety induction on 25th of October. This will encompass all site-specific safety procedures. Additionally, safety toolboxes will be held each morning before work commences.

10. Communication Management

10.1. Introduction

The following sections will set the communications framework for this project. It will serve as a guide for communications throughout the life of the SPVP Water Playground Project and will be updated as communication needs change. These sections identify and define the roles of persons involved in this project. They also include a communications matrix which maps the communication requirements of this project. An in-depth meeting guideline, as well as a project team directory are included to provide contact information for all stakeholders directly involved in the project.

10.2. Communications Management Approach

The Project Manager will take a proactive role in ensuring effective communications on this project. The communications requirements are documented in the Communications Matrix, which will be used as the guide for what information to communicate, who is to do the communicating, when to communicate it and to whom to communicate.

Updates or changes may be required as the project progresses or changes are approved. The project manager is responsible for managing all proposed and approved changes to the Communications Management Plan. Once the change is approved, the Project Manager will update the plan and supporting documentation and will distribute the updates to the project team and all stakeholders. This methodology ensures all project stakeholders remain aware and informed of any changes to communications management.

10.3. Communications Management Constraints

All project communication activities will occur within the project's approved budget, schedule, and resource allocations. Communication activities will occur in accordance with the mediums set forth in the Communication Matrix to ensure the project adheres to schedule.

LMCC have instructed that where possible, standardised formats and templates must be used for all formal project communications. Additionally, the distribution of any confidential information must be approved by a member of LMCC at the senior engineering supervisor level or higher prior to distribution. The Project Manager is responsible for ensuring that approval is requested and obtained prior to the distribution of any confidential information regarding this project.

10.4. Stakeholder Communication Requirements

As part of the Stakeholder Management Plan, the Project Manager communicated with each stakeholder to determine their preferred frequency and method of communication. This information is maintained in the Stakeholder Register. The Communication Matrix sets out the standard communication procedures for this project, however depending on stakeholder requirements, individual communication may be acceptable dependant on the constraints of the project.

In addition to identifying individual stakeholder communication preferences, each stakeholder has been made aware of the project's communication channels to ensure that stakeholders have access to these channels. The Project Team will maintain stakeholder communication requirements in the project's Stakeholder Register use this, alongside the project Communication Matrix as the basis for all communications.

10.5. Roles

Project Sponsor

The Project Sponsor acts as the champion of the project and has authorised the project by signing the Project Charter. This person is responsible for the projects ultimate success. Unless requested, the Project Sponsor will receive communications in a summary format as they are at the executive level.

Program Manager

The Program Manager oversees the project at the portfolio level and owns most of the resources assigned to the project. Due to this responsibility, the Program Manager will require more detailed communications than the Project Sponsor.

Key Stakeholders

Key stakeholders are those with whom we require a constant level of communication with and are not included in other roles defined in this section. For a list of key stakeholders refer to the Stakeholder Register.

Customer

The customer for this project is LMCC. The customer will be kept informed of project status including any impacts to the schedule for the final delivery of the project.

Project Team

The Project Team consists of all persons who have a role performing work on the project. They need to have a clear understanding of the work to be completed. The Project Team requires a detailed level of communication which is achieved through day to day interactions with the Project Manager and weekly team meetings with other team members

10.6. Communication methods and technologies

The project team will, alongside LMCC, determine the communication methods for each stakeholder and the technologies to do so. The communication method will be determined by several factors; stakeholder communication requirements, available technologies of the stakeholder and organisational policies and standards.

Internal communication within Quantum Mech employees involved in this project will use the team messaging program ‘Slack’. This allows for direct communication with each team member and the project manager at the company.

For other stakeholders, a website will be made available. This website will display general information such as the project timeline and the projects features. As well as these features, the projects status will be made available on this website to keep stakeholders up to date. A forum will be created on the website for any inquiries or questions that the stakeholders might have. For those that don’t have access to the internet and aren’t able to access the website, a phone hotline will be available.

A weekly meeting will be held with key stakeholders, whilst a general meeting will be held monthly for other stakeholders, to provide a status update. Status update reports will be made available in hard copy through LMCC.

10.7. Communication matrix

Appendix H displays the communication requirements for the SPVP Water Playground Project. This includes; the communication type, the objective of communication, the medium of the communication type, the frequency, audience and the deliverables.

10.8. Communication flowchart

To aid in project communication, the flowchart below (Figure 11) was created. This provides the communication framework for the project team to follow on this project. If a situation occurs outside of this flowchart, the Project Manager is responsible for discussing the communication with the Project Sponsor or Technical Representative and deciding on how to proceed.

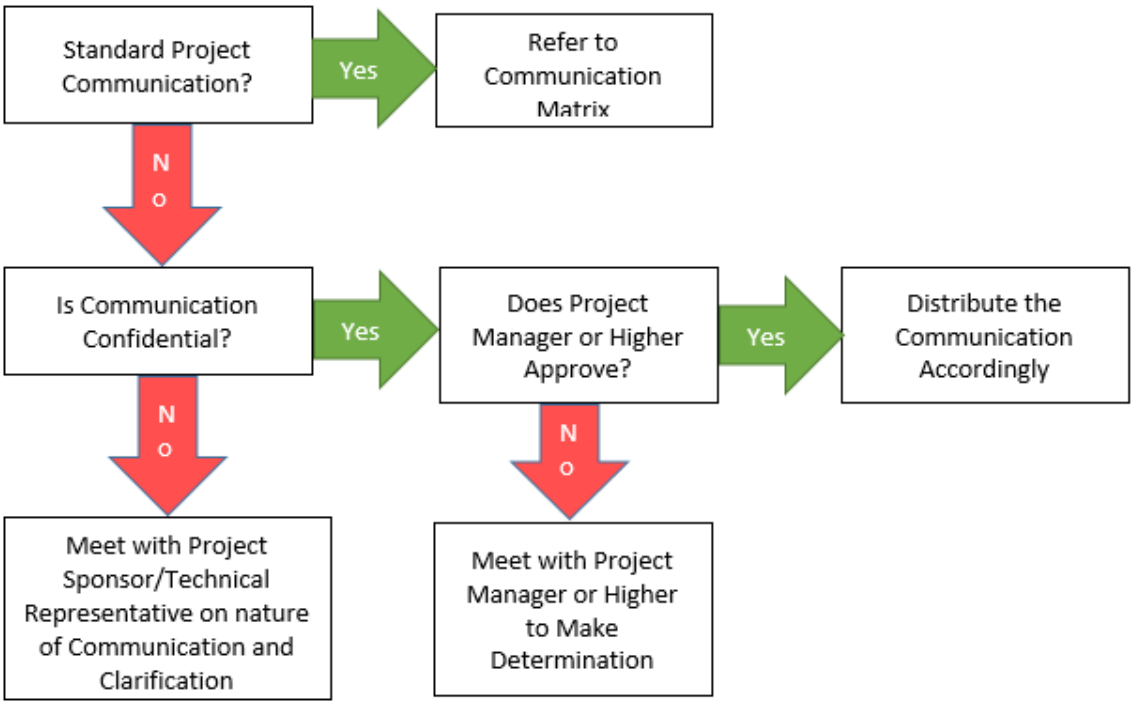


Figure 11 – Communication flowchart

10.9. Guidelines for Meetings

Meeting Agenda

The Meeting Agenda will be distributed 3 business days before the meeting takes place. The agenda will provide topics of discussion, presenters at the meeting, and the time limit of each topic. Allocated time at the end of the meeting will be provided for any questions or inquiries

that anyone may have. The first topic in the agenda will be a review of action items from the last meeting.

Meeting Minutes

A Project Team Member will record the minutes from each meeting and will make them available within 1 business day of the meeting. The minutes will include the status of all topics of the agenda along with new action items.

Action Items

Action Items include both the action item as well as the owner of the action item. They will be recorded in both the meeting agenda and minutes. Meetings will begin with reviewing the previous meetings action items.

Meeting Chair Person

The distribution of the meeting agenda and meeting minutes, as well as, facilitating the meeting lies with the Chair Person. It is their responsibility for ensuring that the meeting begins and ends on time and making sure that presenters speak for their allocated time.

Note Taker

The Note Taker is responsible for the documentation of all meeting topics, questions and inquiries of the stakeholders and taking notes of any else important that takes place in the meeting. The notes from the Note Taker will then be given to the Chair Person to be included in the minutes of the meeting.

Time Keeper

The Time Keeper will be responsible for helping the presenter keep to their allocated time by letting them know when they are drawing close to it. A hand signal will be gestured towards

the presenter to let them know how much longer they have, or if they are deviating from the topic.

Meeting Venues

For key stakeholder meetings, the designated venue will be the conference room located at the Quantum Mech company grounds. This will also be the venue for the project kick-off meeting. The venue for the monthly project update stakeholder meetings, as well as the initial stakeholder meeting, will take place at the Speers Point Community Centre. If an emergency meeting is required, the venue will be decided upon at the time of the emergency.

10.10. Communication Standards

For the SPVP Water Playground Project, Quantum Mech will use standard organisational formats and templates, set by the company, for all project communications. Formal project communications are displayed in the communication matrix and are detailed further, below.

Initial Stakeholder Meeting

The Project team will use the Quantum Mech templates for the meetings minutes and agenda, as well as, any slides or figures will utilise the standard formatting for these visual displays. The meeting minutes will be archived on the projects website.

Project Kick-off Meeting

The Project team will use the Quantum Mech templates for the meetings minutes and agenda, as well as, any slides or figures will utilise the standard formatting for these visual displays. The meeting minutes will be archived on ‘Slack’ and the projects website.

Project Status Meeting – Key

The Project team will use the Quantum Mech templates for the meetings minutes and agenda, as well as, any slides or figures will utilise the standard formatting for these visual displays. The meeting minutes will be archived on ‘Slack’ and the projects website.

Project Status Meeting

The Project team will use the Quantum Mech templates for the meetings minutes and agenda, as well as, any slides or figures will utilise the standard formatting for these visual displays. The meeting minutes will be archived on the projects website.

Emergency Meeting

As it will be an emergency meeting, templates and standard formatting isn’t of the highest priority and may be informal hut should be professional. The meeting minutes will be archived on ‘Slack’.

10.11. Communication Escalation Process

Communication must be efficient and timely for successful project completion. Therefore, any disputes, incidents, conflicts or discrepancies in the projects communications are resolved so that the project schedule isn’t affected. It will be ensured that the correct communications are distributed to prevent any ongoing difficulties. Quantum Mech will use its standard escalation model to provide the framework for communication issues. This is shown in Table 7 below.

Table 7 – Communication escalation process matrix

Priority	Definition	Decision Authority	Timeframe for resolution
Priority 1	Major impact to project operations. A severe impact will occur if not resolved immediately and will impact the project schedule	Project Manager/Project Sponsor	Within 6 hours
Priority 2	Average impact to project operations. An adverse impact could occur and will need sufficient time to resolve and may impact the project schedule	Project Manager	Within 2 business days
Priority 3	Slight/insignificant impact to project. Little to no impact will occur or affect the project schedule	Project Manger	Sufficient time to resolve problem/ work continues

11. Cost Management

11.1. Introduction

The Project Manager will be responsible for all cost management activities on this project. The Project manager shall perform weekly cost reviews that include budget forecasts based on earned value and cost till completion methods. There shall be weekly cost review meetings at 10am Wednesdays where the sponsor and Quantum Mech management review the current situation. If there is a need for a change to the budget it will be addressed in these meetings and formally accepted by the Lake Macquarie City Councils representative and Quantum Mechs Project Manager.

11.2. Cost Estimation Methods

Quantum Mech typically uses two different methods of costing estimation – the Project Evaluation and Review technique, and the Bottom-Up technique. These techniques are described in sections 11.2.1 and 11.2.2 however it should be mentioned here that the reason these two methods are used together is that they produce an easy comparison point and

increased accuracy via estimated figures gained through different means. By doing this, a type of redundancy layer is added to the costing estimations.

11.2.1. Project Evaluation and Review Technique (PERT)

The PERT method of estimation considers the uncertainties surrounding cost, duration and risk of a project. It does this using the formula of Equation 1:

$$PERT = (O + (4 \text{ X } ML) + P) / 6 \quad (1)$$

Here, ML represents the most likely scenario and is often a figure provided by the resource owner or performer. O represents the optimistic scenario and assumes the ideal circumstances exist so that performing the task will have near-perfect to perfect results. Finally, P represents the pessimistic scenario and assumes worst case performance. This is one of the preferred methods for costing because it ensures that the range of uncertainty around the expected costs is captured.

11.2.2. Bottom up

The bottom-up method of estimation involves approximating individual costs for each task at the greatest level of specified detail. Using a high level of scrutiny at task-level allows for these costs to be summarised to accurately indicate costs of task groups, and so on up the Work Breakdown Structure (WBS) hierarchy. This method proves advantageous as it allows for highly accurate costing estimates directly based on individual costs of tasks within the project.

11.3. Forecasts

Forecasting involves the development of an estimate at completion (EAC) cost. Creating this estimate involves using current performance information and other known data to project future conditions and events for the project. Forecasting provides the management team with a metric for where action is to be taken to remedy underwhelming performance. For example, if the

EAC cost is greater than that of the budget at completion (BAC), this suggests that necessary action is to be taken to ensure that the balance of EAC and BAC is satisfied. Forecasting also forces foresight from the project management, increasing the likelihood of perceiving possible unfavourable conditions or events within the project's future and allowing responses to possible hazards to be employed at an earlier time.

Within this project, the EAC forecast is computed through two components. Firstly, a bottom-up EAC is calculated using the actual costs incurred up to the present summed with the bottom-up figures for tasks yet to be completed from the WBS, encompassed within Equation 2.

$$EAC = AC + ETC_{BU} \tag{2}$$

Here, EAC represents Estimated Actual Cost; AC represents Actual Cost; and ETC_{BU} represents Bottom-Up Estimate to Complete.

