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Faculty of Engineering and Mathematical Sciences
Assignment, Report & Laboratory Coversheet for Individual & Group Assignment

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GENG5505 (Sem2, 2019) - Major Group Project Marking Guide

| | | | |
|---------------------------------|--|-------------------|----------|
| Group Name: | CHURROS | | |
| Project Name: | PEBBLE BEACH BOULEVARD WASTEWATER PUMP STATION AND PRESSURE MAIN UPGRADE | | |
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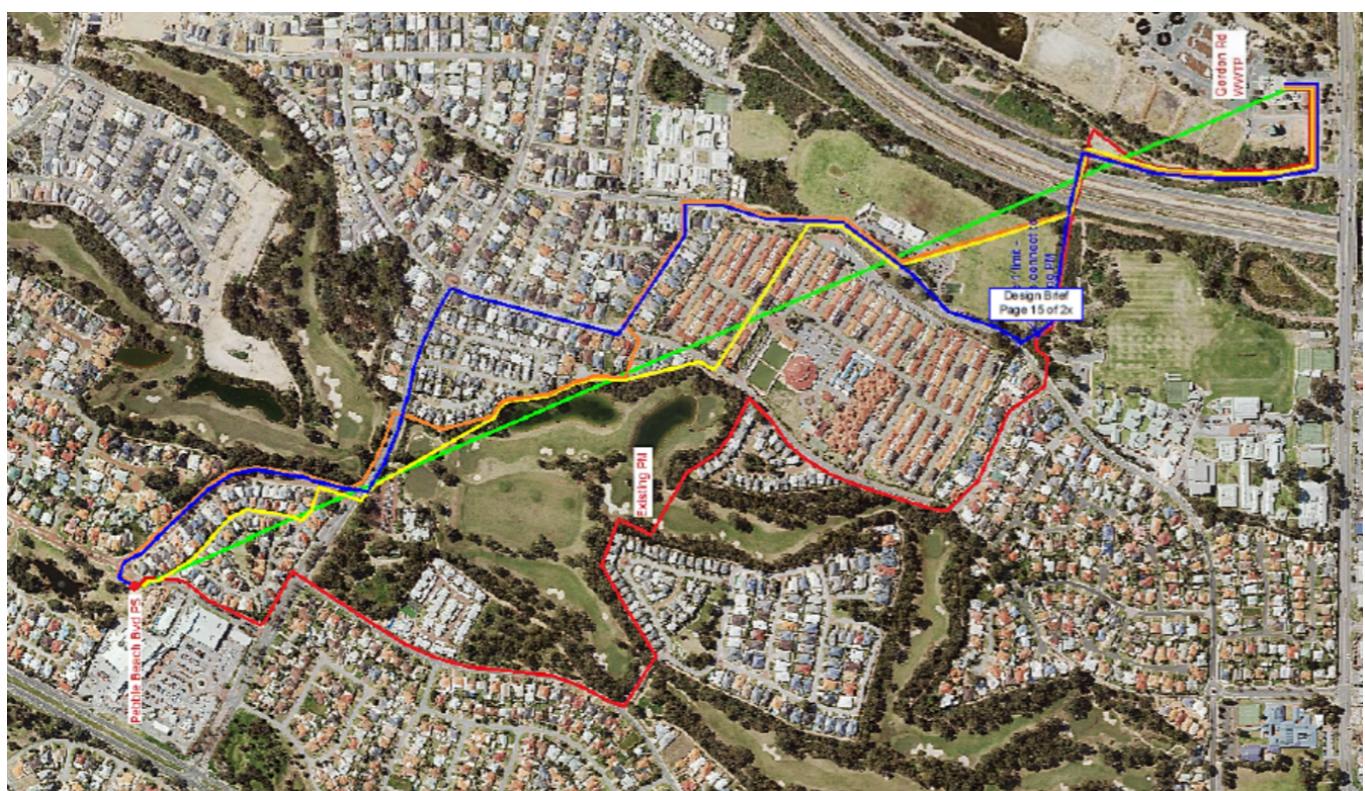
CONTENT ASSESSMENT CRITERIA

| Marking | Very Poor | Fair | Good | Excellent | |
|---|-----------|------|------|-----------|-----|
| Executive Summary (Maximum 1 page) | | | | | |
| Clarity & conciseness | 0-1.5 | 2 | 2.5 | 3 | 3.5 |
| Executive Summary - Total | | | | | |
| Section A: Case study writing (Approx. 1,500 words) | | | | | |
| Clarity & conciseness of project background | 0 | 4 | 5 | 6 | 7 |
| Quality & relevance of research material (i.e. info/facts) | 0 | 4 | 5 | 6 | 7 |
| Total Section A | | | | | |
| Section B: Case Study Analysis (Approx. 2,500 words) | | | | | |
| Introduction (clarity of purpose & conciseness) | 0-1.5 | 2 | 2.5 | 3 | 3.5 |
| Use & relevance of theories, models & frameworks | 0 | 4 | 5 | 6 | 7 |
| Depth of analysis, clear & logical argument | 0 | 4 | 5 | 6 | 7 |
| Total Section B | | | | | |
| Section C: Recommendations to the case (Approx. 2,000 words) | | | | | |
| Use & relevance of theories, models & frameworks | 0 | 4 | 5 | 6 | 7 |
| Relevance & justification of recommendations | 0-2.5 | 3 | 3.5 | 4 | 5 |
| Insight & synthesis, clear & logical argument | 0-2.5 | 3 | 3.5 | 4 | 5 |
| Total Section C | | | | | |
| Conclusion (Maximum 1 page) | | | | | |
| Logical summary | 0-1.5 | 2 | 2.5 | 3 | 3.5 |
| Conclusion - Total | | | | | |
| Table of contents (compulsory), references & appendices | | | | | |
| Appropriate table of contents, appendices & references | 0-1.5 | 2 | 2.5 | 3 | 3.5 |
| Table of contents, references & appendices – Total | | | | | |
| Group meetings (agenda & minutes) | | | | | |
| Relevance & consistency of issues & outcome | 0 | 4 | 5 | 6 | 7 |
| Clarity, conciseness, team reflections and leadership | 0-1.5 | 2 | 2.5 | 3 | 3.5 |
| Group meetings (agenda & minutes) - Total | | | | | |

TOTAL GROUP MARK /100 %



WATER CORPORATION AND GHD'S PEBBLE BEACH BOULEVARD WASTEWATER PUMP STATION AND PRESSURE MAIN UPGRADE



A CASE STUDY OF THE PROJECT MANAGEMENT LIFECYCLE
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1. Executive Summary

GHD was the engineering design consultant for Water Corporation's (WC) Pebble Beach (PB) Boulevard Wastewater Pump Station (WWPS) and Pressure Main (PM) Upgrade project. The objective of this report is to analyse the project management lifecycle stages; conceptualisation, planning, execution (including monitoring and controlling) and finalisation. In addition, a Triple Bottom Line (TBL) approach is employed to highlight the environmental, social and economic considerations of the project. The PB project scope included the increase in pumping rate at the existing WWPS and to ensure that the resulting noise and vibrations satisfied the Environmental Protection Regulations 1997.

The project ran overtime by 8 months, and over budget by \$60,496 due to the following issues that were uncovered across the project lifecycle stages:

- Inaccurate budget and schedule forecasting, resulting in cost variations;
- Excess variations in the scope of services throughout the project lifecycle;
- Poor risk management during the conceptualisation stage of the project;
- Lack of planning, managing and controlling of stakeholder engagement;
- Inefficient communication management between stakeholders; and
- Failure to implement quality management procedures;

Through application of the relevant conceptual frameworks and theories identified by Cosimo Faiello, Stephen Hartley and the Project Management Body of Knowledge (PMBOK), the following key recommendations were made in regard to the respective issues:

- Consideration of Earned Value Management and the Analogous Method;
- Application of the MoSCoW Framework to clarify the scope of services accordingly;
- Implementation of the Risk Management Dilemma along with SWOT analysis;
- Inclusion of a Power and Interest Matrix as well as a Stakeholder Management Plan;
- Usage of a formal Communication Management Plan; and
- Establishment of a Quality Management Plan, system and appropriate flow charts.

Utilisation of these frameworks by GHD would've greatly benefited the PB project. An improvement in budget and time would be observed through precise scope, budgeting and quality procedures. Furthermore, the relationship between key stakeholders would be enhanced. These recommendations would realise the opportunities present to align the project with TBL and lifecycle thinking.

2. Abbreviations & Definitions

| Abbreviation | Meaning | Definition |
|--------------|--|--|
| ESR | Engineering Summary Report | This report contains information regarding the project context, engineering design, financial analysis, risk assessment, environmental and social analysis, project constraints, timeline, stakeholder review response and design output references. |
| EVM | Earned Value Management | Quantitative measurement of project progress and value. |
| MoSCoW | Must have, should have, could have, won't have | An effective technique to clearly delineate the scope requirements. |
| PB | Pebble Beach | Pebble Beach Boulevard, Meadow Springs in the City of Mandurah is the area of concern. |
| PDCA | Plan, do, check, act | An iterative four-step management method for the control and continuous improvement of processes and products. |
| PE | Polyethene Pipe | This is a type of flexible plastic pipe used for fluid transfer. |
| PM | Pressure Main | A pipeline that carries a fluid (typically water and sewage) at a pressure greater than atmospheric pressure. |
| PMBOK | Project Management Body of Knowledge | This is a set of standard terminology and guidelines for project management. |
| PSP | Project Specific Preliminary | This report contains information regarding project specific specifications. |
| QMS | Quality Management System | A collection of business processes focused on consistently meeting client requirements and enhancing their satisfaction. |
| SMP | Stakeholder Management Plan | Details the strategies to effectively engage stakeholders throughout the project lifecycle. |
| SoP | Schedule of Prices | Forms part of the Contract for the purposes of making and assessing progress claims, identifying provisional sums and quantities, and as a guidance in pricing variations. |
| TBL | Triple Bottom Line | A project management framework that assists a company in sustainably achieving their business goals and increasing shareholder value. |
| WC | Water Corporation | The principal supplier of water, wastewater and drainage services throughout WA. |
| WWPS | Wastewater Pump Station | Sewage collection system that transfers wastewater to higher elevations. |

3. Section A: Case Study Writing

3.1 Project Overview

Water Corporation's (WC) Pebble Beach (PB) Boulevard Wastewater Pumping Station (WWPS) and Pressure Main (PM) upgrade was a segment of their \$3.2 million wastewater project along PB in Meadow Springs. WC selected GHD for the engineering and detailed design of this project following proposal submission evaluation.

The scope of the project was to increase the pumping rate at the existing WWPS to deliver between 100-110 L/s through replacing existing pumps and pumping station pipework. Additionally, the noise and vibrations caused from the pumps and replacement pipework were not to exceed the permissible level under the Environmental Protection Regulations 1997.

During the conceptualisation stage, engineering consultants are involved in data collection, review and concept development, the identification of potential project risks and the initial establishment of stakeholder relationships. The planning stage involved site investigations, preparation of strategic plans to mitigate identified risks and the commencement of drafting the detailed design. The execution stage is where the engineering design is completed. This stage involves the confirmation of drawings, Risk Register and the completion of many other vital documents. The final stage of the project lifecycle involves the hand over process of the detailed design, geotechnical investigation reports, preliminary design drawings, the Engineering Summary Report (ESR) along with the tender documents, which includes the Schedule of Prices (SoP) and Project Specific Preliminary (PSP).

3.2 Conceptualisation Stage

The conceptualisation stage of a project is primarily referred to as the 'initiation stage', where project goals are explored, potential risks are identified, and initial budget is forecasted (Hartley 2018, p.76).

3.2.1 Scope Management

An essential component of the conceptualisation stage involves the production of a scope management plan, exploring how the scope of a project should be defined and validated. The design brief for the PB project was inclusive of WC's project scope. Each aspect of this scope was further reinforced and explored in GHD's proposal (Appendix A). Project scopes are often subject to alteration throughout the project lifecycle, due to potential unforeseen circumstances or improvement opportunities. Hence, it is essential that all parties involved come to an agreement on an appropriate protocol procedure to be followed when scope variations are required.

3.2.2 Cost Management

The establishment of a cost management plan also remains a crucial aspect in providing a clear framework regarding all "cost estimation, budgeting and cost-controlling processes" that are necessary for expectations to align (Hartley 2018, p. 238). GHD's proposal in response to WC's design brief included their offer in terms of scheduled rates with a target fee. This is explored in the Quotation and Detailed Breakdown Price Schedule (Appendix B), analysing lump sums, schedule of rates, expenses, disbursements and provisional sums.

3.2.3 Stakeholder and Communication Management

Stakeholders are "those that contribute to the project output and those that are impacted by the project output" (Hartley 2018, p. 146). As project outcomes are heavily reliant on the contributions made by the stakeholders involved, it is vital that effective communication is reinforced to ensure that there are no misunderstandings regarding project milestones. GHD's proposal for the PB project included an organisational structure, highlighting the relationships between the internal stakeholders and how communication would be carried out to WC (Appendix C). The proposal also identified the key external stakeholders involved, such as the City of Mandurah (CoM), utility providers and the golf course.

3.2.4 Risk Management

Risk can occur during all stages of a project lifecycle. Hence, risk management plays a crucial role in ensuring that a project can achieve its objectives. WC's design brief outlined the main risks associated with the PB project. These project risks were further explored in GHD's proposal (Appendix D).

3.3 Planning Stage

The planning stage of a project is often described as the 'development' stage, involving the detailed scheduling and planning of required resources, along with the approval of administrative matters and cost estimations (Hartley 2018, p.76).

3.3.1 Scope Management

The scope management plan, established initially in the conceptualisation stage, is used as a guidance parameter to assist with the scope refinement process during the planning stage. This involves clarifying the project goals and documenting the most desirable method to achieve them. GHD recognised the inevitability of scope creep throughout the project lifecycle due to the constant evolution of stakeholder expectations and variation in circumstances. As such, GHD developed concise change request protocols to actively manage scope creep (Appendix E).

3.3.1 Cost Management

As part of the planning stage, it is essential to further develop the cost management plan established in the conceptualisation stage. Following the provisional Quotation and Detailed Breakdown Price Schedule (Appendix B), GHD produced revisions of this price schedule as the project progressed in order to reflect scope changes, additional hours required to complete activities and any other unforeseen circumstances.

3.3.2 Time Management

Effective time management during the planning stage is crucial to ensure that the project deliverables are executed and finalised as required by stakeholders. Following the Provisional Project Schedule listed in the proposal (Appendix F), GHD developed a baseline Gantt Chart, detailing the activities and order of completion (Appendix G). However, given the high variability in the duration range, GHD was required to revise and produce revisions of the baseline schedule to increase the accuracy of the required estimate.

3.3.1 Risk Management

In addition to the assessment and analysis of the risks identified in the conceptualisation stage, the planning stage also involves recognising the risks that are likely to occur as the project progresses. GHD addressed these risks through the Risk Register (Appendix H), which includes the consequence and likelihood ratings, risk matrix and proposed treatment control types. This Risk Register should be updated regularly and at every phase of the project lifecycle in order to facilitate proactive risk management.

3.4 Execution Stage

The execution stage of a project commences once the planning stage is complete. It involves the utilisation of the schedules developed during the initial stages of the project. This stage contributes hugely to the project outcomes and is often referred to as the ‘implementation’ stage (Hartley 2018, p.76).

3.4.1 Cost Management

The execution stage is where engineering design projects are subject to the highest risk of substantial cost variations. Hence, it is crucial for GHD to ensure that the Quotation and Detailed Breakdown Price Schedule is closely abided to (Appendix B). This involves actively controlling, monitoring and reporting project costs to ensure expenditure is as planned. Part of GHD’s responsibility is to recognise early indications of over budgeting and take appropriate actions to prevent further escalation.

3.4.2 Time Management

During this stage, it is crucial for GHD to abide to the estimated durations indicated in the Gantt Chart and produce revisions as required to reflect unforeseen circumstances (Appendix G). Following the Gantt Chart closely would ensure that the project abides to WC's proposed timeline, as it provides an estimate of the scheduled hours for each engineering consultant and drafter involved in the design process.

3.4.3 Communication Management

The execution stage predominantly involved the design of the pipeline connecting to the existing PM along with hydraulic modelling. GHD must maintain constant communication with WC during the execution stage in order to ensure objectives are aligned. The constructability review minutes highlighted the communication between GHD and WC in regards to necessary drawing revisions and specific site areas (Appendix I). An Outstanding Issues Register was frequently updated to include WC's comments and feedback.

3.4.1 Quality Management

The required design deliverables must be thoroughly reviewed by the design team to ensure accuracy and compliance with relevant legislations, as stated in the PSP. Doing so will ensure that the design complies with WC's quality standards (DS51).

3.5 Finalisation Stage

The finalisation stage reflects the completion of a project, with deliverables being handed over to the client who must accept the work (Hartley 2018, p.76). Prior to closing the contract, the client must be informed of contractual agreements met and those not met. An evaluation including lessons learnt, performance review, and feedback from key stakeholders is recommended as it may assist with future projects.

3.5.1 Stakeholder Management

While GHD had identified several key stakeholders in the conceptualisation stage, it is also important to consider the planning of stakeholder management, as well as the managing and controlling of stakeholder engagement. The ESR (Appendix J) contains all documented stakeholder engagement, with a record of stakeholder response and feedback to the ESR, as well as stakeholder correspondence across the project lifecycle stages (Appendix K).

3.5.2 Quality Management

To ensure quality in the overall project performance, both the quality of deliverables handed over in the finalisation stage and project management approach are critical (Hartley 2018, p. 269). To ensure quality in the outputs and deliverables, GHD sought to comply with all the requirements in the contract documents, design brief, variations, along with WC's Engineering Design Manual and Standards.

3.6 Triple Bottom Line

The TBL approach is a project management framework that assists a company in sustainably achieving their business goals and increasing shareholder value. Here, sustainability is defined as a company operating such that stakeholder needs are met today, without impeding on the ability for future stakeholders to meet their own needs (Failello 2019). This is done by integrating and protecting social, economic and environmental opportunities into the company's business strategy (Failello 2019).

3.6.1 Social

To integrate and protect social considerations into the project, constant engagement with internal and external stakeholders is required, allowing the project to mutually benefit all parties involved.

3.6.2 Economic

To integrate and protect economic considerations into the project, the project should be able to function healthily and meet completion. This means that the project should be able to deliver on the value promised, without extremely running over budget and inducing financial stress on stakeholders involved.

3.6.3 Environmental

To integrate and protect environmental considerations into the project, awareness of how the environment may be impacted should be reviewed. Reduction of impact and rehabilitation of the environment is essential, where future impact should also be considered throughout the project lifecycle.

4. Section B: Case Study Analysis

4.1 Conceptualisation Stage

4.1.1 Scope Management

Scope management plays a vital role in enriching the foundation of a project. The scope baseline of a project is subject to potential alterations during the project lifecycle, leading to inevitable variations. Both WC and GHD signed a Complied Contract outlining the appropriate methods to be implemented should such variations surface (Appendix E). The protocol procedure includes drafting a variation request, documenting the required adjustments, the services required, the impact on the project outcome and a set approval deadline. After the variation request has been approved, it's necessary to update the relevant documents, such as the schedule, risks and the monitoring controls.

4.1.2 Cost Management

The meeting minutes from the project kick off meeting held between WC and GHD documented a reflection of WC's responses to GHD's proposal. WC mentioned that GHD's cost estimate was in close approximation to their expected budget, however, was higher in comparison to the bids received from competing engineering consultancies. Regardless, GHD won the project due to their detailed understanding and thorough methodology.

4.1.3 Stakeholder and Communication Management

As mentioned in Section A, stakeholder and communication management plays a crucial role in determining the success of a project. PMBOK (2013) provides three key processes to achieve this, namely, planning communications management, managing communications and controlling communications (Hartley 2018, p. 330). The organisational structure presented in the proposal provides an overall understanding of how items would be communicated between key stakeholders. For example, the WC's project manager, design manager and client representative would predominantly liaise with GHD's project manager and project director (Appendix C). The team was chosen based on individual qualifications and experiences that are suitable for the scope of services required. While a background overview of the external stakeholders was outlined in the proposal, GHD failed to provide a thorough communication management plan, catered towards all stakeholders involved.