This method encourages the use of bottom-up estimation to provide an accurate method of forecasting tasks yet to be completed, and as such benefits from the detailed estimates of this method. Secondly, this EAC forecast will be compared to an EAC forecast with consideration of the cost performance index (CPI) and schedule performance index (SPI). The CPI and SPI detail the ratio of earned value (EV) to actual cost (AC) and the ratio of earned value (EV) to planned value (PV) respectively. This method produces an alternative forecast focusing on a desired balance of cost and schedule performance indices, and serves for an additional means of warning of underperformance. This second method is encompassed in Eqn 3.

$$EAC = AC + [(BAC - EV) / (CPI \times SPI)] \tag{3}$$

Here, EAC represents Estimated Actual Cost; AC represents Actual Cost; BAC represents Budgeted at Completion; EV represents Earned Value; CPI represents Cost Performance Index; and SPI represents Schedule Performance Index.

11.4. Variation Response

To ensure the project does not go drastically over budget, there will be defined control limits that will trigger a cost variance corrective action plan to be implemented. The control measures used to trigger this plan will be a CPI of greater than 0.9 and a SPI of less than 1.1. If these trigger levels are reached, the project manager will then present the cost variance corrective action plan to the project sponsor for approval within 5 business days of the control limits being breached.

The cost variance corrective action plan will explain in detail the actions and changes that are needed to ensure the project swiftly returns to within its budgetary constraints. Naturally, the project will deter from the original cost estimates and hence the control measures are set to detect when the project is going drastically away from the planned budget. Actions involved in the plan may involve extending the budget for the project or reducing the quality of the scope. Once this plan has been approved by the project sponsor it will then become part of the project plan and the relevant documents will be updated with the changes that are needed.

11.5. Risks & opportunities

Prior to this cost estimation plan we have developed a detailed risk register, with a weighted value assigned to each risk. This will assist in the accuracy of our cost management approach, via accounting for specific risks. Quantum Mech have defined that when a risk is considered to be equal to or above 80% likely to occur the risks predicted impact/cost on the project will be accounted for in the cost estimate.

Risks will be estimated via the two main methods of our choice; these include the three-point method (or PERT method) and furthermore broken down and assessed in detail via the bottom up method. The final values will be determined in consideration of both methods results.

Opportunities we develop via this project will be costed in a similar method to the same 80% limit. To ensure the project has equal chance to reduce project cost through opportunities as it does to negatively impact costs due to risks. We have assigned the limiting factor at 80% to ensure the project cost management is not grossly impacted, although does account for near certain possibilities.

11.6. Cost Allocation

This cost management plan includes a detailed cost management spreadsheet in Appendix F – Cost Management. Within this spreadsheet includes estimated costs for all task level items of this project. These task items were derived from an extension of the WBS developed earlier in the study. Essentially the task items were developed on a basis of bottom up cost estimating, thus our decision to undertake such pre-tender cost estimates. As outlined in this report, the three-point PERT method will also be used to verify the value obtained via the bottom up approach and vice versa. We believe the application of both methods in the pre-tendering cost estimates is essential to achieve reliable results that relevant stakeholders will find reassuring.

An advantage of using a detailed breakdown method such as the bottom up includes minimising the potential error through smaller estimations. Although a negative connotation of this approach includes the extensive work required by a project team member to research all required tasks to a specific level of detail, increasing overall cost and potentially over running project management costs. We have considered this possibility, and for this project have decided this level of cost management is necessary.

In conjunction to the bottom-up method, the PERT method will also be applied to the same task level to validate all results. This cost estimate tool will include detail cost, anticipated duration and risk uncertainty breakdowns of all tasks. The PERT tool will produce reliable results due to Quantum Mech’s previous experience with similar projects, as the tool requires

anticipated optimistic and pessimistic values which are often best estimated from experiences. We will include all previous findings from our Lessons Learnt from past projects to develop safe and conservative cost estimations.

12. Code of Conduct

12.1. Introduction

At Quantum Mech, there is a deeply ingrained understanding that the world is an ever-changing place, and increasingly, the standards once acceptable are now not even close. Since its inception, Quantum Mech has strived to be, and stay, at the forefront of not only innovation, but in ethical operation. The following section outlines Quantum Mech's Code Of Conduct, which all workers, from the top of management to the subcontractors managed on a project, are expected to follow.

At the core of the company is a deep focus on Corporate Social Responsibility (CSR), meaning that Quantum Mech is accountable for all social and environmental impacts and outcomes across all of its projects. More than this, CSR involves not accountability for impacts, but a responsibility to take the initiative to reduce the social and environmental impacts that will be incurred on a project. Quantum Mech does this by always acting in a responsible, professional manner, ensuring effective internal and external stakeholder engagement, while holding an emphasis on responsible design, construction and maintenance that fosters community wellbeing and future sustainability.

All Quantum Mech projects must plan for and adhere to the company's 'Principle-6' ethical framework, as outlined in Figure 12. These form the core ideas of the ethical attitude at Quantum Mech, and are discussed in further detail in the following sections.

Figure 12 – Principle-6 Ethical Framework

12.2. Integrity

The principal of integrity can be defined as the quality of being honest and having a strong moral compass. The way that this will be implemented throughout the company can be split up in three main ideals.

Acting on the basis of a well-informed conscious is the first of these principles. Employees will be encouraged to act on what they believe is right whilst also acting impartibly and objectively. Employees will also be expected to act in a professional manner and also ensure that they give weight to all contractual, legal and employment obligations.

The second principle involves employees acting in an honest and trustworthy manner. This includes employees providing proper recognition of work, being effective in conflict resolution, giving and receiving fair criticism and also not engaging in any fraudulent or corrupt behaviour.

Finally respecting the dignity others is the last of the integrity principles observed at quantum mech. This involves employees not acting in a manner which causes discrimination against

others and also not applying any bias or discrimination based on race, religion, gender, sexual orientation, disability or country of origin.

12.3. Competency

The principle of professional competence is held with high regard at Quantum Mech, and can essentially be broken down into three basic ideas.

In all undertakings at Quantum Mech, care and diligence in the work is seen with the utmost importance. Employees are encouraged to continue developing personally, and professionally, through training sessions paid for by the company. There is a commitment to mandatory monthly skills workshops, run by a relevant external training company, to work on a vast range of areas, from communication to conflict resolution.

On a technical level, The engineers working at Quantum Mech are continually encouraged to extend themselves, from accredited courses, to the facilitation of being able to work alongside taking further education such as a master's degree. As well, All employees are required to have the relevant mandatory minimum qualifications, from a university degree to plant operating licenses. A register of all qualifications and further training undertaken is kept.

One of the most important programs at the company is the implementation of an on the job mentorship for the younger or less experienced employees to be shadowed and are comfortable they can manage.

Quantum Mech will always represent the company's competence objectively, and never seek to falsify or misrepresent what it is the company can or will do.

As a leading contractor in the field of construction, there is a deep understanding where our competence and skills lie, but perhaps more importantly, where our competence realistically ends. In these fields Quantum Mech have and will employ and manage specialist contractors

who lead in their own respective field to complete the work to the high standard expected. Quantum Mech prides itself on always ensuring it has the right level of knowledge for the job at hand, and will not act on incorrect or insufficient knowledge.

Throughout all stages of any tender process, Quantum Mech adheres to all planning and zoning requirements, speaking to all levels of government required with regards to environmental and community impacts. Throughout the construction of this water park, Quantum Mech will go above and beyond the legal requirements and accepted standards of the industry with regards to health and safety, to ensure everyone goes home safe at the end of the day.

When construction is complete, the park will undergo rigorous testing, ensuring that it meets every possible requirement before it is officially handed over.

Perhaps most important of all, Quantum Mech is aware that there are times when there is a lack of knowledge in a required area. In cases such as these, the company will be upfront, and never try to hide this lack, and in critical matters, will hire the required consultants to ensure the expected high standards are maintained.

12.4. Leadership

Quantum Mech believes that solid, ethical leadership is the backbone of any company, and have adopted the model shown in Figure 13, the 4 V's of leadership to ensure that the ethical standards that are expected, are maintained.

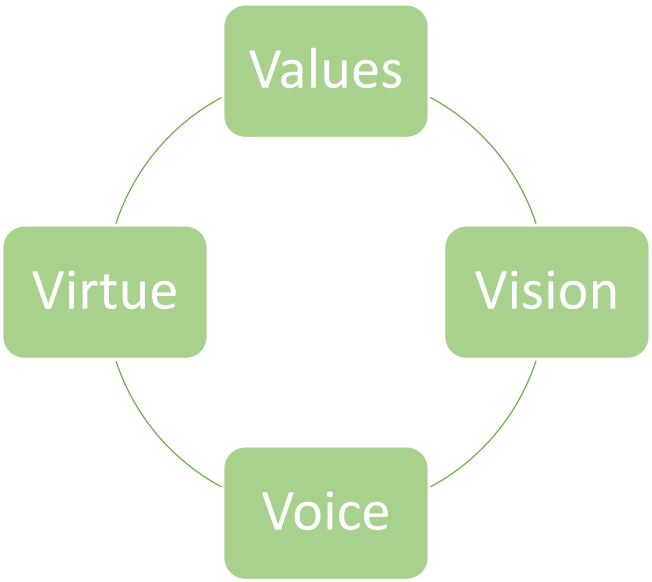


Figure 13 – 4 V's of ethical leadership

Values – From the very beginning, Quantum Mech recruits those with values that align with the company's own high standards. From the values of the leader, comes the ethical basis of the team. The management team and leaders at Quantum Mech promote diversity, communicate clearly and engage with others responsibly. All project leadership staff are further put through an intensive three-day leadership course with the team from *Innovate your business* to further ensure they are up to scratch

Vision – Vision is something that is encouraged for all employees on every project. Those with a clear and driven vision of their future put forth the most innovative ideas and create the best work. That is why at Quantum Mech, employees are given the opportunity to progress their career as far as they possibly can. The company does not give promotions based on seniority, but rather merit. Employees who perform technically and ethically are rewarded through the company's gift card program. Above all, Quantum Mech employees are encouraged to succeed.

Voice – It is essential in the workplace, that no matter the role, everyone has the chance, and right, to be heard. From the labourer to management, it is important that everyone feels

comfortable to put forward ideas and complaints. This is why every project run by Quantum Mech includes a Representative Team, made up of volunteers from across the project, who meet fortnightly to discuss ongoing issues, and anything that has been brought to them by their co-workers. These issues are presided over by a non-project related HR representative from Quantum Mech to ensure that everyone is heard equally, and disputes settled fairly.

Virtue – The idea of virtue at Quantum Mech is clear in the work produced. Quantum Mech is to ensure that all of the virtues held high at the company are incorporated into everyday work. All employees are to communicate in a virtuous, honest and effective manner, particularly when it comes to specialist workers, who have a greater knowledge in their field than others. For this reason, the project holds daily toolboxes (sometimes area specific), which communicate in a way that everyone can understand, anything important happening across the project.

12.5. Engagement

Responsible engagement is at the heart of every project. Without a clear plan for engagement, any project, regardless of its value, can easily lose context. The plan for engagement at Quantum Mech is based off the stakeholder management plan.

As can be seen in Figure 6, Quantum Mech started out by identifying all of the stakeholders for the project, and using this, tailored a specific engagement style for each, based on their help/harm potential.

Using this, Quantum Mech continues by engaging with each stakeholder group individually, through the method of their choosing, throughout the project, keeping those required informed, and constantly liaising with those likely to become disgruntled, where the project will always try to find a solution to keep everybody happy.

Overall, Quantum Mech aims to engage the community as a whole, and not just put everybody into specific groups. The project always aims to reach and engage every individual required. This will be done through a variety of community engagement methods discussed below.

To ensure that Quantum Mech meets and exceeds the goals set with regards to responsible engagement, the initiatives set out in Figure 14 below have been and will be enacted.

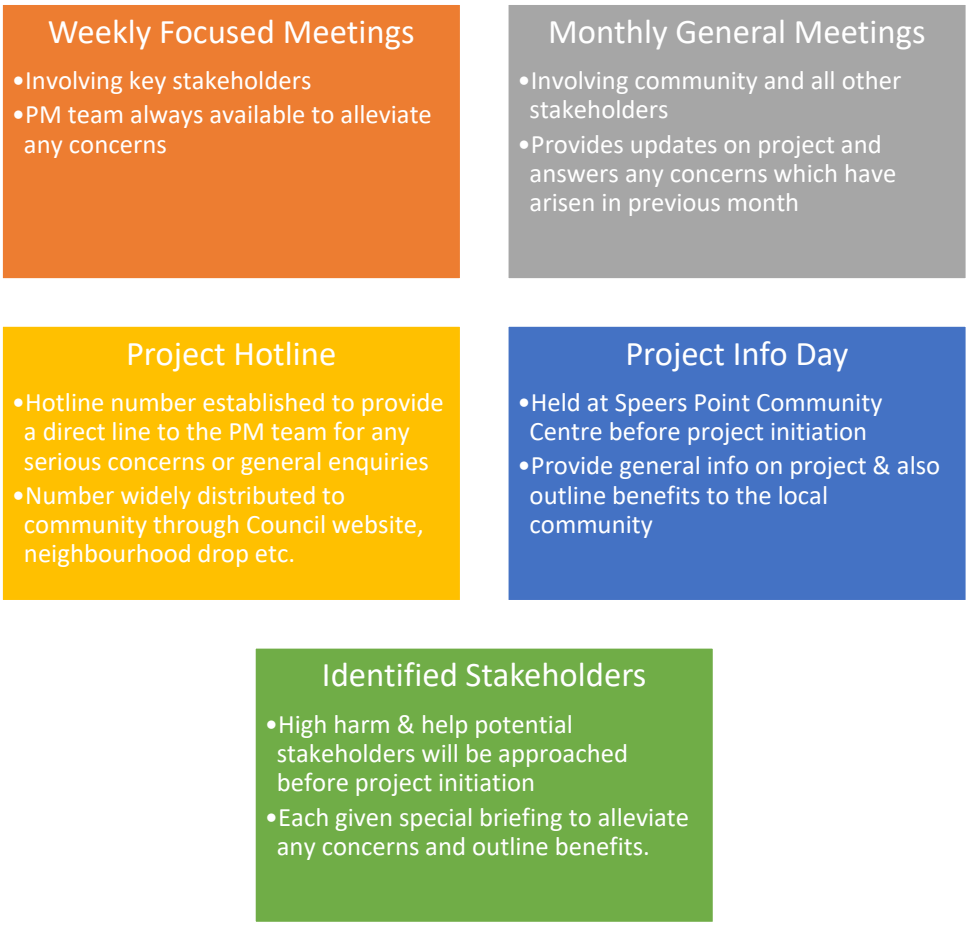


Figure 14 – Project engagement initiatives

12.6. Health, safety and wellbeing

Health and safety is of the upmost importance at Quantum Mech. Quantum Mech will ensure that all relevant legislation is enforced throughout the completion of the project. As this is a construction project, all works will be done in accordance with the work health and safety act

(2011). Other relevant legislation include the NSW public health act and the NSW public health regulation 2012. The specific safety plan for the project can be found in section 9.3.7.