The meeting minutes from the project kick off meeting clarified how the key stakeholder communication process would be carried out, along with the frequency of scheduled meetings. It was confirmed that all communication on GHD's behalf would go through the Project Manager, Jason Nielson, and relevant leads . Whereas all communication on WC's behalf would be carried out through the Design Manager, Shuo Pan, and relevant leads. It was also stated that no key professionals from either GHD or WC were expected to be absent for the duration of this project. Additionally, both GHD and WC agreed there will be fortnightly progress meetings commencing the 31st of July 2018 until the completion of the scope of services. These meetings were to have altering locations, between the WC and GHD's Perth offices, with GHD being responsible for the preparation of the meeting minutes and WC being responsible for evaluating and approving them. The two parties also voiced

any preconceived concerns they had with each other (Appendix L) based on previous experiences with working together. Identifying such issues during the conceptualisation stage is encouraged to mitigate misunderstandings later on in the project lifecycle.

4.1.4 Risk Management

Identifying potential risks during the conceptualisation stage is encouraged so that adequate planning can be done prior to commencing work on the design scope of services. GHD proposed brief explanations as to how they would mitigate the identified project risks in WC's design brief (Appendix D). For example, the identified risk of an overflow occurring during the link-in works, was planned to be mitigated by developing the design in accordance to WC's developed flow management plan. GHD's proposal also expressed their dedication to producing a safe constructible design, aligning with WC's overarching requirement for achieving Zero Harm (Murphy, 2016).

4.2 Planning Stage

4.2.1 Scope Management

During the planning stage, GHD experienced significant but also inevitable scope creep due to the constantly changing expectations of stakeholders and circumstances. Following the proposal feedback, WC identified areas in which GHD's scope management could be improved. GHD failed to detail a formal mechanism to limit, assess and authorise scope changes on a consistent and transparent basis in the initial scope management plan. Over the course of the project lifecycle, more than 30 scope variations were identified (Appendix M), some of which could have been adequately planned for if identified.

4.2.1 Cost Management

During the planning stage, GHD's capital and operating cost estimations were required to have an accuracy of +20%/-5% (Appendix N). This provided an indication to stakeholders that they could potentially encounter the risk of project costs exceeding the budget by 20%. However, the project costs exceeded the 20% limit. This was caused by the largely inaccurate

estimation of the hours required by GHD's resources. The planned hours required by the Project Manager was initially 83, which was greatly underestimated as the actual hours equated to nearly 230 (Appendix O). Since the unit rate for the Project Manager was \$277 per hour, this accounted for a substantial portion of the project fees.

4.2.2 Time Management

Time management includes the processes required to determine and implement the project schedule and manage the agreed timelines with appropriate intervention strategies throughout the project. Significant delay in project activities was a major issue encountered by GHD from the planning stage through to finalisation. Although the Gantt Chart (Appendix G) was referred to throughout the project and revisions were produced to reflect scope changes, the level of task dissemination was evidently insufficient. Tasks that took longer than the estimated duration were due to unforeseen circumstances, failure to identify task dependencies and underestimation of the effort required. For example, there were delays in client review responses which ultimately impacted the final delivery date.

4.2.3 Risk Management

In order to compensate for the lack of risk management achieved during the conceptualisation stage, GHD established a detailed Risk Register (Appendix H), which catered towards all potential risks that would be expected during design, construction, commissioning, operations and maintenance. These were inclusive of a hazard assessment, risk matrix, along with consequence and likelihood ratings. The Risk Register reflected the probability of each risk occurring, the corresponding impact on the project and a ranking system implemented to prioritise them. However, there was insufficient evidence to suggest that other risk control techniques were used to analyse the underlying issues impacting the scope of services. The Risk Register also incorporated the Risk Management Dilemma (Appendix P) in order to identify the expected financial impacts stemming from the five likeliest risks. Evidently, GHD had failed to acknowledge the impact of risk and cost against the time factor, which oversees the overall schedule of the project.

4.3 Execution Stage

4.3.1 Cost Management

Cost management in the execution stage can be defined as the process of managing and controlling the cost of a project, to ensure activities are completed in accordance to the initially estimated budget (PMBOK 2013). The cost management of the PB project was poorly implemented due the recognition of excessive cost variations during the design phase. GHD failed to produce flow charts representing the relationship between the estimated and actual cash flows, indicating a lack of economical sustainability. An Approval to Exceed Project Budget provided an overview of the key parameters that contributed to the cost variations (Appendix O).

4.3.1 Time Management

Through the analysis of GHD's Gantt Chart (Appendix G), it was evident that time management methods were poorly implemented. During the execution stage, the utilised project hours had almost tripled in comparison to the initially estimated 83 hours (Appendix O). This was a direct result of GHD's inadequate documentation and planning of the resources available across the duration of the project lifecycle. The initial agreement during the project kick off meeting indicated that under no circumstances will there be approval of leave requests for consultants and drafters. However, it was apparent that the main assigned drafter had taken three days of leave, hindering the design process due to a lack of formal handover.

4.3.2 Communication Management

There was insufficient communication between GHD and WC during the design process. This led to excessive scope variations, contributing an additional \$18,929 to the estimated cost budget (Appendix O). Hence, GHD has evidently failed to comply with the formal communication methods agreed upon in the proposal, namely weekly consultation between GHD's design manager and WC, in addition to fortnightly progress meetings.

4.3.3 Quality Management

Quality management during the execution stage involves ensuring that all the policies, objectives and responsibilities regarding quality control defined in the planning stage are addressed. From the project kick-off meeting minutes (Appendix L), WC had noted the lack of appropriate quality control in GHD's drawings, stating that drawings with five or more obvious errors will be rejected. Although quality standard guidelines had been established, errors in design deliverables reflect GHD's insufficient adherence to the standard of quality expected by WC and key stakeholders.

4.4 Finalisation Stage

4.4.1 Stakeholder Management

Stakeholder management is one of the key processes in planning and managing projects, where continuous communication is essential (Hartley 2018, p. 146). Hartley proposes a four-step process that includes stakeholder identification, planning stakeholder management, and managing and controlling stakeholder engagement (Hartley 2018, p. 143).

GHD identified early on in their proposal that effective stakeholder management would be required as the pipeline route is sensitive, containing a number of mature native trees throughout the CoM and golf course (Appendix Q). The proposal indicated that GHD assumed that by the execution phase, feedback from stakeholders would have been received (Appendix R). However, GHD failed to detail how they would manage and control the stakeholders identified in their proposal.

Additionally, a lack of planning and managing stakeholders resulted in GHD not being able to control the engagement with the CoM. This can be seen through the second unresolved item in the ESR referencing GHD not being able to formally confirm approval of the pipeline route being acceptable, only verbally and by email (Appendix S). If the CoM were to formally decide that they were unhappy with the pipeline route, the work GHD has done,

including but not limited to the engineering and detailed design and SoP, would be greatly impacted.

4.4.1 Quality Management

To understand quality and how it impacts a project, one needs to consider the quality of both the deliverables and management (Hartley 2018, p.269). GHD addresses the quality of the physical products handed over, such as the pump and associated pipework, in the ESR with a Quality Management System (QMS) in place that is compliant with AS/NZS ISO 9001 (Appendix T). However, this approach doesn't include other deliverables, such as the design drawings and SoP. Additionally, there is no detailed reference to how this QMS is implemented, recorded or reviewed in relation to any of these deliverables, or to GHD's project management approach. This increases the difficulty of tracking the quality of both the physical requirements, such as scope, schedule and cost, and process requirements, such as documentation (Hartley 2018, p.267).

Additionally, there is no project quality plan or record of project quality control, despite this being typical of GHD's project approach (Nielson 2014). This is an issue as even if GHD has complied with the requirements in the contract documents, design brief, variations, WC's Engineering Design Manual and Standards, it is hard to retrospectively review how this acceptance criteria are met if there is no record of project quality control. This is especially a concern if complications with the design occur in the construction of the pump and related pipework, or if the work completed fails in the future.

4.5 Triple Bottom Line

4.5.1 Social

The purpose of the WWPS and PM upgrade is to increase the station pumping capacity, which addresses the growth and development in North Mandurah suburbs such as Meadow Springs and Lakelands (Water Corporation n.d.).

With the current pumping arrangement, and the expected growth and inflow due to the growth of North Mandurah, the WWPS could operate in excess of acceptable run times in the

near future, which could lead to equipment degradation. This may pose safety concerns and impact on the wastewater pumping capacity in the area, impacting residents.

In addition to this, the current pumping arrangement causes significant noise and vibration in the local vicinity of the station, exceeding limits from the Environmental Protection Regulations 1997. This is a social nuisance and causes obvious discomfort to local residents. Thus, another component of the design brief from WC was to reduce this noise and vibration level.

GHD also considered the impact on local residents during construction and provided mitigation strategies to minimise this impact, notifying the local residents (Appendix U). For example, traffic disruption along the PM construction route, and general service disruption to the public in congested areas. GHD proposed that the pipeline route should consider access, traffic and congestion in the construction methodology. Additionally, GHD proposed a 2-pass geotechnical investigation to minimise disruption, with the first pass involving a truck mounted cone penetration test and limited boring, with the second pass involving targeted boring where necessary.

4.5.2 Economic

It is important to note that the WWPS and PM upgrades don't provide any tangible economic return to stakeholders. Instead, the upgrades are necessary to provide essential wastewater management infrastructure in a satisfactory and compliant way, for a growing community. In order for the project to function in a financially healthy manner, GHD initially accounted for provisional sums in the Quotation and Detailed Breakdown of Price Schedule (Appendix B).

4.5.3 Environmental

GHD's proposal considered several environmental factors relevant to construction, providing risk mitigation strategies accordingly. One of these was the significant presence of mature native trees in the CoM, especially along the proposed pipeline route (Appendix Q). GHD leveraged its previous stakeholder experience to highlight that the CoM has very particular requirements around the protection of native trees. GHD proposed significant attention to the detailed alignment of the pipe during the design process, as well as adjusting construction

methodology to minimise disturbance to existing native trees. To assist in achieving this, GHD included a provisional sum of \$30,000 for a flora and fauna survey in its proposal.

5. Section C: Recommendations to the Case

In order to address the problems and issues identified in Section B, key recommendations across the seven relevant project management competencies are put forward. Section C details the recommendations across these competencies, including cost, time, scope, risk, stakeholder, communication and quality management.

5.1 Cost Management

GHD has employed the zero-based method to produce the schedule of hours and rates for each consultant working on the project. There's a lack of evidence to show that they've utilised other approaches in conjunction with this. Therefore, it's recommended that GHD uses a combination of the top-down and program approaches. The top down method will improve the reliability of the estimated costs as it's determined by pooling the knowledge of senior managers and past project results. Then they are passed onto lower-level managers who continue the breakdown into further estimates (Hartley 2018, p.246). Additionally, the program method will allow a greater understanding of the project activities that are to be achieved, with activities being grouped together for cost estimation (Hartley 2018, p.246). Application of these approaches in the initial forecasts during the conceptualisation stage could have resulted in a more accurate bid that align with market conditions and GHD's competitors. Moreover, actively monitoring resources and associated costs could've potentially prevented the over-spending as the project progressed into planning and execution.

Furthermore, due to the lack of effective cost control practices, the actual costs of the project exceeded the initial required cost estimation accuracy of +20%/-5%. Earned Value Management (EVM) is a methodology that combines scope, schedule and resource measurements to constantly measure, assess and control both project progress and performance (Hartley 2018, p.253). It was evident that GHD simply compared actual costs

against budgeted costs and failed to consider the three metrics that underlie EVM calculations including planned value, earned value and actual costs. Implementation of this method will determine the component of work completed or performed to date (Appendix V).

5.2 Time Management

Ineffective time management protocols were implemented by GHD during the planning and execution stages. Therefore, it's recommended that the Gantt Chart (Appendix G) is strictly abided to, revised frequently to reflect current time restraints and to include a higher level of task dissemination. The inaccurate estimation of project hours could've been improved by using an Analogous Method in addition to expert judgement. This method considers the cost from similar projects to develop an estimate. Since GHD has completed similar projects with WC, it's likely that applying hours from previous projects as a benchmark, will improve the accuracy of estimation.

5.3 Scope Management

The scope management process utilised plays a crucial contribution in determining the success of a project. Hence, it's necessary for the scope of services to be extremely comprehensive, compensating for inevitable scope creep. For the PB project, GHD and WC agreed on a protocol procedure to be followed when scope variations were required.

Although the scope of services outlined in GHD's proposal during the initial stages of the project lifecycle addressed all relevant elements of WC's project scope, a lack of detail was evident. As a result, GHD and WC had in excess of 30 variations (Appendix M). Hence, it's recommended that for future projects, GHD explore the scope of services in more thorough detail early on in the project. Whilst all projects are subject to scope alterations throughout the project lifecycle, it can be limited by ensuring there's sufficient input from stakeholders, thorough documentation and having a mandated formal change control process (Hartley 2018, p. 194). It's recommended that GHD review previous projects of a similar nature to identify regular sources of scope creep, which can then be incorporated into the scope refinement process in the planning phase. Although GHD implemented a protocol procedure

for scope variations, there was inadequate documentation analysing approaches that could be utilised to limit the occurrence of such variations.

In future circumstances, GHD could also consider having a third party such as an external technical consultancy or a government subsidiary to evaluate their established scope of services. Often, a third party review can potentially eliminate unstated assumptions on the requirements for certain deliverables of a project. Alongside of conducting potential creep forecasting using the MoSCoW Framework may also be beneficial in identifying areas of concern. As everything from the reporting requirements to the final infrastructure drawings can be analysed through this framework, ensuring that each party has a clear understanding on what the project will, should, could and won't deliver (Hartley 2018, p.178).

5.4 Risk Management

It is highly essential that all risks are identified and managed thoroughly during all stages of the project lifecycle. This is mainly due to risk being an inevitable component of any project. During the conceptualisation stage, WC identified potential risks that may surface in their design brief, for which GHD responded with brief explanations, exploring how they would mitigate them (Appendix D). For future projects, it's highly recommended that GHD produce more detailed mitigation strategies for identified risks so that adequate planning and resources can be allocated early on in the project.

The Risk Register produced by GHD during the planning stage of the project (Appendix H), represented a detailed understanding of the risks that may surface during the execution stage. Providing a probability overview for the occurrence of each risk, along with corresponding impacts and the priority in which they should be addressed. The Risk Register also took into consideration elements of the Risk Management Dilemma (Appendix P). While GHD highlighted the financial consequences of their top five ranked risks, they failed to provide an approximated timeline for each risk identified. Hence, for future projects, GHD should encompass for all identified risks and produce a suitable timeline suggesting when the risks may surface at. Doing so, will ensure there are no misunderstandings or unexpected occurrences during the execution stage.

Additionally, GHD should consider conducting a SWOT analysis, taking into account of factors that the corporation has the capacity to control (strengths and weaknesses), and also factors that are out of controlling limits (opportunities and threats) (Hartley 2018, p. 91). This is a common tool that is utilised in industry to produce strategic analysis. Another recommendation is for GHD to consider the recruitment of risk specialists to provide expert guidance, to ensure that adequate risk management is achieved during future projects.

5.5 Stakeholder Management

As mentioned, GHD superficially identified key stakeholders, such as WC, the CoM, the golf course that the proposed pipeline route passes through, as well as utility providers, but there was no effort to try to quantify stakeholder expectations. This is an important exercise in the conceptualisation and planning stages of the project lifecycle, as early identification and assessment will ensure an appropriate stakeholder management strategy can be established for use throughout the rest of the project lifecycle. This could've been achieved by using a stakeholder Power and Interest Matrix, which allows one to understand to what extent stakeholders need to be informed, and how much effort should go into meeting this. A Power and Interest Matrix that GHD could have used (Appendix W), shows WC and the CoM as stakeholders that need to be managed closely. The strategy required to manage stakeholders closely includes a formal, structured, and scheduled consultation and engagement process (Hartley 2018, p. 158). Such an approach would have allowed GHD to follow a planned and controlled approach to engage the CoM, leading to formal acceptance of the proposed pipeline route instead of this being left as an unresolved item.

After stakeholders and their expectations are identified and quantified, such as through the above Power and Interest Matrix, stakeholder management needs to be planned in a clear and actionable manner to reach and interact with stakeholders (PMBOK 2013). This could be done by implementing a Stakeholder Management Matrix (Appendix X), which tracks who the stakeholders are, as well as their responsibilities, the information they require, their preferred format and time scheduling (Hartley 2018, p.160). Additionally, the RACI or PARIS matrices (Appendix Y) are acceptable variations to the Stakeholder Management Matrix to identify and manage stakeholders with a focus on their required input (Hartley 2018, p.161).

However, it should be noted that to manage and control stakeholder engagement, more is required than simply identifying and analysing stakeholders. To capture stakeholder management in a more formal and structured way, a Stakeholder Management Plan (SMP) could be developed and implemented (Hartley 2018, p. 162). An SMP increases support and decreases the negative impact of stakeholders throughout the project lifecycle, by describing strategies and actions to manage stakeholders as per their power and interest in the project (Forman and Discenza 2012). A good SMP addresses expected stakeholder behaviour, and classifies personalities for use by the project manager, such as champion, neutral, antagonist, stoic or ignored (Forman and Discenza 2012). An integral part of an SMP that GHD should include is a Stakeholder Communications Plan, to keep various stakeholders informed as the project passes through different stages of the project lifecycle (Forman and Discenza 2012). This will be explored further in the stakeholder communication management section below.

5.6 Communication Management

As highlighted in Section B, GHD discussed the communication process that would be taken between themselves and WC in the initial kick off meeting, covering the frequency of meetings and who communication should go through. However, GHD should have implemented a formal communication management plan that includes the other key stakeholders identified, such as the CoM, who are a critical stakeholder. A good Communications Management Plan can provide the documentation and organisation of the process, types and expectations of stakeholder communications (Sivasankari 2010). This can be developed after rigorous stakeholder analysis, such as through a SMP, to ensure that only the information stakeholders require is supplied (Sivasankari 2010).

After developing a communications management plan, GHD should have been managing all project communications. To effectively manage communications, Hartley recommends ensuring that only accurate, timely and pertinent information is communicated (Hartley 2018, p. 333). Additionally, confirming receipt of information and ensuring it's understood is critical (Hartley 2018, p. 333). To ensure effective management of communication, the Communications Process Model (Appendix Z) should be understood. This model highlights the importance of keeping in mind both the sender's and receiver's experience, ensuring the

message is received and understood despite encountering potential noise, through the encoding and decoding process towards the receiver (Failello 2019).

Additionally, GHD should've taken more care in controlling stakeholder communication, which is critical across all stages of the project lifecycle (Hartley 2018, p. 352). There were two main areas of communication barriers experienced. Firstly, different stakeholder expectations on the scope and limitations as mentioned in Section B. And secondly, changing project personnel and frequent changes in relation to the drafter leaving, which lead to 37.5 hours of rework (Appendix O). To address this, GHD should've had a formal handover process between internal drafters to ensure scope work completed and outstanding, as well as other key information was communicated. Additionally, GHD should have been providing organised and summarised information to stakeholders (Hartley 2018, p. 353). The Project Control Diagram (Appendix AA) highlights the importance of controlling stakeholder communication in line with objectives and performance (Hartley 2018, p. 353). To address this, GHD could've used communication tools such as updating work orders, change of scope requests, work instructions and statements of work completed (Hartley 2018, p. 336). Additionally, it's necessary to have project performance reports, which not only provide a summary of project progression, but also on project status (Hartley 2018, p. 344).

5.7 Quality Management

Quality control monitors specific tasks and project results to identify, measure and eliminate the causes of unsatisfactory performance, while ensuring that quality compliance is always demonstrated and achieved. (Hartley 2018, p.278).