To ensure health safety and wellbeing is always at the forefront of employees of Quantum Mech. All employees on site will also be subject to random drug and alcohol testing to ensure that employees are not inhibited by any illicit substances. In addition, any worker who enters the site will also have to undergo a site-specific induction to ensure all safety protocol is followed.

12.7. Present and future needs

At Quantum Mech we realise that both present and future needs form an integral part of the company. These needs are generally based around the requirements from all stakeholders. The main needs for this project involve ongoing production costs, sustainability, delivering the project on time and on budget, reducing project costs and maintaining key client and stakeholder involvement.

Sustainability is a key business focus of Quantum Mech. To ensure this is maintained on the Speers point variety park project a number of measures will be implemented. These include ensuring that the water park uses a water recapture system that will ensure a minimum water recapture rate of 60%. The use of environmentally sustainable and suitable materials will also be used on the project when available.

Production costs is a key business need for the completion of the project. This will be managed by continuous research and time into decreasing margins, as well as allowing excessive time for design to ensure the most economic operation requirements can be implemented.

Lastly to ensure the project is delivered on time and on budget a project manager will be assigned to each high-level task. This will ensure that all tasks are completed, reviewed and delivered at least 48 hours prior to schedule

13. Appendices

13.1. Appendix A Requirements traceability matrix.

Project name	Speers Point water park				
Cost centre	1009776				
ID	Requirements Description	Rationale for inclusion	Owner (responsible person)	Priority	Status
1	Project being completed on time and on time		Project Manager	High	Incomplete
2	Design to comply with all relevant Australian Standards;		Project Manager	High	Incomplete
3	Construction will be undertaken in a safe manner and will also comply with relevant regulations;		Project Manager	High	Incomplete
4	High water efficiency during design		Project Manager, Water engineers	High	Incomplete

13.2. Appendix B – Risk Register

RISK REGISTER

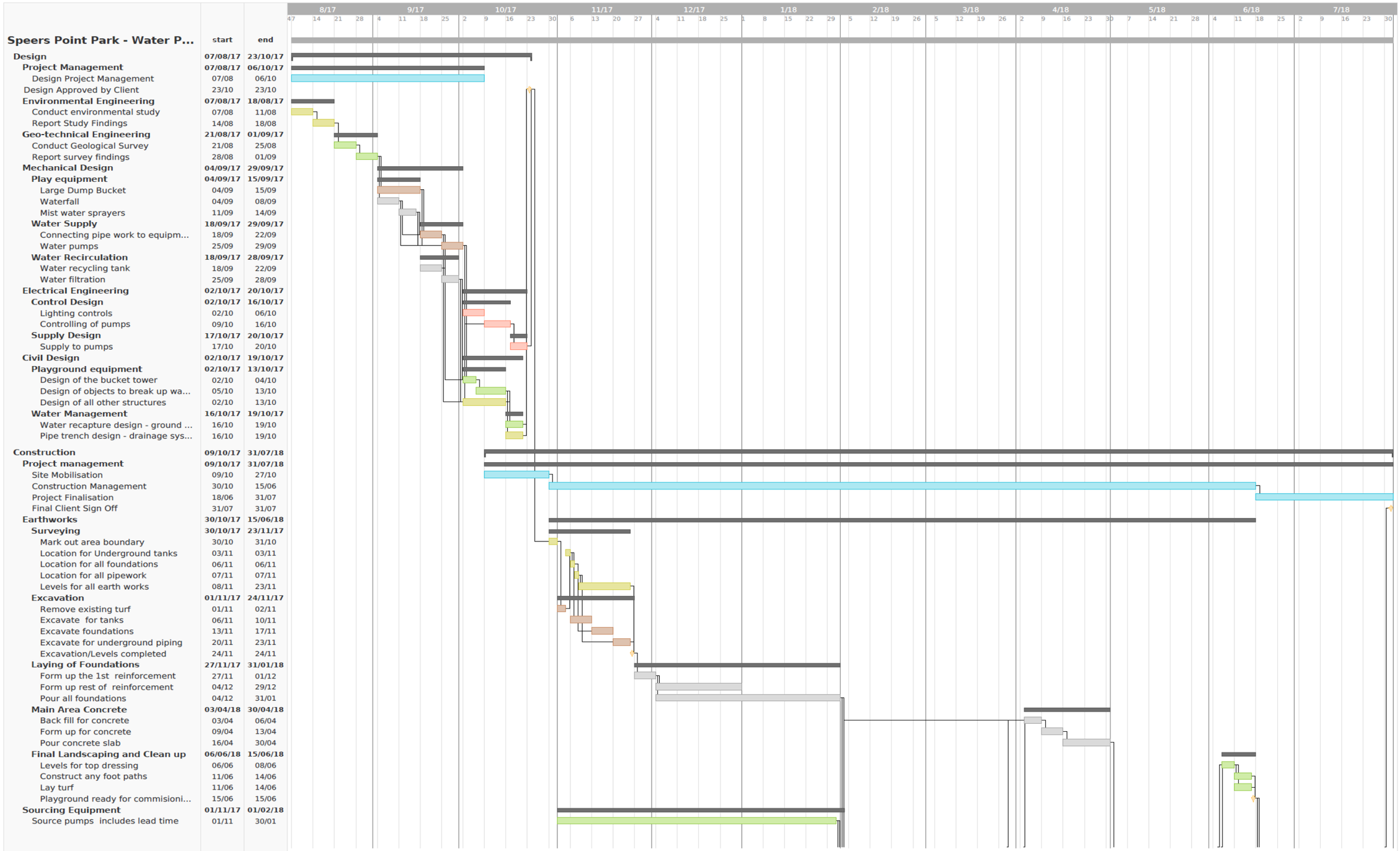
CLIENT:	Lake Maquarie Council	ORDER NO:	PO 666888	Plan Prepared by: Mitchell Blanch	Date:	12-04-17
PROJECT:	Spears Point Park Water Playground	JOB NO:	414100	(Please print)		

ITEM No.	DETAILED RISK IDENTIFICATION	INITIAL RISK MATRIX				COST IMPACT ESTIMATE			MITIGATING ACTIONS				RESIDUAL RISK MATRIX				ACCEPT RISK
		CONSEQUENCE	LIKELIHOOD	LEVEL	RISK RATING	MINIMUM	MAXIMUM	LIKELY	MITIGATING ACTIONS	LIKELY COST OF MITIGATING ACTIONS ($000)	COST BENEFIT OF IMPLEMENTING MITIGATING MEASURES	MITIGATION ACTION IMPLEMENTED YES/NO	CONSEQUENCE	LIKELIHOOD	LEVEL	RISK RATING	YES/NO
1	Procurement lead times blow out on the water pumps	4-Major	C-Possible	High	18	$ 20,000.00	$ 50,000.00	$ 30,000.00	Prefeasibility Study including quotes from suppliers featuring delivery details and sub-contractor contract to have penalty clauses for late delivery where possible.	$ 5,000.00	$ 25,000.00	YES	4-Major	D-Unlikely	High	14	YES
2	Inclement weather rain days exceeding the allowed 4 days	4-Major	B-Likely	Extreme	21	$ 5,000.00	$ 50,000.00	$ 35,000.00	The mitigation of this risk would be to increase the hours worked early in the project giving more float in the schedule allowing more wet weather days if necessary. The costs to this is a hire labor rate and increased labor costs due to overtime.	$ 30,000.00	$ 5,000.00	YES	4-Major	C-Possible	High	18	YES
3	Inclement weather localized flooding	4-Major	C-Possible	High	18	$ 5,000.00	$ 15,000.00	$ 10,000.00	Ensure that the site is left prepared especially when wet weather is forecast. This would include extra compaction of ground works, equipment moved to high ground etc.	$ 4,000.00	$ 6,000.00	YES	3-Moderate	C-Possible	High	13	YES
4	Possibility of an aboriginal heritage site	4-Major	E-Rare	Moderate	10	$ 20,000.00	$ 60,000.00	$ 45,000.00	Aboriginal representative to be on site during ground works to allow for fast and efficient clarification and so that there are no arguments over cover ups etc.	$ 6,000.00	$ 39,000.00	YES	3-Moderate	D-Unlikely	Moderate	9	YES
5	Protest from local community groups – Local residents	3-Moderate	B-Likely	High	17	$ 5,000.00	$ 15,000.00	$ 7,000.00	This will be mitigated by early consultation with all residents and even one on one house visits with the residents that will be immediately effected i.e. residents that look though the park to the lake.	$ 5,000.00	$ 2,000.00	YES	3-Moderate	D-Unlikely	Moderate	9	YES
6	Contractors not meeting their scope requirements and deadliness	4-Major	C-Possible	High	18	$ 10,000.00	$ 30,000.00	$ 25,000.00	If the contract is large enough place in KPI's for compliance and on time delivery. If contract is too small or is just a supplier ensure that the quality and time is factored into procurement decision.	$ 15,000.00	$ 10,000.00	YES	4-Major	D-Unlikely	High	14	YES
7	Lost time injuries	3-Moderate	C-Possible	High	13	$ 2,000.00	$ 6,000.00	$ 4,000.00	lost time injuries can be reduced though a good safety culture and this will be created as per the severe injuries mitigating action. Additionally, there could be a need for additional safety equipment or specialized tooling which is covered in this mitigation action and cost.	$ 5,000.00	-$ 1,000.00	YES	2-Minor	D-Unlikely	Low	5	YES
8	Severe injuries which generate negative press	5-Catastrophic	C-Possible	Extreme	22	$ 100,000.00	$ 200,000.00	$ 150,000.00	This risk can be minimized by ensuring there is a safety focused culture on the site. To gain this extra inductions and courses will be required and supervision increased.	$ 50,000.00	$ 100,000.00	YES	5-Catastrophic	D-Unlikely	High	19	YES
9	Incorrect quoting	3-Moderate	D-Unlikely	Moderate	9	$ 20,000.00	$ 100,000.00	$ 40,000.00	This can be reduced by having more than one internal team quote on the job, or extra checks being put in place. This increases the initial bid costs which could be detrimental if the bid is not the winning bid. *Not implemented due to the large negative cost benefit and the possibility of losing the entire job*	$ 80,000.00	-$ 40,000.00	NO	3-Moderate	D-Unlikely	Moderate	9	YES
10	Service strike possibility	4-Major	C-Possible	High	18	$ 6,000.00	$ 15,000.00	$ 8,000.00	All possible service plans are reviewed early. If there is the chance then conduct potholing to ensure the utilities are not hit and damaged.	$ 6,000.00	$ 2,000.00	YES	4-Major	E-Rare	Moderate	10	YES
11	Old mine shafts and/or mine disturbance	4-Major	E-Rare	Moderate	10	$ 40,000.00	$ 100,000.00	$ 80,000.00	Geotechnical study conducted earlier before too much planning has been put into place so the costings of moving location are less or the extra remediation costs are known earlier and can be factored in. If problems are found early in the process they cost exponentially less to resolve.	$ 45,000.00	$ 35,000.00	YES	3-Moderate	E-Rare	Low	6	YES
12	Power outage	1-Insignificant	C-Possible	Low	4	$ 1,000.00	$ 2,000.00	$ 1,500.00	Supply a backup generator to be on stand-by. *Not implemented due to poor cost benefit and minimal impact if it does eventuate*	$ 8,000.00	-$ 6,500.00	NO	1-Insignificant	C-Possible	Low	4	YES
13	Contamination of Lake Maquarie from soil run off	4-Major	C-Possible	High	18	$ 30,000.00	$ 100,000.00	$ 40,000.00	Increase the area bunding from the minimum requirement to the best possible practice.	$ 30,000.00	$ 10,000.00	YES	3-Moderate	D-Unlikely	Moderate	9	YES
14	Contaminated area e.g. asbestos that had been dumped and subsequently buried	3-Moderate	D-Unlikely	Moderate	9	$ 3,000.00	$ 10,000.00	$ 4,000.00	This cannot be mitigated but extra staff awareness will be implemented and possible removal contractors listed in case they are required.	$ 1,000.00	$ 3,000.00	YES	2-Minor	D-Unlikely	Low	5	YES
15	Local fauna disturbance	3-Moderate	D-Unlikely	Moderate	9	$ 1,000.00	$ 10,000.00	$ 3,000.00	Study into local fauna and flora to be conducted prior to starting project to understand what needs to be protected. Bad press is the worst outcome for the project so it is important to understand what is required of Quantummech to ensure this doesn't happen	$ 2,000.00	$ 1,000.00	YES	2-Minor	D-Unlikely	Low	5	YES
16	Local flora disturbance	3-Moderate	D-Unlikely	Moderate	9	$ 1,000.00	$ 10,000.00	$ 3,000.00	Study into local fauna and flora to be conducted prior to starting project to understand what needs to be protected. Bad press is the worst outcome for the project so it is important to understand what is required of Quantummech to ensure this doesn't happen	$ 2,000.00	$ 1,000.00	YES	2-Minor	D-Unlikely	Low	5	YES
17	Vandalism during the project	2-Minor	D-Unlikely	Low	5	$ 500.00	$ 10,000.00	$ 2,000.00	Not directly mitigatable but will be influenced by having a positive image within the community which is already a key area for Quantummech on this project. No further associated costs	$ -	$ 2,000.00	YES	2-Minor	E-Rare	Low	3	YES
18	Stolen property	2-Minor	E-Rare	Low	3	$ 300.00	$ 3,000.00	$ 2,000.00	Ensure all equipment is locked away at the end of shift	$ -	$ 2,000.00	YES	1-Insignificant	E-Rare	Low	1	YES
19	Availability of the skilled labor requirements	3-Moderate	E-Rare	Low	6	$ 2,000.00	$ 4,000.00	$ 2,500.00	Retain additional casual staff from other jobs. *Not implemented due to very bad cost benefit.*	$ 20,000.00	-$ 17,500.00	NO	3-Moderate	E-Rare	Low	6	YES
20	Equipment Commissioning problems (incorrect pump design)	4-Major	E-Rare	Moderate	10	$ 50,000.00	$ 200,000.00	$ 100,000.00	Add additional safety factors to design. This would however increase the pump price. *Not implemented even though there is a cost benefit due to the possibility of the risk being rare and the risk reward being $80,000.*	$ 80,000.00	$ 20,000.00	NO	4-Major	E-Rare	Moderate	10	YES
21	Labor disputes and the inherent time to resolve them	3-Moderate	D-Unlikely	Moderate	9	$ 1,000.00	$ 15,000.00	$ 1,000.00	This is a work force culture problem usually and Quantummech already pays its staff above the award and has an excellent work culture in general. Project manager to monitor.	$ -	$ 1,000.00	YES	3-Moderate	E-Rare	Low	6	YES
22	Cut to original agreed funding levels	5-Catastrophic	C-Possible	Extreme	22	$ 5,000.00	$ 200,000.00	$ 150,000.00	Have an upfront payment and then scheduled payments to decrease the Quantummech's risk. Ensure the project is always cash flow positive therefore only expected income can be lost not owed income.	$ 30,000.00	$ 120,000.00	YES	4-Major	C-Possible	High	18	YES
23	Changes to Government regulations	3-Moderate	E-Rare	Low	6	$ 5,000.00	$ 30,000.00	$ 6,000.00	This risk cannot be mitigated only mitigation is the use of a variation to recuperate any associated costs	$ -	$ 6,000.00	YES	2-Minor	E-Rare	Low	3	YES
24	Changes to funding criteria	4-Major	D-Unlikely	High	14	$ 5,000.00	$ 15,000.00	$ 10,000.00	Ensure that the project is always cash flow positive which ensure it can only impact future costs. Ensure the client is aware that any changes to the criteria of funding will result in a contract variation being raised.	$ 2,000.00	$ 8,000.00	YES	3-Moderate	D-Unlikely	Moderate	9	YES
25	No conformance claim during operation equaling a defects liability claim.	3-Moderate	E-Rare	Low	6	$ 5,000.00	$ 15,000.00	$ 10,000.00	This risk can be reduced by adding additional design and commissioning time. The design time to think of any additional problems and commissioning to test more thoroughly. *Not implemented as Quantummech are confident in the design and execution of the project based on previous works. and the cost benefit negative as well*	$ 11,000.00	-$ 1,000.00	NO	3-Moderate	E-Rare	Low	6	YES
26	Additional lines to be added as required	1-Insignificant	E-Rare	Low	1						$ -		1-Insignificant	E-Rare	Low	1	