Quality assurance and control tools can be applied during the execution stage to help ensure that project deliverables meet design requirements. GHD could've used more Quality Control Procedures (Appendix BB) to reduce the amount of error in their drawings, thus increasing adherence to existing guidelines. Specifically, flowcharts, checklists, tick sheets, audits, a PDCA (plan, do, check, act) cycle would result in the production of high-quality deliverables. The utilisation of such tools can lead to a reduction in work hours, hence decreasing the total expenditure of the project.

To ensure quality in overall project performance, it's recommended that GHD applies an internationally certified approach, such as the ISO 9000 series (Hartley 2018, p.273), for all deliverables as well as the management approach taken. Which provides stakeholders the confidence that relevant quality standards are met, through the evaluation of project performance on a regular basis.

6. Conclusion

The PB Boulevard WWPS and PM upgrade was part of WC's \$3.2 million wastewater project in North Mandurah. Following proposal submissions, GHD was selected by WC to provide the engineering and detailed design for this project. The scope of services included the increase in pumping rate at the existing WWPS and to ensure the pump noise and vibrations didn't exceed the permissible level under the Environmental Protection Regulations 1997.

Analysis of the PB project, from conceptualisation through to planning, execution and finalisation, revealed that a lack of frameworks and methodologies were employed across the project lifecycle. Section A provided the relevant information required to analyse each of these project lifecycle stages in more detail. In Section B, problems and issues that occurred in each stage of the project lifecycle were identified. These were addressed in terms of the relevant project management competencies including cost, time, scope, risk, stakeholder, communication and quality management . However, the critical issues discussed were the largely inaccurate budget and schedule forecasting, excessive scope variations and lack of consistent management and communication between stakeholders.

In Section C, relevant theories and conceptual frameworks suggested by Cosimo Faiello, Stephen Hartley and the Project Management Body of Knowledge (PMBOK), were utilised to provide effective recommendations in response to the critical issues identified. For cost and time management, considerations in Earned Value and applying an Analogous Method could greatly reduce the risk of overbudgeting. The MoSCoW Framework can be used to clarify the scope of services to avoid excessive scope variations. A formal Communication Management Plan, as well as considering the Risk Management Dilemma and SWOT analysis can improve the overall quality of the PB project deliverables.

Thorough investigation of the PB project has highlighted the insufficient application of crucial project management competencies by GHD throughout the project lifecycle. This ultimately resulted in issues regarding the design and relationship between GHD, WC and other key stakeholders. Future consideration of the recommended frameworks in addition to existing approaches will greatly benefit GHD's overall quality of services and reputation.

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8. Appendices

Appendix A: Scope of Services (Extracted from the Design Brief and Proposal).

Design Brief

The scope of the current project is to increase the pumping rate at the existing WWPS to between 100 - 110 L/s by replacement of the pumps and pumping station pipework, and by duplication of a portion of the pressure main.

A complementary requirement of this project is to (further) reduce the noise and vibration currently being experienced in the vicinity of the pumping station to below levels specified in the Environmental Protection (Noise) Regulations 1997.

Proposal

The design Scope of works from the design brief is listed below. Following review and clarification GHD have developed this into the design proposal presented in section 2 onwards. Key design elements include:

- Design the upgrade/replacement of pumps and PS pipework at Pebble Beach Blvd. WWPS, so as to be capable of delivering between 100 and 110 L/s through the upgraded.
- Design a replacement of the existing DN250 pressure main from the pumping station to a point on the existing PM near the eastern side of Oakmont Ave.
- Undertake modelling to confirm that noise and vibration from the pumps and replacement pipework will be less than the maximum permissible under applicable noise regulations.
- Review the existing electrical infrastructure at the WWPS to confirm whether it requires upgrading, and if it does, prepare a report on the upgrading required.

- Obtain adequate survey data for the purposes of designing the works.
- Confirm that the proposed DN560 Polyethene Pipe (PE) PN16 pressure main pressure main meet this and future upgrade requirements. Hydraulic modelling also to consider the retained section of existing DN250 Pressure Main under the railway to Gordon Road, to ensure that it is not adversely impacted by this upgrade to 110L/s.
- Design the pressure main alignments required along the Water Corporation recommended route and confirm this route is practicable.
- Prepare a “Prerequisites to Works” (Notice of Proposal) plan for the proposed works.
- Determine and specify the most appropriate construction methodology and design accordingly, in consultation with Corporation design, project and construction management representatives.
- Consider the constraints such as the location of launch / receival pits, radius of installation, exit and entry angles, depth, and any other relevant factors for trenchless installation.
- Investigate the and recommend potential locations of valves, as part of the replacement pressure main works, with the objective of ensuring safe access for Corporation maintenance and operation personnel.
- Assist the Corporation with the approvals process by providing inputs as necessary, namely designed alignments / levels, proposed construction methodologies and, where applicable Dewatering Management Plan (DMP). The Designer shall consider environmental impacts from the proposed works, minimising these as far as practicable to reduce approvals requirements.
- Make provision for input into the Commissioning and Decommissioning Plans for the new and existing pressure mains.
- Preparation of all tender documentation to allow the PS pumps, pipework and pressure main replacement works to proceed; including the Schedule of Prices, modular Specification with completed Appendices and Project Specific Preliminaries sections, and the Safety in Design Report.
- Attendance at progress meetings and the CCPA review, to be conducted at the Water Corporation Leederville office.

Appendix B: Quotation and Detailed Breakdown Price Schedule (Extracted from the Proposal).

| Quotation and Detailed Breakdown Price Schedule | | | | | | | | | | | | | Corporation Project Number: CS003227 Consultant's Representative: Scott Henderson Job Title: Pebble Beach Blvd WWPS and PM Upgrade | | | | | | | | | | |
|--|------------|---|------------------------|---|----------------|---|------------|---|---------|----|--------------------|----|--|----|--------|----|------------|----|---------------|------|-----------------|----------|-----------|
| Panel Contract Consultant's Job Manager: Design Stage(s): | | 4700005260 Elaine Bishop Engineering Design | | | | | | | | | | | | | | | | | | | | | |
| Job Activity | Variations | | RnR RnR DB PS | | Job Management | | Mechanical | | Geotech | | Civil & Structural | | Environment | | Survey | | Electrical | | Documentation | | Sub-contractors | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | |
| C Site investigation | | | | | | | | | | | | | | | | | | | | | | | |
| 2 Survey and service locating | | | | | | | | | | | | | | | | | | | | | | | |
| 2.01 Survey project management | LS | | | | | | | | | | | | | | | | | | | | 212.5 | 45 | 46 |
| 2.02 HSE and liaison | LS | | | | | | | | | | | | | | | | | | | | 11.5 | 0 | \$36,446 |
| 2.03 Landgate SLIP search | LS | | | | | | | | | | | | | | | | | | | | 29 | \$1,366 | \$8,281 |
| 2.04 Level and feature survey 2.4km half road | LS | | | | | | | | | | | | | | | | | | | | 50 | \$0 | \$21,342 |
| 2.05 drainage survey assume 20 pts | PS | | | | | | | | | | | | | | | | | | | | 3 | \$651 | \$6,469 |
| 2.06 underground service location and survey | PS | | | | | | | | | | | | | | | | | | | | 3 | \$404 | \$4,044 |
| 2.07 stabilisation and demolition | LS | | | | | | | | | | | | | | | | | | | | 1 | \$127 | \$12,704 |
| 2.08 survey processing | LS | | | | | | | | | | | | | | | | | | | | 75 | \$59,309 | \$9,309 |
| 2.09 Engage sub-contractor to locate services, including preparation of agreement and P2 HSE Plan, manage sub-contractor | LS | | | | | | | | | | | | | | | | | | | | 13 | \$1,611 | \$16,111 |
| 2.10 Driving production and service plan | LS | | | | | | | | | | | | | | | | | | | | 16 | \$2,032 | \$20,322 |
| 2.11 Survey dashcamment - GPS hire, vehicle hire, landgate fees | DB | | | | | | | | | | | | | | | | | | | | 10 | \$1,238 | \$12,380 |
| 3 Site investigation - refer separate breakdown | | | | | | | | | | | | | | | | | | | | | | | |
| 3.01 SJM management | LS | | | | | | | | 7 | 4 | 1 | | | | | | | | | | 96 | 45 | 47 |
| 3.02 approvals for site works | LS | | | | | | | | | | | 4 | 9 | | | | | | | | 12 | \$2,887 | \$28,877 |
| 3.03 First stage investigations | SR | | | | | | | | 1 | 4 | 40 | | | | | | | | | | 13 | \$1,887 | \$18,887 |
| 3.04 First stage provisional sums | PS | | | | | | | | 1 | 6 | | | | | | | | | | 45 | \$6,112 | \$61,112 | |
| 3.05 Analysis and reporting | LS | | | | | | | | 3 | 18 | 32 | 14 | 4 | | | | | | | 2200 | 17 | \$4,638 | |
| 3.06 (Grotec dashcamment and sub contractor costs | DB | | | | | | | | | | | | | | | | | | | | 71 | \$10,544 | \$105,444 |
| 4 Summary of site investigation conditions | | | | | | | | | | | | | | | | | | | | | 5 | \$0 | \$0 |
| 4.01 small summary of site investigations | LS | | | | | | | | | | | | | | | | | | | | 5 | \$650 | \$650 |
| D Engineering Design | | | | | | | | | | | | | | | | | | | | | 388 | 0 | 0 |
| 5 Mechanical engineering / hydraulic modelling | | | | | | | | | | | | | | | | | | | | | 70.5 | \$0 | \$0 |
| 5.01 Study valve & pump selection (with NPV) for Stage 1 single and combined PMs | LS | | | | | | | | 4 | 4 | | | | | | | | | | 9 | \$1,381 | \$13,811 | |
| 5.02 Transient analysis for Stage 1 single and combined PM | LS | | | | | | | | 0.5 | 4 | 16 | | | | | | | | | 22 | \$2,614 | \$26,142 | |
| 5.03 Study & valve pump selection (with NPV) for Stage 2 single and combined PMs | LS | | | | | | | | 3.5 | 4 | | | | | | | | | | 8 | \$1,071 | \$10,711 | |
| 5.04 Review of pump WCs on head and velocity with a system and pump selection curves showing 4 extremes | LS | | | | | | | | 1 | 2 | | | | | | | | | | 3 | \$396 | \$396 | |
| 5.05 Transient analysis for Stage 2 single and combined PM | LS | | | | | | | | 0.5 | 1 | 12 | | | | | | | | | 14 | \$1,509 | \$15,091 | |
| 5.06 Brief Transient Analysis Report | LS | | | | | | | | 0.5 | 1 | 2 | 4 | | | | | | | | 8 | \$1,105 | \$11,051 | |
| 5.07 Specs etc for valves, pumps (Stage 1 only) | LS | | | | | | | | 2 | 6 | | | | | | | | | | 8 | \$1,002 | \$10,021 | |

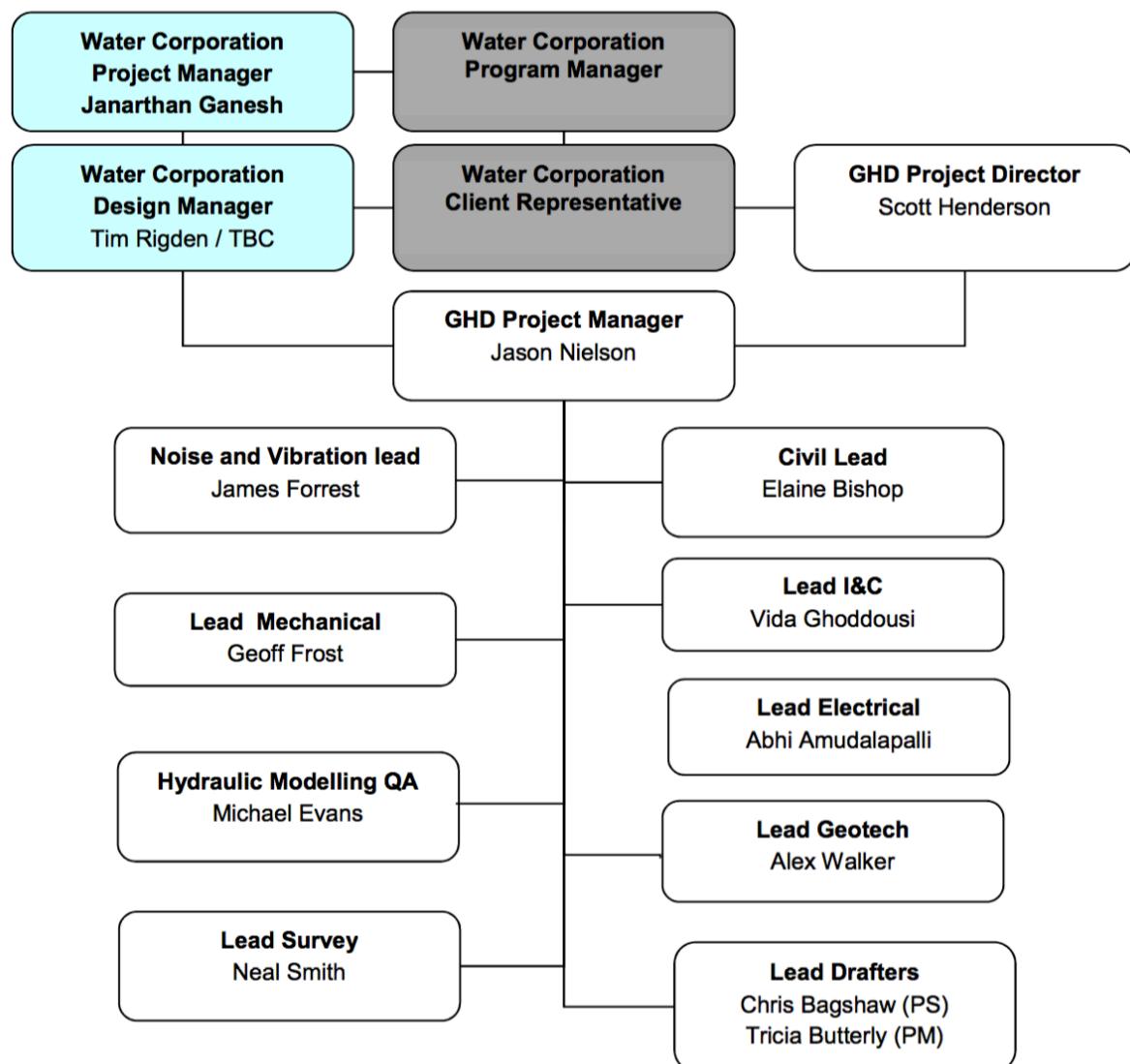
Quotation and Detailed Breakdown Price Schedule


Panel Contract
Consultant's Job Manager:
Elaine Bishop
Design Stage(s):
Engineering Design

Corporation Project Number: CS003227
Consultant's Representative: Scott Henderson
Job Title: Pebble Beach Blvd WWPS and PM Upgrad
Note: Rates and disbursements excl

| Job Activity | Variation | Rate Rev | LS | RS | DB | PS | BOM | A6 | A7 | A8 | A9 | A10 | A11 | A12 | A13 | A14 | A15 | A16 | A17 | A18 | A19 | A20 | A21 | A22 | A23 | A24 | A25 | A26 | A27 | A28 | A29 | A30 | A31 | A32 | A33 | A34 | A35 | A36 | A37 | A38 | A39 | A40 | A41 | A42 | A43 | A44 | A45 | A46 | A47 | A48 | A49 | A50 | A51 | A52 | A53 | A54 | A55 | A56 | A57 | A58 | A59 | A60 | A61 | A62 | A63 | A64 | A65 | A66 | A67 | A68 | A69 | A70 | A71 | A72 | A73 | A74 | A75 | A76 | A77 | A78 | A79 | A80 | A81 | A82 | A83 | A84 | A85 | A86 | A87 | A88 | A89 | A90 | A91 | A92 | A93 | A94 | A95 | A96 | A97 | A98 | A99 | A100 | A101 | A102 | A103 | A104 | A105 | A106 | A107 | A108 | A109 | A110 | A111 | A112 | A113 | A114 | A115 | A116 | A117 | A118 | A119 | A120 | A121 | A122 | A123 | A124 | A125 | A126 | A127 | A128 | A129 | A130 | A131 | A132 | A133 | A134 | A135 | A136 | A137 | A138 | A139 | A140 | A141 | A142 | A143 | A144 | A145 | A146 | A147 | A148 | A149 | A150 | A151 | A152 | A153 | A154 | A155 | A156 | A157 | A158 | A159 | A160 | A161 | A162 | A163 | A164 | A165 | A166 | A167 | A168 | A169 | A170 | A171 | A172 | A173 | A174 | A175 | A176 | A177 | A178 | A179 | A180 | A181 | A182 | A183 | A184 | A185 | A186 | A187 | A188 | A189 | A190 | A191 | A192 | A193 | A194 | A195 | A196 | A197 | A198 | A199 | A200 | A201 | A202 | A203 | A204 | A205 | A206 | A207 | A208 | A209 | A210 | A211 | A212 | A213 | A214 | A215 | A216 | A217 | A218 | A219 | A220 | A221 | A222 | A223 | A224 | A225 | A226 | A227 | A228 | A229 | A230 | A231 | A232 | A233 | A234 | A235 | A236 | A237 | A238 | A239 | A240 | A241 | A242 | A243 | A244 | A245 | A246 | A247 | A248 | A249 | A250 | A251 | A252 | A253 | A254 | A255 | A256 | A257 | A258 | A259 | A260 | A261 | A262 | A263 | A264 | A265 | A266 | A267 | A268 | A269 | A270 | A271 | A272 | A273 | A274 | A275 | A276 | A277 | A278 | A279 | A280 | A281 | A282 | A283 | A284 | A285 | A286 | A287 | A288 | A289 | A290 | A291 | A292 | A293 | A294 | A295 | A296 | A297 | A298 | A299 | A300 | A301 | A302 | A303 | A304 | A305 | A306 | A307 | A308 | A309 | A310 | A311 | A312 | A313 | A314 | A315 | A316 | A317 | A318 | A319 | A320 | A321 | A322 | A323 | A324 | A325 | A326 | A327 | A328 | A329 | A330 | A331 | A332 | A333 | A334 | A335 | A336 | A337 | A338 | A339 | A340 | A341 | A342 | A343 | A344 | A345 | A346 | A347 | A348 | A349 | A350 | A351 | A352 | A353 | A354 | A355 | A356 | A357 | A358 | A359 | A360 | A361 | A362 | A363 | A364 | A365 | A366 | A367 | A368 | A369 | A370 | A371 | A372 | A373 | A374 | A375 | A376 | A377 | A378 | A379 | A380 | A381 | A382 | A383 | A384 | A385 | A386 | A387 | A388 | A389 | A390 | A391 | A392 | A393 | A394 | A395 | A396 | A397 | A398 | A399 | A400 | A401 | A402 | A403 | A404 | A405 | A406 | A407 | A408 | A409 | A410 | A411 | A412 | A413 | A414 | A415 | A416 | A417 | A418 | A419 | A420 | A421 | A422 | A423 | A424 | A425 | A426 | A427 | A428 | A429 | A430 | A431 | A432 | A433 | A434 | A435 | A436 | A437 | A438 | A439 | A440 | A441 | A442 | A443 | A444 | A445 | A446 | A447 | A448 | A449 | A450 | A451 | A452 | A453 | A454 | A455 | A456 | A457 | A458 | A459 | A460 | A461 | A462 | A463 | A464 | A465 | A466 | A467 | A468 | A469 | A470 | A471 | A472 | A473 | A474 | A475 | A476 | A477 | A478 | A479 | A480 | A481 | A482 | A483 | A484 | A485 | A486 | A487 | A488 | A489 | A490 | A491 | A492 | A493 | A494 | A495 | A496 | A497 | A498 | A499 | A500 | A501 | A502 | A503 | A504 | A505 | A506 | A507 | A508 | A509 | A510 | A511 | A512 | A513 | A514 | A515 | A516 | A517 | A518 | A519 | A520 | A521 | A522 | A523 | A524 | A525 | A526 | A527 | A528 | A529 | A530 | A531 | A532 | A533 | A534 | A535 | A536 | A537 | A538 | A539 | A540 | A541 | A542 | A543 | A544 | A545 | A546 | A547 | A548 | A549 | A550 | A551 | A552 | A553 | A554 | A555 | A556 | A557 | A558 | A559 | A560 | A561 | A562 | A563 | A564 | A565 | A566 | A567 | A568 | A569 | A570 | A571 | A572 | A573 | A574 | A575 | A576 | A577 | A578 | A579 | A580 | A581 | A582 | A583 | A584 | A585 | A586 | A587 | A588 | A589 | A590 | A591 | A592 | A593 | A594 | A595 | A596 | A597 | A598 | A599 | A600 | A601 | A602 | A603 | A604 | A605 | A606 | A607 | A608 | A609 | A610 | A611 | A612 | A613 | A614 | A615 | A616 | A617 | A618 | A619 | A620 | A621 | A622 | A623 | A624 | A625 | A626 | A627 | A628 | A629 | A630 | A631 | A632 | A633 | A634 | A635 | A636 | A637 | A638 | A639 | A640 | A641 | A642 | A643 | A644 | A645 | A646 | A647 | A648 | A649 | A650 | A651 | A652 | A653 | A654 | A655 | A656 | A657 | A658 | A659 | A660 | A661 | A662 | A663 | A664 | A665 | A666 | A667 | A668 | A669 | A670 | A671 | A672 | A673 | A674 | A675 | A676 | A677 | A678 | A679 | A680 | A681 | A682 | A683 | A684 | A685 | A686 | A687 | A688 | A689 | A690 | A691 | A692 | A693 | A694 | A695 | A696 | A697 | A698 | A699 | A700 | A701 | A702 | A703 | A704 | A705 | A706 | A707 | A708 | A709 | A710 | A711 | A712 | A713 | A714 | A715 | A716 | A717 | A718 | A719 | A720 | A721 | A722 | A723 | A724 | A725 | A726 | A727 | A728 | A729 | A730 | A731 | A732 | A733 | A734 | A735 | A736 | A737 | A738 | A739 | A740 | A741 | A742 | A743 | A744 | A745 | A746 | A747 | A748 | A749 | A750 | A751 | A752 | A753 | A754 | A755 | A756 | A757 | A758 | A759 | A760 | A761 | A762 | A763 | A764 | A765 | A766 | A767 | A768 | A769 | A770 | A771 | A772 | A773 | A774 | A775 | A776 | A777 | A778 | A779 | A780 | A781 | A782 | A783 | A784 | A785 | A786 | A787 | A788 | A789 | A790 | A791 | A792 | A793 | A794 | A795 | A796 | A797 | A798 | A799 | A800 | A801 | A802 | A803 | A804 | A805 | A806 | A807 | A808 | A809 | A810 | A811 | A812 | A813 | A814 | A815 | A816 | A817 | A818 | A819 | A820 | A821 | A822 | A823 | A824 | A825 | A826 | A827 | A828 | A829 | A830 | A831 | A832 | A833 | A834 | A835 | A836 | A837 | A838 | A839 | A840 | A841 | A842 | A843 | A844 | A845 | A846 | A847 | A848 | A849 | A850 | A851 | A852 | A853 | A854 | A855 | A856 | A857 | A858 | A859 | A860 | A861 | A862 | A863 | A864 | A865 | A866 | A867 | A868 | A869 | A870 | A871 | A872 | A873 | A874 | A875 | A876 | A877 | A878 | A879 | A880 | A881 | A882 | A883 | A884 | A885 | A886 | A887 | A888 | A889 | A890 | A891 | A892 | A893 | A894 | A895 | A896 | A897 | A898 | A899 | A900 | A901 | A902 | A903 | A904 | A905 | A906 | A907 | A908 | A909 | A910 | A911 | A912 | A913 | A914 | A915 | A916 | A917 | A9 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | 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Appendix C: Organisational Structure (Extracted from the Proposal).