13.3. Appendix C – Activity List

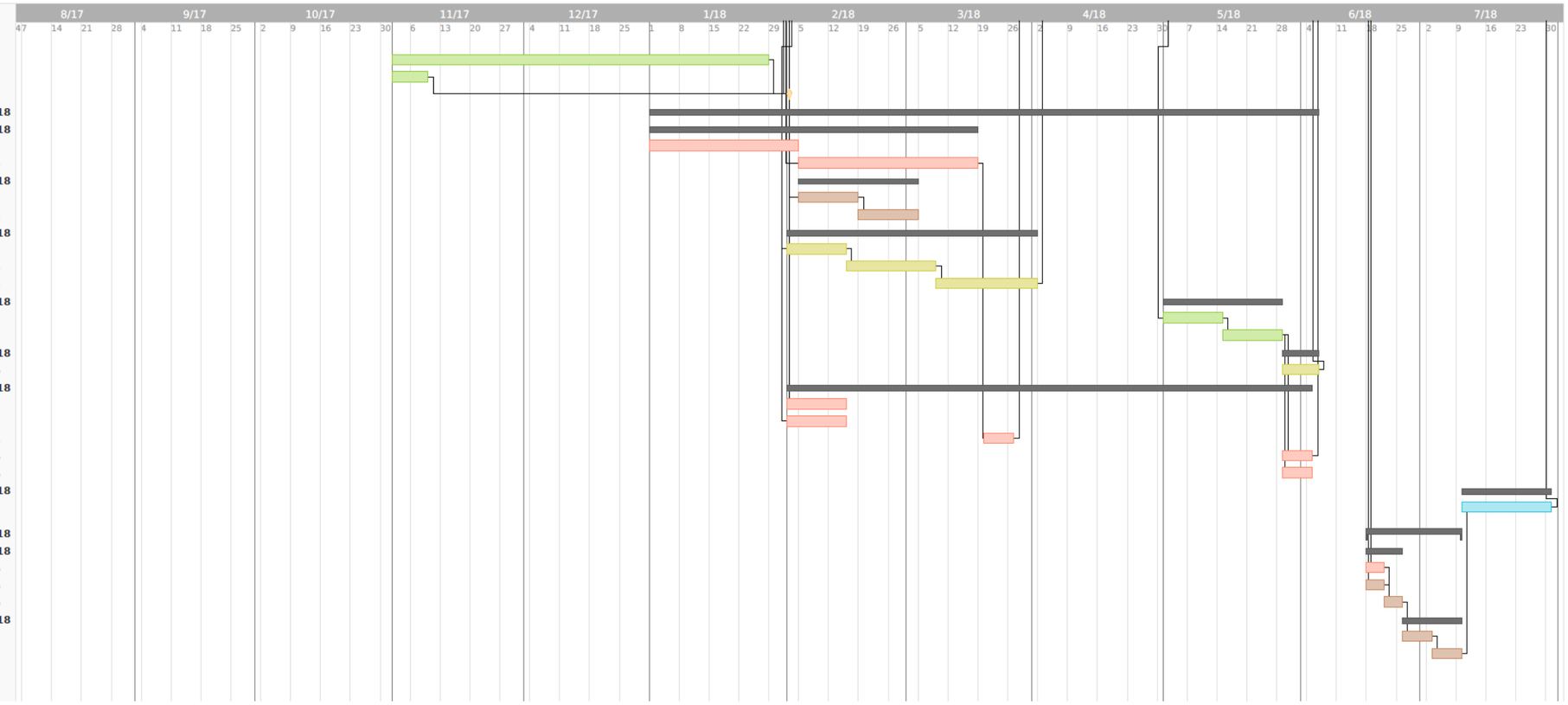
Taks Number	Name/Title	Start Date	End Date	Resources	Predecessors
1	Speers Point Park - Water Playground	07-08-17	31-07-18		
1.1	Design	07-08-17	23-10-17		
1.1.1	Project Management	07-08-17	06-10-17		
1.1.1.1	Design Project Management	07-08-17	06-10-17	Mitchell Blanch	
1.1.2	Design Approved by Client	23-10-17	23-10-17	Mitchell Blanch	1.1.6.2.1, 1.1.7.2.1, 1.1.7.2.2
1.1.3	Environmental Engineering	07-08-17	18-08-17		
1.1.3.1	Conduct environmental study	07-08-17	11-08-17	James Tochowicz	
1.1.3.2	Report Study Findings	14-08-17	18-08-17	James Tochowicz	1.1.3.1
1.1.4	Geo-technical Engineering	21-08-17	01-09-17		
1.1.4.1	Conduct Geological Survey	21-08-17	25-08-17	Jake Hunter	1.1.3.2
1.1.4.2	Report survey findings	28-08-17	01-09-17	Jake Hunter	1.1.4.1
1.1.5	Mechanical Design	04-09-17	29-09-17		
1.1.5.1	Play equipment	04-09-17	15-09-17		
1.1.5.1.1	Large Dump Bucket	04-09-17	15-09-17	Sam Davidson	1.1.4.2
1.1.5.1.2	Waterfall	04-09-17	08-09-17	Tim Schultz	1.1.4.2
1.1.5.1.3	Mist water sprayers	11-09-17	14-09-17	Tim Schultz	
1.1.5.2	Water Supply	18-09-17	29-09-17		
1.1.5.2.1	Connecting pipe work to equipment	18-09-17	22-09-17	Sam Davidson	1.1.5.1.1, 1.1.5.1.2, 1.1.5.1.3
1.1.5.2.2	Water pumps	25-09-17	29-09-17	Sam Davidson	1.1.5.1.1, 1.1.5.1.2, 1.1.5.1.3
1.1.5.3	Water Recirculation	18-09-17	28-09-17		
1.1.5.3.1	Water recycling tank	18-09-17	22-09-17	Tim Schultz	
1.1.5.3.2	Water filtration	25-09-17	28-09-17	Tim Schultz	
1.1.6	Electrical Engineering	02-10-17	20-10-17		
1.1.6.1	Control Design	02-10-17	16-10-17		
1.1.6.1.1	Lighting controls	02-10-17	06-10-17	Matt Amos	1.1.5.2.2
1.1.6.1.2	Controlling of pumps	09-10-17	16-10-17	Matt Amos	1.1.5.2.2
1.1.6.2	Supply Design	17-10-17	20-10-17		
1.1.6.2.1	Supply to pumps	17-10-17	20-10-17	Matt Amos	1.1.6.1.2
1.1.7	Civil Design	02-10-17	19-10-17		
1.1.7.1	Playground equipment	02-10-17	13-10-17		
1.1.7.1.1	Design of the bucket tower	02-10-17	04-10-17	Jake Hunter	1.1.5.2.1, 1.1.5.2.2, 1.1.5.3.1, 1.1.5.3.2
1.1.7.1.2	Design of objects to break up water flow from bucket	05-10-17	13-10-17	Jake Hunter	1.1.7.1.1
1.1.7.1.3	Design of all other structures	02-10-17	13-10-17	James Tochowicz	1.1.5.2.1, 1.1.5.2.2, 1.1.5.3.2
1.1.7.2	Water Management	16-10-17	19-10-17		
1.1.7.2.1	Water recapture design - ground slopes	16-10-17	19-10-17	Jake Hunter	1.1.7.1.2, 1.1.7.1.3
1.1.7.2.2	Pipe trench design - drainage system	16-10-17	19-10-17	James Tochowicz	1.1.7.1.2, 1.1.7.1.3
1.2	Construction	09-10-17	31-07-18		
1.2.1	Project management	09-10-17	31-07-18		
1.2.1.1	Site Mobilisation	09-10-17	27-10-17	Mitchell Blanch	
1.2.1.2	Construction Management	30-10-17	15-06-18	Mitchell Blanch	1.2.1.1
1.2.1.3	Project Finalisation	18-06-18	31-07-18	Mitchell Blanch	1.2.1.2
1.2.1.4	Final Client Sign Off	31-07-18	31-07-18	Mitchell Blanch	1.2.5.1
1.2.2	Earthworks	30-10-17	15-06-18		
1.2.2.1	Surveying	30-10-17	23-11-17		
1.2.2.1.1	Mark out area boundary	30-10-17	31-10-17	James Tochowicz	1.1.2
1.2.2.1.2	Location for Underground tanks	03-11-17	03-11-17	James Tochowicz	1.2.2.2.1
1.2.2.1.3	Location for all foundations	06-11-17	06-11-17	James Tochowicz	1.2.2.1.2
1.2.2.1.4	Location for all pipework	07-11-17	07-11-17	James Tochowicz	
1.2.2.1.5	Levels for all earth works	08-11-17	23-11-17	James Tochowicz	1.2.2.1.4
1.2.2.2	Excavation	01-11-17	24-11-17		
1.2.2.2.1	Remove existing turf	01-11-17	02-11-17	Sam Davidson	1.2.2.1.1
1.2.2.2.2	Excavate for tanks	06-11-17	10-11-17	Sam Davidson	1.2.2.1.2
1.2.2.2.3	Excavate foundations	13-11-17	17-11-17	Sam Davidson	1.2.2.1.3
1.2.2.2.4	Excavate for underground piping	20-11-17	23-11-17	Sam Davidson	1.2.2.1.4
1.2.2.2.5	Excavation/Levels completed	24-11-17	24-11-17	Mitchell Blanch	1.2.2.1.5, 1.2.2.2.4
1.2.2.3	Laying of Foundations	27-11-17	31-01-18		
1.2.2.3.1	Form up the 1st reinforcement	27-11-17	01-12-17	Tim Schultz	1.2.2.2.5
1.2.2.3.2	Form up rest of reinforcement	04-12-17	29-12-17	Tim Schultz	1.2.2.3.1
1.2.2.3.3	Pour all foundations	04-12-17	31-01-18	Tim Schultz	1.2.2.3.1
1.2.2.4	Main Area Concrete	03-04-18	30-04-18		
1.2.2.4.1	Back fill for concrete	03-04-18	06-04-18	Tim Schultz	1.2.2.3.3, 1.2.4.3.3, 1.2.4.6.3
1.2.2.4.2	Form up for concrete	09-04-18	13-04-18	Tim Schultz	1.2.2.4.1
1.2.2.4.3	Pour concrete slab	16-04-18	30-04-18	Tim Schultz	1.2.2.4.2
1.2.2.5	Final Landscaping and Clean up	06-06-18	15-06-18		
1.2.2.5.1	Levels for top dressing	06-06-18	08-06-18	Jake Hunter	1.2.4.5.1, 1.2.4.6.4
1.2.2.5.2	Construct any foot paths	11-06-18	14-06-18	Jake Hunter	1.2.2.5.1
1.2.2.5.3	Lay turf	11-06-18	14-06-18	Jake Hunter	1.2.2.5.1
1.2.2.5.4	Playground ready for commisioning	15-06-18	15-06-18	Mitchell Blanch	1.2.2.5.2, 1.2.2.5.3
1.2.3	Sourcing Equipment	01-11-17	01-02-18		
1.2.3.1	Source pumps includes lead time	01-11-17	30-01-18	Jake Hunter	
1.2.3.2	Source play equipment includes lead time	01-11-17	26-01-18	Jake Hunter	
1.2.3.3	Source electrical equipment includes lead time	01-11-17	08-11-17	Jake Hunter	
1.2.3.4	All equipment on site	01-02-18	01-02-18	Mitchell Blanch	1.2.3.1, 1.2.3.2, 1.2.3.3
1.2.4	Pipe works and Equipment Installation	01-01-18	05-06-18		
1.2.4.1	Installation of Pumps	01-01-18	16-03-18		
1.2.4.1.1	Pre pump arrival works	01-01-18	02-02-18	Matt Amos	
1.2.4.1.2	Installation of pumps	05-02-18	16-03-18	Matt Amos	1.2.3.1
1.2.4.2	Installation of recirculation system	05-02-18	02-03-18		
1.2.4.2.1	Installation of tanks	05-02-18	16-02-18	Sam Davidson	1.2.2.3.3
1.2.4.2.2	Installation of simple filteration	19-02-18	02-03-18	Sam Davidson	1.2.4.2.1
1.2.4.3	Installation of Pipework	01-02-18	30-03-18		
1.2.4.3.1	Install 300NB supply line	01-02-18	14-02-18	James Tochowicz	1.2.2.3.3
1.2.4.3.2	Install 150NB equipment supply line	15-02-18	07-03-18	James Tochowicz	1.2.4.3.1
1.2.4.3.3	Install drainage lines	08-03-18	30-03-18	James Tochowicz	1.2.4.3.2
1.2.4.4	Installation of Playground Equipment	01-05-18	28-05-18		
1.2.4.4.1	Install main structure	01-05-18	14-05-18	Jake Hunter	1.2.2.4.3
1.2.4.4.2	Install all feature play items	15-05-18	28-05-18	Jake Hunter	1.2.4.4.1
1.2.4.5	Ground surface Installaton	29-05-18	05-06-18		
1.2.4.5.1	Install the safety ground surface	29-05-18	05-06-18	James Tochowicz	1.2.4.4.2
1.2.4.6	Electrical Installation	01-02-18	04-06-18		
1.2.4.6.1	Install lighting cables	01-02-18	14-02-18	Matt Amos	1.2.2.3.3
1.2.4.6.2	Install equipment cables	01-02-18	14-02-18	Matt Amos	1.2.2.3.3
1.2.4.6.3	Install pump electronics	20-03-18	26-03-18	Matt Amos	1.2.4.1.2
1.2.4.6.4	Install playground lighting	29-05-18	04-06-18	Matt Amos	1.2.4.4.2
1.2.4.6.5	Install playground control system	29-05-18	04-06-18	Matt Amos	1.2.4.4.2
1.2.5	Delays	10-07-18	30-07-18		
1.2.5.1	Project Float	10-07-18	30-07-18	Mitchell Blanch	1.3.2.2
1.3	Commisioning	18-06-18	09-07-18		
1.3.1	Wrap Up	18-06-18	25-06-18		
1.3.1.1	Systems check for elctrical	18-06-18	20-06-18	Matt Amos	1.2.2.5.4
1.3.1.2	Systems check for water	18-06-18	20-06-18	Sam Davidson	1.2.2.5.4
1.3.1.3	Full functioning 48hr trial	21-06-18	25-06-18	Matt Amos, Sam Davidson	1.3.1.1, 1.3.1.2
1.3.2	Hand Over	26-06-18	09-07-18		
1.3.2.1	Conduct training for council operators	26-06-18	02-07-18	Matt Amos, Mitchell Blanch, Sam Davidson	1.3.1.3
1.3.2.2	Conduct hand over with council operators	03-07-18	09-07-18	Matt Amos, Mitchell Blanch, Sam Davidson	1.3.2.1

13.4. Appendix D – Project Gantt Chart

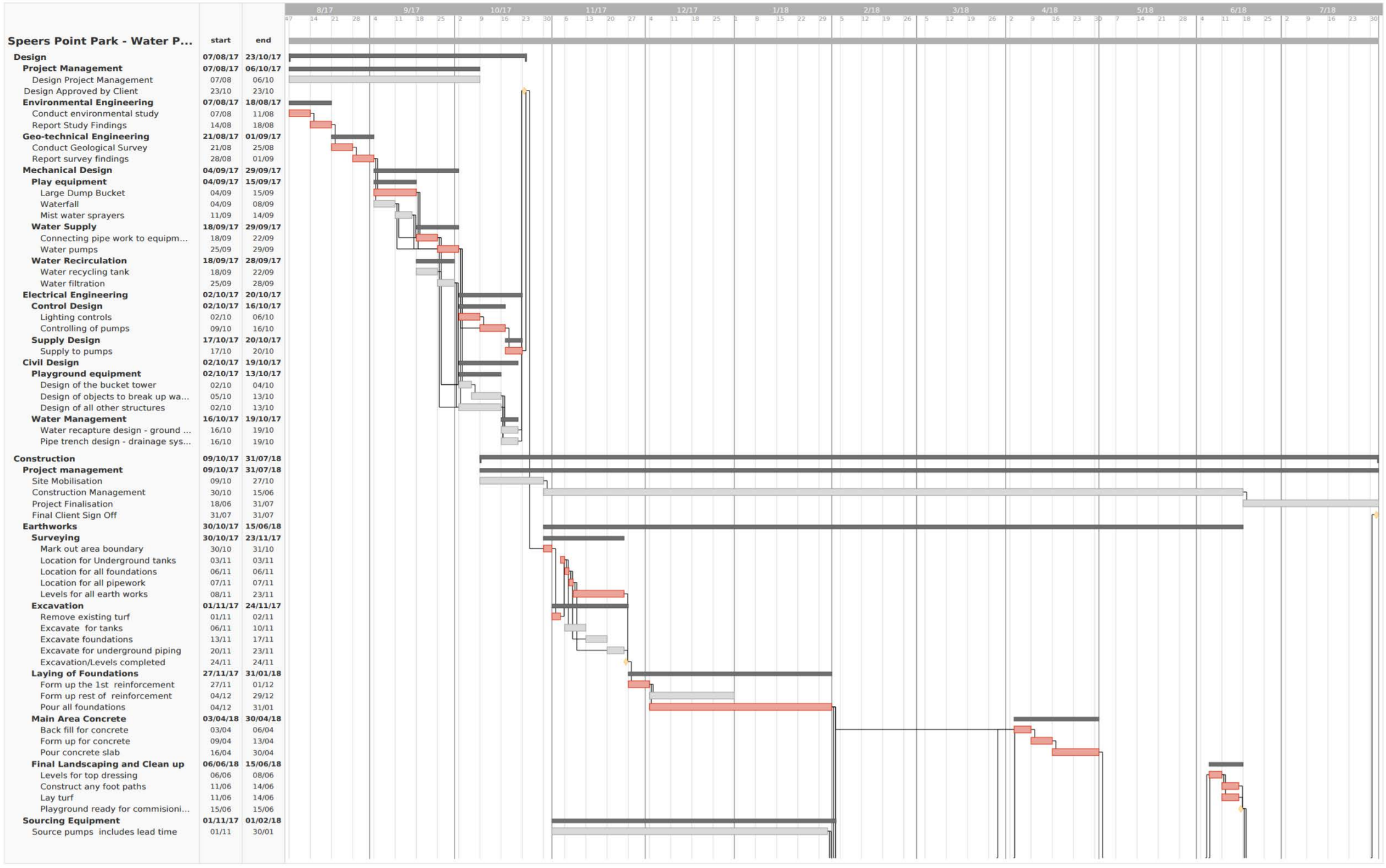


Speers Point Park - Water P...	start	end
Design	07/08/17	23/10/17
Project Management	07/08/17	06/10/17
Design Project Management	07/08	06/10
Design Approved by Client	23/10	23/10
Environmental Engineering	07/08/17	18/08/17
Conduct environmental study	07/08	11/08
Report Study Findings	14/08	18/08
Geo-technical Engineering	21/08/17	01/09/17
Conduct Geological Survey	21/08	25/08
Report survey findings	28/08	01/09
Mechanical Design	04/09/17	29/09/17
Play equipment	04/09/17	15/09/17
Large Dump Bucket	04/09	15/09
Waterfall	04/09	08/09
Mist water sprayers	11/09	14/09
Water Supply	18/09/17	29/09/17
Connecting pipe work to equipm...	18/09	22/09
Water pumps	25/09	29/09
Water Recirculation	18/09/17	28/09/17
Water recycling tank	18/09	22/09
Water filtration	25/09	28/09
Electrical Engineering	02/10/17	20/10/17
Control Design	02/10/17	16/10/17
Lighting controls	02/10	06/10
Controlling of pumps	09/10	16/10
Supply Design	17/10/17	20/10/17
Supply to pumps	17/10	20/10
Civil Design	02/10/17	19/10/17
Playground equipment	02/10/17	13/10/17
Design of the bucket tower	02/10	04/10
Design of objects to break up wa...	05/10	13/10
Design of all other structures	02/10	13/10
Water Management	16/10/17	19/10/17
Water recapture design - ground ...	16/10	19/10
Pipe trench design - drainage sys...	16/10	19/10
Construction	09/10/17	31/07/18
Project management	09/10/17	31/07/18
Site Mobilisation	09/10	27/10
Construction Management	30/10	15/06
Project Finalisation	18/06	31/07
Final Client Sign Off	31/07	31/07
Earthworks	30/10/17	15/06/18
Surveying	30/10/17	23/11/17
Mark out area boundary	30/10	31/10
Location for Underground tanks	03/11	03/11
Location for all foundations	06/11	06/11
Location for all pipework	07/11	07/11
Levels for all earth works	08/11	23/11
Excavation	01/11/17	24/11/17
Remove existing turf	01/11	02/11
Excavate for tanks	06/11	10/11
Excavate foundations	13/11	17/11
Excavate for underground piping	20/11	23/11
Excavation/Levels completed	24/11	24/11
Laying of Foundations	27/11/17	31/01/18
Form up the 1st reinforcement	27/11	01/12
Form up rest of reinforcement	04/12	29/12
Pour all foundations	04/12	31/01
Main Area Concrete	03/04/18	30/04/18
Back fill for concrete	03/04	06/04
Form up for concrete	09/04	13/04
Pour concrete slab	16/04	30/04
Final Landscaping and Clean up	06/06/18	15/06/18
Levels for top dressing	06/06	08/06
Construct any foot paths	11/06	14/06
Lay turf	11/06	14/06
Playground ready for commisioni...	15/06	15/06
Sourcing Equipment	01/11/17	01/02/18
Source pumps includes lead time	01/11	30/01

Source play equipment includes le...	01/11	26/01
Source electrical equipment inclu...	01/11	08/11
All equipment on site	01/02	01/02
Pipe works and Equipment Instal...	**01/01/18**	**05/06/18**
Installation of Pumps	**01/01/18**	**16/03/18**
Pre pump arrival works	01/01	02/02
Installation of pumps	05/02	16/03
Installation of recirculation sys...	**05/02/18**	**02/03/18**
Installation of tanks	05/02	16/02
Installation of simple filteration	19/02	02/03
Installation of Pipework	**01/02/18**	**30/03/18**
Install 300NB supply line	01/02	14/02
Install 150NB equipment supply l...	15/02	07/03
Install drainage lines	08/03	30/03
Installation of Playground Equi...	**01/05/18**	**28/05/18**
Install main structure	01/05	14/05
Install all feature play items	15/05	28/05
Ground surface Installaton	**29/05/18**	**05/06/18**
Install the safety ground surface	29/05	05/06
Electrical Installation	**01/02/18**	**04/06/18**
Install lighting cables	01/02	14/02
Install equipment cables	01/02	14/02
Install pump electronics	20/03	26/03
Install playground lighting	29/05	04/06
Install playground control system	29/05	04/06
Delays	**10/07/18**	**30/07/18**
Project Float	10/07	30/07
Commisioning	**18/06/18**	**09/07/18**
Wrap Up	**18/06/18**	**25/06/18**
Systems check for elctrical	18/06	20/06
Systems check for water	18/06	20/06
Full functioning 48hr trial	21/06	25/06
Hand Over	**26/06/18**	**09/07/18**
Conduct training for council operat...	26/06	02/07
Conduct hand over with council op...	03/07	09/07