Appendix D: Risk Management (Extracted from the Proposal).

| Water Corporation Risk Item | GHD proposed mitigation |
|---|--|
| Delays due to approvals associated with access to golf course land and local authority reserve | Early engagement of stakeholders and provisional sum to allow for additional meeting and site inspections |
| Impacts on the local community from the proposed works | Pipe route to consider access, traffic and congestion from construction, construction methodology. Investigation works planned to minimise disruption (2 pass geotechnical proposed with truck mounted CPT following by boring where necessary) |
| Controlling noise at the pumping station | GHD acoustic specialist team will advise on suitable mitigation strategies, for both airborne and ground borne noise and vibration generation |
| Traffic management along the pressure main construction route | Investigation works planned to minimise disruption (2 pass geotechnical investigations: 1 st stage proposed with truck mounted CPT and limited boring followed by 2 nd stage targeted boring where necessary) |
| Service disruption / nuisance to the public – based on the selected construction methodology in congested residential areas | Appropriate construction method selection, application of trenchless installation to minimise congestion and traffic management in critical areas (e.g. Camden way and meadow Springs drive) |
| Linking of new pressure main to existing live main | Design to be developed and operational requirements to be reviewed at constructability review in conjunction with Water Corporation-developed flow management plan. Integrity of the existing pressure main will be considered in the hydraulic modelling to ensure pipe rating is not exceeded. |
| Overflow to the environment during the link-in works | Design to be developed and operational requirements to be reviewed at constructability review in conjunction with Water Corporation-developed flow management plan |
| Rock excavation & potential for cavernous limestone with associated groundwater intrusion | Geotechnical investigation takes a 2 pass approach to identify potential areas where ground condition may be difficult, to be reviewed with design layout and proposed construction methodologies to minimise risk. |
| Significant variation to project costs due to unexpected extent of rock and dewatering | Geotechnical investigation takes a 2 pass approach to identify potential areas where ground condition may be difficult, to be reviewed with design layout and proposed construction methodologies to minimise risk. Appropriate wording and definition in Tender documentation and SoP. |

Appendix E: Scope Variation Procedure (Extracted from the Complied Contract).

7.2 Variations

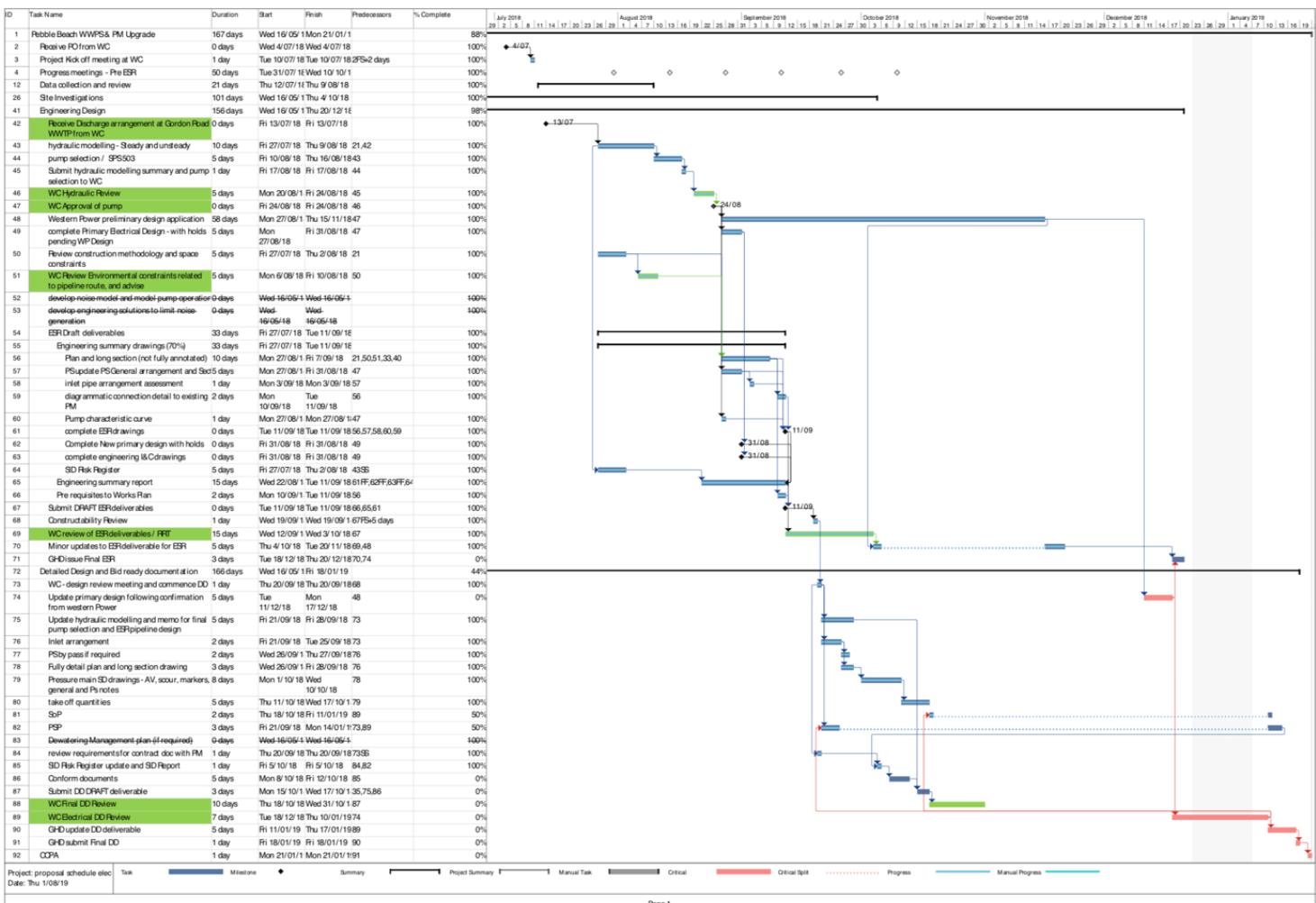
- (a) The Principal may Direct an alteration, amendment, omission, deletion, addition or other variation to the Services or any part of the Services (Variation), the Variation does not change the nature of the Contract. Any addition to the Services (Variation) given at the Direction of the Principal must be performed by the Consultant. A Variation must be given by the Principal to be effective.
- (b) The Consultant must not vary the Services without an approved Variation given by the Principal.
- (c) The Fee shall be adjusted for each Variation using the charge rates, rates or prices set out in the Contract and if those charge rates, rates or prices are not applicable, then the adjustment will be calculated by agreement between the Parties. If the Parties cannot agree on the adjustment to the Fee, the Principal, acting reasonably, will calculate the adjustment using reasonable rates and prices. The Purchase Order will also be changed as required.
- (d) A Direction to the Consultant to perform the Services in accordance with the Contract is not a Variation.
- (e) No Variation will vitiate the Contract.
- (f) If the Principal elects to omit or delete any part of the Services, it may, at its sole discretion, elect to carry that part of the Services itself or arrange for those Services to be carried out by others. The Principal is not obliged to make any payments (including any Consequential Losses) to the Consultant whatsoever for omitting or deleting any part of the Services.