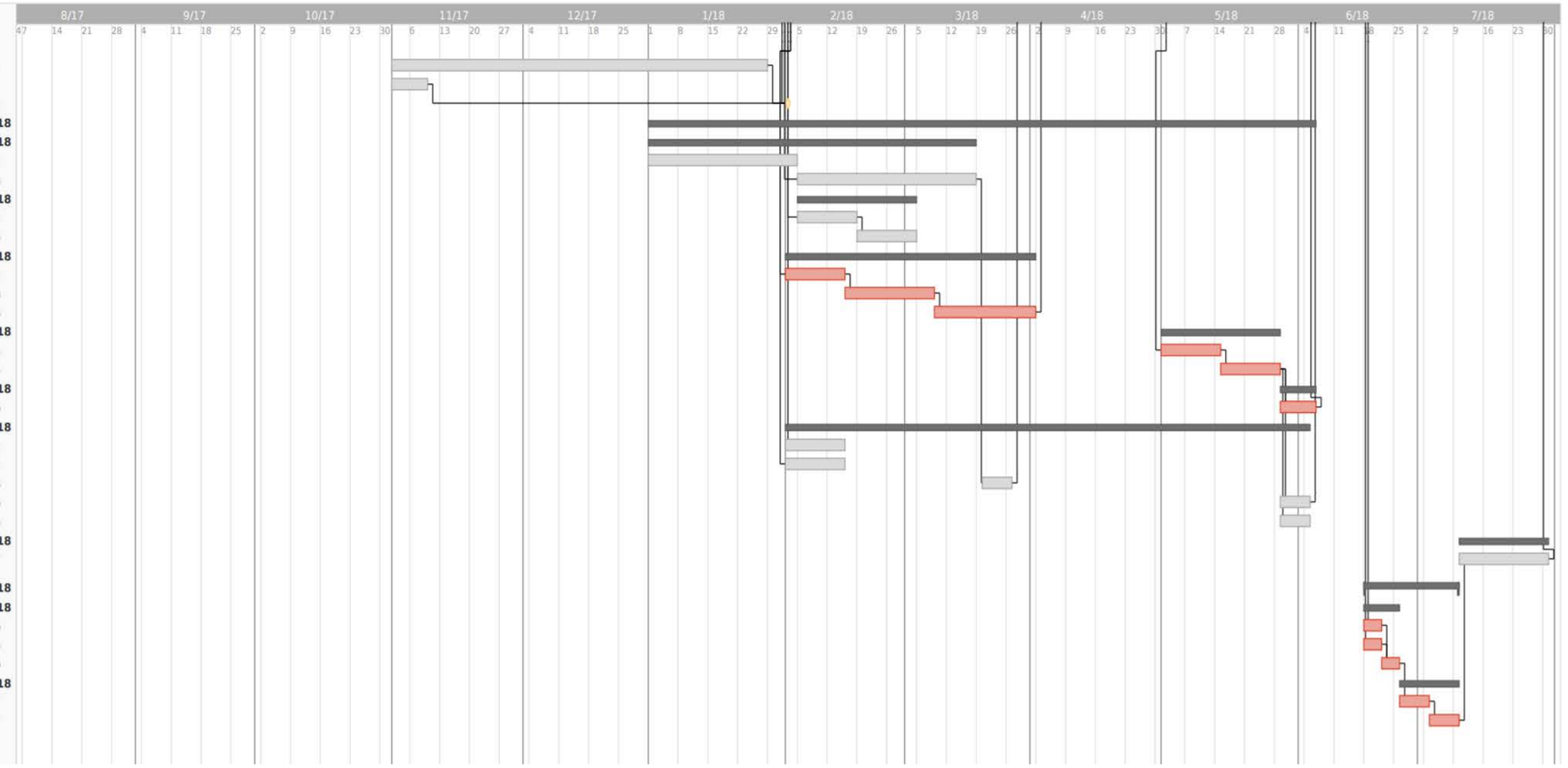


13.5. Appendix E – Critical Path



Speers Point Park - Water P...	start	end
Design	**07/08/17**	**23/10/17**
Project Management	**07/08/17**	**06/10/17**
Design Project Management	07/08	06/10
Design Approved by Client	23/10	23/10
Environmental Engineering	**07/08/17**	**18/08/17**
Conduct environmental study	07/08	11/08
Report Study Findings	14/08	18/08
Geo-technical Engineering	**21/08/17**	**01/09/17**
Conduct Geological Survey	21/08	25/08
Report survey findings	28/08	01/09
Mechanical Design	**04/09/17**	**29/09/17**
Play equipment	**04/09/17**	**15/09/17**
Large Dump Bucket	04/09	15/09
Waterfall	04/09	08/09
Mist water sprayers	11/09	14/09
Water Supply	**18/09/17**	**29/09/17**
Connecting pipe work to equipm...	18/09	22/09
Water pumps	25/09	29/09
Water Recirculation	**18/09/17**	**28/09/17**
Water recycling tank	18/09	22/09
Water filtration	25/09	28/09
Electrical Engineering	**02/10/17**	**20/10/17**
Control Design	**02/10/17**	**16/10/17**
Lighting controls	02/10	06/10
Controlling of pumps	09/10	16/10
Supply Design	**17/10/17**	**20/10/17**
Supply to pumps	17/10	20/10
Civil Design	**02/10/17**	**19/10/17**
Playground equipment	**02/10/17**	**13/10/17**
Design of the bucket tower	02/10	04/10
Design of objects to break up wa...	05/10	13/10
Design of all other structures	02/10	13/10
Water Management	**16/10/17**	**19/10/17**
Water recapture design - ground ...	16/10	19/10
Pipe trench design - drainage sys...	16/10	19/10
Construction	**09/10/17**	**31/07/18**
Project management	**09/10/17**	**31/07/18**
Site Mobilisation	09/10	27/10
Construction Management	30/10	15/06
Project Finalisation	18/06	31/07
Final Client Sign Off	31/07	31/07
Earthworks	**30/10/17**	**15/06/18**
Surveying	**30/10/17**	**23/11/17**
Mark out area boundary	30/10	31/10
Location for Underground tanks	03/11	03/11
Location for all foundations	06/11	06/11
Location for all pipework	07/11	07/11
Levels for all earth works	08/11	23/11
Excavation	**01/11/17**	**24/11/17**
Remove existing turf	01/11	02/11
Excavate for tanks	06/11	10/11
Excavate foundations	13/11	17/11
Excavate for underground piping	20/11	23/11
Excavation/Levels completed	24/11	24/11
Laying of Foundations	**27/11/17**	**31/01/18**
Form up the 1st reinforcement	27/11	01/12
Form up rest of reinforcement	04/12	29/12
Pour all foundations	04/12	31/01
Main Area Concrete	**03/04/18**	**30/04/18**
Back fill for concrete	03/04	06/04
Form up for concrete	09/04	13/04
Pour concrete slab	16/04	30/04
Final Landscaping and Clean up	**06/06/18**	**15/06/18**
Levels for top dressing	06/06	08/06
Construct any foot paths	11/06	14/06
Lay turf	11/06	14/06
Playground ready for commisioni...	15/06	15/06
Sourcing Equipment	**01/11/17**	**01/02/18**
Source pumps includes lead time	01/11	30/01

Source play equipment includes le...	01/11	26/01
Source electrical equipment inclu...	01/11	08/11
All equipment on site	01/02	01/02
Pipe works and Equipment Instal...	**01/01/18**	**05/06/18**
Installation of Pumps	**01/01/18**	**16/03/18**
Pre pump arrival works	01/01	02/02
Installation of pumps	05/02	16/03
Installation of recirculation sys...	**05/02/18**	**02/03/18**
Installation of tanks	05/02	16/02
Installation of simple filteration	19/02	02/03
Installation of Pipework	**01/02/18**	**30/03/18**
Install 300NB supply line	01/02	14/02
Install 150NB equipment supply l...	15/02	07/03
Install drainage lines	08/03	30/03
Installation of Playground Equi...	**01/05/18**	**28/05/18**
Install main structure	01/05	14/05
Install all feature play items	15/05	28/05
Ground surface Installaton	**29/05/18**	**05/06/18**
Install the safety ground surface	29/05	05/06
Electrical Installation	**01/02/18**	**04/06/18**
Install lighting cables	01/02	14/02
Install equipment cables	01/02	14/02
Install pump electronics	20/03	26/03
Install playground lighting	29/05	04/06
Install playground control system	29/05	04/06
Delays	**10/07/18**	**30/07/18**
Project Float	10/07	30/07
Commisioning	**18/06/18**	**09/07/18**
Wrap Up	**18/06/18**	**25/06/18**
Systems check for elctrical	18/06	20/06
Systems check for water	18/06	20/06
Full functioning 48hr trial	21/06	25/06
Hand Over	**26/06/18**	**09/07/18**
Conduct training for council operat...	26/06	02/07
Conduct hand over with council op...	03/07	09/07



13.6. Appendix F – Cost Management

		Bottom Up Method									Pert Method				Variance		Budget		Forecast									
Taks Number	Name/Title	Start Date	End Date	Estimated Days	Estimated hours	People	Est. Man hours	Rate	Material	Cost	Minimum	Maximum	Most Likely	PERT	Variance	Variance Reason	TOC Estimate	blank	TOC Estimate	Approved Budget Changes	New Budget at Completion	Percent Complete	Planned Percent Complete	Earned Value	Planned Value	Estimate to Complete (BU)	Actual Costs - Includes Commitments	Estimate at Completion Method 1	Estimate at Completion Method 2
1	**Speers Point Park - Water Playground**	07-08-17	31-07-18	257																									
1.1	Design	07-08-17	23-10-17	56																									
1.1.1	***Project Management***	07-08-17	06-10-17	45																									
1.1.1.1	Design Project Management	07-08-17	06-10-17	45	360	1	360	$54.00		$19,440.00	$12,250.00	$33,500.00	$19,500.00	$20,625.00	10%	Additonal tasks as project progresses	$22,687.50		$22,687.50	$0.00	$22,687.50	100%	100%	$22,687.50	$22,687.50	$0.00	$22,687.50	$22,687.50	$22,687.50
1.1.2M	**Design Approved by Client**	23-10-17	23-10-17																										
1.1.3	***Environmental Engineering***	07-08-17	18-08-17	10																									
1.1.3.1	Conduct environmental study	07-08-17	11-08-17	5	40	2	80	$54.00		$4,320.00	$3,500.00	$5,000.00	$4,200.00	$4,216.67	5%	More hours may be required if first study is inconclusive	$4,536.00		$4,536.00	$0.00	$4,536.00	100%	100%	$4,536.00	$4,536.00	$0.00	$4,536.00	$4,536.00	$4,536.00
1.1.3.2	Report Study Findings	14-08-17	18-08-17	5	40	2	80	$54.00		$4,320.00	$3,300.00	$5,250.00	$4,100.00	$4,158.33	0%		$4,320.00		$4,320.00	$0.00	$4,320.00	100%	100%	$4,320.00	$4,320.00	$0.00	$4,320.00	$4,320.00	$4,320.00
1.1.4	***Geo-technical Engineering***	21-08-17	01-09-17	10																									
1.1.4.1	Conduct Geological Survey	21-08-17	25-08-17	5	40	2	80	$54.00		$4,320.00	$3,250.00	$5,300.00	$4,300.00	$4,291.67	5%	More hours may be required if first study is inconclusive	$4,536.00		$4,536.00	$0.00	$4,536.00	100%	100%	$4,536.00	$4,536.00	$0.00	$4,536.00	$4,536.00	$4,536.00
1.1.4.2	Report survey findings	28-08-17	01-09-17	5	40	2	80	$54.00		$4,320.00	$3,400.00	$5,400.00	$4,250.00	$4,300.00	0%		$4,320.00		$4,320.00	$0.00	$4,320.00	100%	100%	$4,320.00	$4,320.00	$0.00	$4,320.00	$4,320.00	$4,320.00
1.1.5	**Mechanical Design**	04-09-17	29-09-17	20																									
1.1.5.1	***Play equipment***	04-09-17	15-09-17	10																									
1.1.5.1.1	Large Dump Bucket	04-09-17	15-09-17	10	80	2	160	$54.00		$8,640.00	$8,150.00	$11,500.00	$8,750.00	$9,108.33	0%		$9,108.33		$9,108.33	$0.00	$9,108.33	100%	100%	$9,108.33	$9,108.33	$0.00	$9,108.33	$9,108.33	$9,108.33
1.1.5.1.2	Waterfall	04-09-17	08-09-17	5	40	2	80	$54.00		$4,320.00	$3,550.00	$5,100.00	$4,400.00	$4,375.00	0%		$4,375.00		$4,375.00	$0.00	$4,375.00	100%	100%	$4,375.00	$4,375.00	$0.00	$4,375.00	$4,375.00	$4,375.00
1.1.5.1.3	Mist water sprayers	11-09-17	14-09-17	4	32	2	64	$54.00		$3,456.00	$2,750.00	$4,100.00	$3,550.00	$3,508.33	0%		$3,508.33		$3,508.33	$0.00	$3,508.33	100%	100%	$3,508.33	$3,508.33	$0.00	$3,508.33	$3,508.33	$3,508.33
1.1.5.2	***Water Supply***	18-09-17	29-09-17	10																									
1.1.5.2.1	Connecting pipe work to equipment	18-09-17	22-09-17	5	40	2	80	$54.00		$4,320.00	$3,600.00	$4,850.00	$4,000.00	$4,075.00	5%	Old infrastructure may require further works	$4,536.00		$4,536.00	$0.00	$4,536.00	100%	100%	$4,536.00	$4,536.00	$0.00	$4,536.00	$4,536.00	$4,536.00
1.1.5.2.2	Water pumps	25-09-17	29-09-17	5	40	2	80	$54.00		$4,320.00	$3,750.00	$4,800.00	$4,200.00	$4,225.00	0%		$4,320.00		$4,320.00	$0.00	$4,320.00	100%	100%	$4,320.00	$4,320.00	$0.00	$4,320.00	$4,320.00	$4,320.00
1.1.5.3	***Water Recirculation***	18-09-17	28-09-17	9																									
1.1.5.3.1	Water recycling tank	18-09-17	22-09-17	5	40	2	80	$54.00		$4,320.00	$3,800.00	$5,050.00	$4,350.00	$4,375.00	0%		$4,375.00		$4,375.00	$0.00	$4,375.00	100%	100%	$4,375.00	$4,375.00	$0.00	$4,375.00	$4,375.00	$4,375.00
1.1.5.3.2	Water filtration	25-09-17	28-09-17	4	32	2	64	$54.00		$3,456.00	$2,850.00	$3,700.00	$3,200.00	$3,225.00	0%		$3,456.00		$3,456.00	$0.00	$3,456.00	100%	100%	$3,456.00	$3,456.00	$0.00	$3,456.00	$3,456.00	$3,456.00
1.1.6	**Electrical Engineering**	02-10-17	20-10-17	15																									
1.1.6.1	***Control Design***	02-10-17	16-10-17	11																									
1.1.6.1.1	Lighting controls	02-10-17	06-10-17	5	40	2	80	$54.00		$4,320.00	$3,750.00	$4,850.00	$4,200.00	$4,233.33	0%		$4,320.00		$4,320.00	$0.00	$4,320.00	100%	100%	$4,320.00	$4,320.00	$0.00	$4,320.00	$4,320.00	$4,320.00
1.1.6.1.2	Controlling of pumps	09-10-17	16-10-17	6	48	2	96	$54.00		$5,184.00	$4,550.00	$5,600.00	$5,200.00	$5,158.33	0%		$5,184.00		$5,184.00	$0.00	$5,184.00	100%	100%	$5,184.00	$5,184.00	$0.00	$5,184.00	$5,184.00	$5,184.00
1.1.6.2	***Supply Design***	17-10-17	20-10-17	4																									
1.1.6.2.1	Supply to pumps	17-10-17	20-10-17	4	32	2	64	$54.00		$3,456.00	$3,000.00	$4,150.00	$3,350.00	$3,425.00	0%		$3,456.00		$3,456.00	$0.00	$3,456.00	100%	100%	$3,456.00	$3,456.00	$0.00	$3,456.00	$3,456.00	$3,456.00
1.1.7	**Civil Design**	02-10-17	19-10-17	14																									
1.1.7.1	***Playground equipment***	02-10-17	13-10-17	10																									
1.1.7.1.1	Design of the bucket tower	02-10-17	04-10-17	3	24	2	48	$54.00		$2,592.00	$1,950.00	$2,850.00	$2,250.00	$2,300.00	0%		$2,592.00		$2,592.00	$0.00	$2,592.00	100%	100%	$2,592.00	$2,592.00	$0.00	$2,592.00	$2,592.00	$2,592.00
1.1.7.1.2	Design of objects to break up water flow from bucket	05-10-17	13-10-17	7	56	2	112	$54.00		$6,048.00	$5,600.00	$7,200.00	$6,250.00	$6,300.00	0%		$6,300.00		$6,300.00	$0.00	$6,300.00	100%	100%	$6,300.00	$6,300.00	$0.00	$6,300.00	$6,300.00	$6,300.00
1.1.7.1.3	Design of all other structures	02-10-17	13-10-17	10	80	2	160	$54.00		$8,640.00	$7,850.00	$9,150.00	$8,450.00	$8,466.67	0%		$8,640.00		$8,640.00	$0.00	$8,640.00	100%	100%	$8,640.00	$8,640.00	$0.00	$8,640.00	$8,640.00	$8,640.00
1.1.7.2	***Water Management***	16-10-17	19-10-17	4																									
1.1.7.2.1	Water recapture design - ground slopes	16-10-17	19-10-17	4	32	2	64	$54.00		$3,456.00	$3,150.00	$3,950.00	$3,300.00	$3,383.33	0%		$3,456.00		$3,456.00	$0.00	$3,456.00	100%	100%	$3,456.00	$3,456.00	$0.00	$3,456.00	$3,456.00	$3,456.00
1.1.7.2.2	Pipe trench design - drainage system	16-10-17	19-10-17	4	32	2	64	$54.00		$3,456.00	$3,050.00	$4,200.00	$3,450.00	$3,508.33	0%		$3,508.33		$3,508.33	$0.00	$3,508.33	100%	100%	$3,508.33	$3,508.33	$0.00	$3,508.33	$3,508.33	$3,508.33
1.2	Construction	09-10-17	31-07-18	212	1696																								
1.2.1	***Project management***	09-10-17	31-07-18	212																									
1.2.1.1	Site Mobilisation	09-10-17	27-10-17	15	120	1	120	$38.00		$4,560.00	$4,200.00	$5,150.00	$4,450.00	$4,525.00	0%		$4,560.00		$4,560.00	$0.00	$4,560.00	50%	50%	$2,280.00	$2,280.00	$2,000.00	$2,000.00	$4,000.00	$4,000.00
1.2.1.2	Construction Management	30-10-17	15-06-18	165	1320	1	1320	$38.00		$50,160.00	$38,500.00	$62,500.00	$55,000.00	$53,500.00	0%		$53,500.00		$53,500.00	$0.00	$53,500.00	5%	5%	$2,675.00	$2,675.00	$2,000.00	$2,500.00	$4,500.00	$50,000.00
1.2.1.3	Project Finalisation	18-06-18	31-07-18	32	256	1	256	$38.00		$9,728.00	$8,850.00	$11,550.00	$9,650.00	$9,833.33	10%	May be more hours if agreement cant be reached	$10,816.67		$10,816.67	$0.00	$10,816.67	0%	0%	$0.00	$0.00	$10,816.67	$0.00	$10,816.67	#DIV/0!
1.2.1.4M	**Final Client Sign Off**	31-07-18	31-07-18																										
1.2.2	***Earthworks***	30-10-17	15-06-18	165																									
1.2.2.1	***Surveying***	30-10-17	23-11-17	19																									
1.2.2.1.1	Mark out area boundary	30-10-17	31-10-17	2	16	3	48	$38.00		$1,824.00	$1,650.00	$2,100.00	$1,750.00	$1,791.67	0%		$1,824.00		$1,824.00	$0.00	$1,824.00	100%	100%	$1,824.00	$1,824.00	$0.00	$1,900.00	$1,900.00	$1,900.00
1.2.2.1.2	Location for Underground tanks	03-11-17	03-11-17	1	8	3	24	$38.00		$912.00	$750.00	$1,150.00	$950.00	$950.00	0%		$950.00		$950.00	$0.00	$950.00	10%	15%	$95.00	$142.50	$800.00	$100.00	$900.00	$1,450.00
1.2.2.1.3	Location for all foundations	06-11-17	06-11-17	1	8	3	24	$38.00		$912.00	$700.00	$1,050.00	$950.00	$925.00	0%		$925.00		$925.00	$0.00	$925.00	0%	0%	$0.00	$0.00	$925.00	$0.00	$925.00	#DIV/0!
1.2.2.1.4	Location for all pipework	07-11-17	07-11-17	1	8	3	24	$38.00		$912.00	$750.00	$1,100.00	$900.00	$908.33	0%		$912.00		$912.00	$0.00	$912.00	0%	0%	$0.00	$0.00	$912.00	$0.00	$912.00	#DIV/0!
1.2.2.1.5	Levels for all earth works	08-11-17	23-11-17	12	96	3	288	$38.00		$10,944.00	$8,750.00	$14,550.00	$10,650.00	$10,983.33	0%		$10,983.33		$10,983.33	$0.00	$10,983.33	0%	0%	$0.00	$0.00	$10,983.33	$0.00	$10,983.33	#DIV/0!
1.2.2.2	***Excavation***	01-11-17	24-11-17	18																									
1.2.2.2.1	Remove existing turf	01-11-17	02-11-17	2	16	6	96	$38.00		$3,648.00	$3,250.00	$4,350.00	$3,750.00	$3,766.67	3%	Unexpected terrain may cause additional earthworks	$3,879.67		$3,879.67	$0.00	$3,879.67	0%	0%	$0.00	$0.00	$3,879.67	$0.00	$3,879.67	#DIV/0!
1.2.2.2.2	Excavate for tanks	06-11-17	10-11-17	5	40	6	240	$38.00		$9,120.00	$8,600.00	$9,650.00	$9,050.00	$9,075.00	3%	Unexpected terrain may cause additional earthworks	$9,393.60		$9,393.60	$0.00	$9,393.60	0%	0%	$0.00	$0.00	$9,393.60	$0.00	$9,393.60	#DIV/0!
1.2.2.2.3	Excavate foundations	13-11-17	17-11-17	5	40	6	240	$38.00		$9,120.00	$8,850.00	$9,950.00	$9,200.00	$9,266.67	3%	Unexpected terrain may cause additional earthworks	$9,544.67		$9,544.67	$0.00	$9,544.67	0%	0%	$0.00	$0.00	$9,544.67	$0.00	$9,544.67	#DIV/0!
1.2.2.2.4	Excavate for underground piping	20-11-17	23-11-17	4	32	6	192	$38.00		$7,296.00	$6,500.00	$8,050.00	$7,100.00	$7,158.33	3%	Unexpected terrain may cause additional earthworks	$7,514.88		$7,514.88	$0.00	$7,514.88	0%	0%	$0.00	$0.00	$7,514.88	$0.00	$7,514.88	#DIV/0!
1.2.2.5M	**Excavation/Levels completed**	24-11-17	24-11-17																										
1.2.2.3	***Laying of Foundations***	27-11-17	31-01-18	48																									
1.2.2.3.1	Form up the 1st reinforcement	27-11-17	01-12-17	5	40	6	240	$38.00		$9,120.00	$8,550.00	$9,450.00	$8,950.00	$8,966.67	0%		$9,120.00		$9,120.00	$0.00	$9,120.00	0%	0%	$0.00	$0.00	$9,120.00	$0.00	$9,120.00	#DIV/0!
1.2.2.3.2	Form up rest of reinforcement	04-12-17	29-12-17	20	160	6	960	$38.00		$36,480.00	$31,950.00	$42,500.00	$35,500.00	$36,075.00	0%		$36,480.00		$36,480.00	$0.00	$36,480.00	0%	0%	$0.00	$0.00	$36,480.00	$0.00	$36,480.00	#DIV/0!
1.2.2.3.3	Pour all foundations	04-12-17	31-01-18	43	344	6	2064	$38.00	$172.75	$78,604.75	$69,500.00	$95,000.00	$80,500.00	$81,083.33	0%		$81,083.33		$81,083.33	$0.00	$81,083.33	0%	0%	$0.00	$0.00	$81,083.33	$0.00	$81,083.33	#DIV/0!
1.2.2.4	***Main Area Concrete***	03-04-18	30-04-18	20																									
1.2.2.4.1	Back fill for concrete	03-04-18	06-04-18	4	32	6	192	$38.00		$7,296.00	$6,500.00	$8,150.00	$7,450.00	$7,408.33	0%		$7,408.33		$7,408.33	$0.00	$7,408.33	0%	0%	$0.00	$0.00	$7,408.33	$0.00	$7,408.33	#DIV/0!
1.2.2.4.2	Form up for concrete	09-04-18	13-04-18	5	40	6	240	$38.00		$9,120.00	$8,150.00	$9,850.00	$9,100.00	$9,066.67	0%		$9,120.00		$9,120.00	$0.00	$9,120.00	0%	0%	$0.00	$0.00	$9,120.00	$0.00	$9,120.00	#DIV/0!
1.2.2.4.3	Pour concrete slab	16-04-18	30-04-18	11	88	6	528	$38.00	$6,909.90	$26,973.90	$19,500.00	$32,500.00	$27,500.00	$27,000.00	0%		$27,000.00		$27,000.00	$0.00	$27,000.00	0%	0%	$0.00	$0.00	$27,000.00	$0.00	$27,000.00	#DIV/0!
1.2.2.5	***Final Landscaping and Clean up***	06-06-18	15-06-18	8																									
1.2.2.5.1	Levels for top dressing	06-06-18	08-06-18	3	24	3	72	$38.00		$2,736.00	$2,250.00	$3,150.00	$2,600.00	$2,633.33	0%		$2,736.00		$2,736.00	$0.00	$2,736.00	0%	0%	$0.00	$0.00	$2,736.00	$0.00	$2,736.00	#DIV/0!
1.2.2.5.2	Construct any foot paths	11-06-18	14-06-18	4	32	3	96	$38.00		$3,648.00	$2,950.00	$4,100.00	$3,500.00	$3,508.33	0%		$3,648.00		$3,648.00	$0.00	$3,648.00	0%	0%	$0.00	$0.00	$3,648.00	$0.00	$3,648.00	#DIV/0!
1.2.2.5.3	Lay turf	11-06-18	14-06-18	4	32	6	192	$38.00		$7,296.00	$6,850.00	$7,650.00	$7,150.00	$7,183.33	0%		$7,296.00		$7,296.00	$0.00	$7,296.00	0%	0%	$0.00	$0.00	$7,296.00	$0.00	$7,296.00	#DIV/0!
1.2.2.5.4M	**Playground ready for commisioning**	15-06-18	15-06-18																										
1.2.3	***Sourcing Equipment***	01-11-17	01-02-18	67																									
1.2.3.1	Source pumps includes lead time	01-11-17	30-01-18	65	520	1	16	$38.00	$3,100.00	$3,708.00	$500.00	$850.00	$600.00	$625.00	0%		$3,708.00		$3,708.00	$0.00	$3,708.00	0%	0%	$0.00	$0.00	$3,708.00	$0.00	$3,708.00	#DIV/0!
1.2.3.2	Source play equipment includes lead time	01-11-17	26-01-18	63	504	1	40	$38.00	$65,000.00	$66,520.00	$550.00	$900.00	$650.00	$675.00	0%		$66,520.00		$66,520.00	$0.00	$66,520.00	0%	0%	$0.00	$0.00	$66,520.00	$0.00	$66,520.00	#DIV/0!
1.2.3.3	Source electrical equipment includes lead time	01-11-17	08-11-17	6	48	1	16	$38.00	$4,300.00	$4,908.00	$500.00	$900.00	$600.00	$633.33	0%		$4,908.00		$4,908.00	$0.00	$4,908.00	0%	0%	$0.00	$0.00	$4,908.00	$0.00	$4,908.00	#DIV/0!
1.2.3.4M	**All equipment on site**	01-02-18	01-02-18																										
1.2.4	**Pipe works and Equipment Installation**	01-01-18	05-06-18	112																									
1.2.4.1	***Installation of Pumps***	01-01-18	16-03-18	55																									
1.2.4.1.1	Pre pump arrival works	01-01-18	02-02-18	25	200	4	800	$38.00		$30,400.00	$27,350.00	$34,550.00	$29,850.00	$30,216.67	0%		$30,400.00		$30,400.00	$0.00	$30,400.00	0%	0%	$0.00	$0.00	$30,400.00	$0.00	$30,400.00	#DIV/0!
1.2.4.1.2	Installation of pumps	05-02-18	16-03-18	30	240	4	960	$38.00		$36,480.00	$33,250.00	$42,000.00	$38,950.00	$38,508.33	0%		$38,508.33		$38,508.33	$0.00	$38,508.33	0%	0%	$0.00	$0.00	$38,508.33	$0.00	$38,508.33	#DIV/0!
1.2.4.2	***Installation of recirculation system***	05-02-18	02-03-18	20																									
1.2.4.2.1	Installation of tanks	05-02-18	16-02-18	10	80	4	320	$38.00	$31,814.00	$43,974.00	$57,750.00	$69,450.00	$62,250.00	$62,700.00	0%		$62,700.00		$62,700.00	$0.00	$62,700.00	0%	0%	$0.00	$0.00	$62,700.00	$0.00	$62,700.00	#DIV/0!
1.2.4.2.2	Installation of simple filteration	19-02-18	02-03-18	10	80	4	320	$38.00		$12,160.00	$11,600.00	$13,050.00	$12,250.00	$12,275.00	0%		$12,275.00		$12,275.00	$0.00	$12,275.00	0%	0%	$0.00	$0.00	$12,275.00	$0.00	$12,275.00	#DIV/0!
1.2.4.3	***Installation of Pipework***	01-02-18	30-03-18	42																									
1.2.4.3.1	Install 300NB drainage line	01-02-18	14-02-18	10	80	4	320	$38.00	$2,014.80	$14,174.80	$13,050.00	$15,350.00	$14,100.00	$14,133.33	0%		$14,174.80		$14,174.80	$0.00	$14,174.80	0%	0%	$0.00	$0.00	$14,174.80	$0.00	$14,174.80	#DIV/0!
1.2.4.3.2	Install 150NB equipment supply line	15-02-18	07-03-18	15	120	4	480	$38.00	$386.40	$18,626.40	$17,950.00	$19,450.00	$18,600.00	$18,633.33	0%		$18,633.33		$18,633.33	$0.00	$18,633.33	0%	0%	$0.00	$0.00	$18,633.33	$0.00	$18,633.33	#DIV/0!
1.2.4.3.3	Install drainage from tank overflow	08-03-18	30-03-18	17	136	4	544	$38.00	$769.00	$21,441.00	$21,050.00	$29,800.00	$23,550.00	$24,175.00	0%		$24,175.00		$24,175.00	$0.00	$24,175.00	0%	0%	$0.00	$0.00	$24,175.00	$0.00	$24,175.00	#DIV/0!
1.2.4.4	***Installation of Playground Equipment***	01-05-18	28-05-18	20																									
1.2.4.4.1	Install main structure	01-05-18	14-05-18	10	80	6	480	$38.00		$18,240.00	$20,150.00	$28,750.00	$23,400.00	$23,750.00	5%	Futher construction costs may apply	$24,937.50		$24,937.50	$0.00	$24,937.50	0%	0%	$0.00	$0.00	$24,937.50	$0.00	$24,937.50	#DIV/0!
1.2.4.4.2	Install all feature play items	15-05-18	28-05-18	10	80	3	240	$38.00		$9,120.00	$10,700.00	$21,050.00	$13,750.00	$14,458.33	0%		$14,458.33		$14,458.33	$0.00	$14,458.33	0%	0%	$0.00	$0.00	$14,458.33	$0.00	$14,458.33	#DIV/0!
1.2.4.5	***Ground surface Installaton***	29-05-18	05-06-18	6																									
1.2.4.5.1	Install the safety ground surface	29-05-18	05-06-18	6	48	6	288	$38.00		$10,944.00	$12,050.00	$14,650.00	$13,150.00	$13,216.67	0%		$13,216.67		$13,216.67	$0.00	$13,216.67	0%	0%	$0.00	$0.00	$13,216.67	$0.00	$13,216.67	#DIV/0!
1.2.4.6	***Electrical Installation***	01-02-18	04-06-18	88																									

1.2.4.6.1	Install lighting cables	01-02-18	14-02-18	10	80	2	160	$38.00		$6,080.00	$6,050.00	$7,300.00	$6,400.00	$6,491.67	0%		$6,491.67	$6,491.67	$0.00	$6,491.67	0%	0%	$0.00	$0.00	$6,491.67	$0.00	$6,491.67	#DIV/0!
1.2.4.6.2	Install equipment cables	01-02-18	14-02-18	10	80	2	160	$38.00		$6,080.00	$6,250.00	$7,350.00	$6,350.00	$6,500.00	0%		$6,500.00	$6,500.00	$0.00	$6,500.00	0%	0%	$0.00	$0.00	$6,500.00	$0.00	$6,500.00	#DIV/0!
1.2.4.6.3	Install pump electronics	20-03-18	26-03-18	5	40	2	80	$38.00		$3,040.00	$3,350.00	$3,950.00	$3,550.00	$3,583.33	0%		$3,583.33	$3,583.33	$0.00	$3,583.33	0%	0%	$0.00	$0.00	$3,583.33	$0.00	$3,583.33	#DIV/0!
1.2.4.6.4	Install playground lighting	29-05-18	04-06-18	5	40	2	80	$38.00		$3,040.00	$2,800.00	$4,100.00	$3,500.00	$3,483.33	0%		$3,483.33	$3,483.33	$0.00	$3,483.33	0%	0%	$0.00	$0.00	$3,483.33	$0.00	$3,483.33	#DIV/0!
1.2.4.6.5	Install playground control system	29-05-18	04-06-18	5	40	2	80	$38.00		$3,040.00	$2,750.00	$3,950.00	$3,300.00	$3,316.67	0%		$3,316.67	$3,316.67	$0.00	$3,316.67	0%	0%	$0.00	$0.00	$3,316.67	$0.00	$3,316.67	#DIV/0!
1.2.5	***Delays***	10-07-18	30-07-18	15																						
1.2.5.1	Project Float	10-07-18	30-07-18	15	120	3	360	$38.00		$13,680.00	$13,100.00	$14,350.00	$13,750.00	$13,741.67	5%	Additonal tasks as project progresses	$14,428.75	$14,428.75	$0.00	$14,428.75	0%	0%	$0.00	$0.00	$14,428.75	$0.00	$14,428.75	#DIV/0!
1.2.6	***Variations***																									
1.2.6.1	Inclement weather rain days exceeding the allowed 4 days - Extra overtime to allow for delays later	08-01-18	18-01-18	4	32	6	192	$38.00		$7,296.00				$0.00	0%		$7,296.00	$7,296.00	$0.00	$7,296.00	0%	0%	$0.00	$0.00	$7,296.00	$0.00	$7,296.00	#DIV/0!
1.2.6.2	Injurys that Generate Negative press - Cost of Increased Safety Training	10-10-17	13-10-17	3	24	10	240	$38.00	$300.00	$9,420.00				$0.00	0%		$9,420.00	$9,420.00	$0.00	$9,420.00	0%	0%	$0.00	$0.00	$9,420.00	$0.00	$9,420.00	#DIV/0!
1.2.6.3	Variation 3																									
1.3	**Commisioning**	18-06-18	09-07-18	16																						
1.3.1	***Wrap Up***	18-06-18	25-06-18	6																						
1.3.1.1	Systems check for elctrical	18-06-18	20-06-18	3	24	3	72	$38.00		$2,736.00	$2,300.00	$3,250.00	$2,700.00	$2,725.00	0%		$2,736.00	$2,736.00	$0.00	$2,736.00	0%	0%	$0.00	$0.00	$2,736.00	$0.00	$2,736.00	#DIV/0!
1.3.1.2	Systems check for water	18-06-18	20-06-18	3	24	3	72	$38.00		$2,736.00	$2,450.00	$3,250.00	$2,650.00	$2,716.67	0%		$2,736.00	$2,736.00	$0.00	$2,736.00	0%	0%	$0.00	$0.00	$2,736.00	$0.00	$2,736.00	#DIV/0!
1.3.1.3	Full functioning 48hr trial	21-06-18	25-06-18	3	24	4	96	$38.00		$3,648.00	$3,150.00	$4,250.00	$3,750.00	$3,733.33	0%		$3,733.33	$3,733.33	$0.00	$3,733.33	0%	0%	$0.00	$0.00	$3,733.33	$0.00	$3,733.33	#DIV/0!
1.3.2	***Hand Over***	26-06-18	09-07-18	10																						
1.3.2.1	Conduct training for council operators	26-06-18	02-07-18	5	40	2	80	$38.00		$3,040.00	$2,750.00	$3,300.00	$3,000.00	$3,008.33	0%		$3,040.00	$3,040.00	$0.00	$3,040.00	0%	0%	$0.00	$0.00	$3,040.00	$0.00	$3,040.00	#DIV/0!
1.3.2.2	Conduct hand over with council operators	03-07-18	09-07-18	5	40	2	80	$38.00		$3,040.00	$2,650.00	$3,450.00	$3,100.00	$3,083.33	0%		$3,083.33	$3,083.33	$0.00	$3,083.33	0%	0%	$0.00	$0.00	$3,083.33	$0.00	$3,083.33	#DIV/0!
1.1	**Total Design**				**1168**		**1976**			**$106,704.00**	**$87,050.00**	**$135,500.00**	**$105,250.00**	**$107,258.33**			**$111,534.50**	**$111,534.50**	**$0.00**	**$111,534.50**	**100%**	**100%**	$111,534.50	$111,534.50	**$0.00**	**$111,534.50**	**$111,534.50**	**$111,534.50**
1.2	**Total Construct**				**5424**		**13632**			**$632,782.85**	**$508,300.00**	**$675,250.00**	**$584,200.00**	**$586,725.00**			**$681,830.20**	**$681,830.20**	**$0.00**	**$681,830.20**	**2%**	**2%**	$10,227.45	$10,227.45	**$625,796.20**	**$6,500.00**	**$632,296.20**	**$433,333.33**
1.3	**Total Commision**				**152**		**400**			**$15,200.00**	**$13,300.00**	**$17,500.00**	**$15,200.00**	**$15,266.67**			**$15,328.67**	**$15,328.67**	**$0.00**	**$15,328.67**	**0%**	**0%**	$0.00	$0.00	**$15,328.67**	**$0.00**	**$15,328.67**	**#DIV/0!**
1	**Total Design, Construct, and Commision**	07-08-17	31-07-18		**6744**		**16008**			**$754,686.85**	**$608,650.00**	**$828,250.00**	**$704,650.00**	**$709,250.00**			**$808,693.36**	**$808,693.36**	**$0.00**	**$808,693.36**	**20%**	**20%**	$161,738.67	$161,738.67	**$641,124.87**	**$118,034.50**	**$759,159.37**	**$590,172.50**

13.7. Appendix G - Roles, responsibilities and authorities of each team member

Team Member	Role	Authority	Responsibilities	Competency
Mitchell Blanch	Project Manager (PM)	Approval of all project expenditures and project scope and schedule variations	• Manage project team • Coordinate between project team and stakeholders • Project performance reviews • Scope, schedule and cost control • Coordinate with functional managers	• Efficient project management skills • Conflict resolution skills • Leadership skills • Budgeting and schedule management skills • Effective communication between all stakeholders of project
Matthew Amos	Functional Manager	Approving resource requirements	• Providing resources for project • Coordinate with PM and DE’s to manage skill requirements • Undertaking performance reviews of resources	• Effective communication link between PM and DE’s • Efficient management skills to meet project requirements
Samuel Davidson	Implementation Manager	Report project communications management plan conformance to PM	• Responsible for implemented design decisions • Report to PM on project communications management plan	• Proficient management of DE’s performance • Ensure efficient communication between project team
Tim Schultz	Design Engineer (DE) (Mechanical)	Technical design based decisions	• Equipment specification and layout design • Detailed design of water supply and reticulation	• Mechanical Engineering design experience • Sufficient communication with project team
Jake Hunter	Design Engineer (Enviro. and Geotech.)	Technical design based decisions	• Conducting geotechnical investigation and reporting findings • Conducting environmental investigation and reporting findings	• Geotechnical Engineering design experience • Environmental Engineering design experience • Sufficient communication with project team
Darby O’Sullivan	Design Engineer (Electrical and Civil)	Technical design based decisions	• Control system design • Electrical supply requirements and design • Structural design/assessment of playground equipment considering live and dead loading conditions • Water recapture management design	• Electrical Engineering design experience • Sufficient communication with project team • Civil Engineering design experience • Sufficient communication with project team
James Tochowicz	Training Lead (TL)	Technical design based decisions	• Ensuring training plans are carried out efficiently • Provide training status reports to PM	• Effective communication skills • Relevant technical knowledge to undertake training development plans

13.8. Appendix H – Communication requirements matrix

Communication Type	Objective of Communication	Medium	Frequency	Audience	Deliverables
Initial Stakeholder Meeting	Identify stakeholder's requirements and concerns.	Face to Face	Once	• Project Sponsor • Technical Representative • Project Team • Stakeholders	• Minutes archived on project website
Project Kick-off Meeting	Report the project schedule, specifications and initial cost management plan.	Face to Face	Once	• Project Team • Technical Representative • Key Stakeholders	• Minutes archived on 'Slack' • Project schedule archived on project website
Project Status Meeting - Key	Review Status of the project with key stakeholders.	Face to Face	Weekly	• Project Team • Technical Representative • Key Stakeholders	• Minutes archived on 'Slack'
Project Status Meeting	Report the status of the project to stakeholders. Answer any inquiries from the stakeholders.	Face to Face	Monthly	• Project Sponsor • Stakeholders	• Minutes archived on project website • Status report updated on project site
Emergency Meeting	A meeting for an emergency that requires urgent attention	Face to Face	When Required	• Project Sponsor • Project Team	• Results from meeting archived on 'Slack'

Appendix I – Report sections For Part B

Name	Student Number	Section title	Points
Mitchell Blanch	C3183523	Cost Management	11.1 – 11.6
Samuel Davidson	C3186764	Communication Management	10.1 – 10.5
Matthew Amos	C3202194	HR Management	9.3
Tim Schultz	C3202190	HR Management	9.1 - 9.2
James Tochowicz	C3146855	Communication Management	10.6 -10.11
Darby O'Sullivan	C3183152	Code Of Ethics	12.1,12.3 -12.5
Jake Hunter	C3180128	Code Of Ethics	12.2, 12.6 - 12.7