Appendix F: Provisional Project Schedule (Extracted from the Proposal).

Table 6 Project schedule

| Milestone | Required Date by Brief | Scheduled Date by GHD |
|---|------------------------|-----------------------|
| Award of Project | 08/06/2018 | 18/06/2018 |
| DRAFT ESR and Preliminaries to Works Plan | 31/08/2018 | 17/08/2018 |
| WC ESR review complete | 21/09/2018 | 07/09/2018 |
| Final ESR submitted | 05/10/2018 | 17/09/2018 |
| Final Drawings, SoP and PSP submitted | 19/10/2018 | 19/10/2018 |
| Water Corporation DD review complete | 02/11/2018 | 15/10/2018 |
| Design Job finalised | 16/11/2018 | 08/11/2018 |

Appendix G: Baseline Gantt Chart.



Appendix H: Hazard Assessment (Extracted from the Risk Register).

| Public Beach Bed WWPS & PM Upgrade | | | | | | | | | | | | | Job No: CR0027 | Designer: GHD | Client: Water Corporation | | | |
|------------------------------------|-------------------------|---|---|----------------------------|-------------------------------|--------------------------------|------------------------|--|--|--|---|--------------------|-------------------------------------|-------------------------------|--------------------------------|---------------------------------------|-------------------|--|
| No | Design Life Cycle Stage | Guideword | Hazard Description | Description of Consequence | Consequence Severity (Rating) | Risk Event Likelihood (Rating) | Risk Level (Rating) | Treatment Control Type | Resolving or Risk Treatment / Mitigation Plan | Reason why next highest treatment was not used | Responsibility | By When | Decision / Status | Consequence Severity (Rating) | Risk Event Likelihood (Rating) | Risk Level (Rating) | Decision / Status | |
| | | | | | | | | | | | | | Resulted as a consequence of Design | | | | | |
| Activity | Sub-activity | Risk Short Title | Risk Description | Residual HQ Consequence | Residual L Likelihood | Risk P Risk | Risk S Risk | Action Title | Action Description | Action Assess | Due Date | Action Description | Residual HQ consequence | Residual L Likelihood | Risk P Risk | Action Status | | |
| 1 | Design | Confined Space | pump station wet well, confined space pump and internal pipe work to be replaced and can't be done by any other method. Access to wet well is difficult, wet well to be wash down by Principal prior to contractor entry. | 4 Major | C Possible | H High | Isolation | mitigation comply with water corporation confined space procedures. Double isolation to be implemented. | Risk not able to be eliminated - pump and internal pipe work can't be done by any other method. | Designer & Contractor and Water Corporation | During Design and construction. | | 4 Major | D Unlikely | H High | To be implemented during construction | | |
| 2 | Design | Electrical | Exposure during the upgrade of existing DN200 pump station. Overhead power lines in vicinity of construction works. Potential to make contact with overhead electrical services. Switch boards. | 4 Major | C Possible | H High | Isolation | Overhead power lines installed on the drawings and DWYD detailed. Pathology analysis has been completed. Work done in critical areas and results are available. The proposed solution for the upgrade involves components only and can be completed by the contractor. | Risk not able to be eliminated - excavation for pressure mains must be undertaken. | Designer and Contractor | During Design and construction. | | 4 Major | D Unlikely | H High | To be implemented during construction | | |
| 3 | Design | Excavation/Collapse/Equipment | Deep excavations for pressure sewers | 4 Major | D Unlikely | H High | Isolation | Temporary construction was proposed in some areas but rejected by Water Corporation due to potential impact on existing services. A revised plan has been developed where required to limit impact on existing services. | Risk not able to be eliminated - excavation for pump station and pressure mains must be undertaken. | Designer and Contractor | During Design and construction. | | 4 Major | E Rare | M Moderate | | | |
| 6 | Design | Fall Prevention/Working at Height/Falling Objects | Objects falling into deep pits and trenches during construction. | 4 Major | D Unlikely | H High | Engineering Control | Barriers to be provided around the excavation | Risk not able to be engineered out - cables must be open. | Contractor | During construction & Commissioning. | | 4 Major | E Rare | M Moderate | | | |
| 7 | Design | Isolation | Failure of the incoming sewer to the wet well. | 4 Major | C Possible | H High | Isolation | Double isolation possible at pump station to allow for metering and plug in later access to meter. | can not be substituted | Contractor | During construction & Commissioning. | | 4 Major | D Unlikely | H High | | | |
| 8 | Design | Isolation | Isolation of the existing DN200 pipeline for cut ins and pump station by passing by pass. | 2 Minor | C Possible | M Moderate | Isolation | Temporary connection to DN200 designed at the pump station to allow the existing DN200 pressure main to be isolated and pass by pass through the tie in point. | can not be substituted | Contractor | During construction & Commissioning. | | 2 Minor | D Unlikely | L Low | | | |
| 9 | Design | Lifting Operations/Cranage | Dumping lifting of materials, tools could come loose and hit workers and/or public. | 4 Major | D Unlikely | H High | Administrative Control | Contractor to manage lifting work in accordance with safe work methods. | can not be engineered out. | Contractor | During construction & Commissioning. | | 4 Major | E Rare | M Moderate | | | |
| 10 | Design | Road Safety and Movement of People and Materials | Dumping for the geotechnical report will require using machinery in the road reserve on the site as the public access to the site via moving vehicles during the site visit. | 3 Moderate | D Unlikely | M Moderate | Administrative Control | A traffic management plan will need to be developed to manage the risk to the public. Personnel to wear appropriate PPE and follow welding and traffic safety PSS. | Road closure or barrier installation would be disproportionate as the task involves walking on established public footpaths, as most participants do during daily commute. | Designer | During Design. | | 3 Moderate | D Unlikely | M Moderate | | | |
| 11 | Design | Road Safety and Movement of People and Materials | Worker in collision with vehicles during public maintenance activities. | 3 Moderate | D Unlikely | M Moderate | Engineering Control | Barriers are generally set in the road median or ways, excepting the areas where the public may cross the future PSS, which is in the median. | Value required can not be substituted for alternative. | Designer | During construction, commissioning and operation. | | 3 Moderate | D Unlikely | M Moderate | | | |
| 12 | Design | Access/egress, access ways, entrances/gates | Unsafe access to some areas of the site. | 2 Minor | C Possible | M Moderate | Isolation | Only access areas of the site which are required. | It is necessary to attend the site for design and geotechnical survey purposes. | Designer | During Design. | | 2 Minor | E Rare | L Low | | | |
| 13 | Design | Adjacent structures | Excavations in close proximity to houses and fencing. Risk of vibrations damaging | 4 Major | D Unlikely | H High | Isolation | Route chosen to stay away from any structures or the distance that will minimize risk to houses and fencing. | Risk not able to be engineered out -PM and GHD. | Designer | | | 4 Major | E Rare | M Moderate | | | |

Appendix I: An extracted component of the constructability review minutes.

Agenda:

Project Overview

Discussion and constructability review of each site area, Review comments and action recorded below.

Notes from constructability review and actions

Reviewed with WC on 26/09/2018 with Actions Assigned

| Area | Drg No | Rev | Title | Review & Comment | Action By: | |
|--|--------|-----|---------------|---|--|----------|
| Mandurah Wastewater – Meadow Springs Pumping Station No. 4 – Pebble Beach Blvd and PM Pressure Main | EM52 | | | <ul style="list-style-type: none"> Construction in winter for golf course, in consultation with golf course. P SUM for contractor to maintain irrigation /watering of golf course. WC enviros approved removal of tree in golf course. Definition of rock, check module. PS for importing sand for bedding and disposal of rock (excessive rock spoil) DN150 air valves. Add coordinates to AV and scour pit. Run steady state with 230 l/s with 375 GRP, 450 GRP and 560 PE to the tie in point. TBC Shuo. | GHD | |
| | 0-2 | A1 | General Works | <ul style="list-style-type: none"> Pump efficiency and power curves for both KSB and Xylem pump. Confirm minimum curve is at over flow level/modelling indicate pump cut in. | GHD as VO GHD | |
| | EM52 | 1-2 | E1 | Pressure Main Characteristic Curve | <ul style="list-style-type: none"> Pipe to go 4306 and change back to PE. **21/09/2018 discussion: realignment not required** | Complete |

Appendix J: Engineering Summary Report Table of Contents.

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Appendix K: Stakeholder Correspondence (Extracted from the Engineering Summary Report).

Appendix 3 – Stakeholder Correspondence

1. Email with City of Mandurah, re pipe route confirmation and confirmation from Water Corporation Design Manager, re elimination of Meadow Springs Golf & Country Club alternative route.
2. Email with Meadow Springs Golf & Country Club, re significant tree
3. Email from John Harris re Trees in the project area.
4. Email with City of Mandurah, confirming approval for oval crossing & lots on Oakmont.
5. Email from Steve Evans, pump selection – two pump requirement
6. Water Corporation Geotec Stage 2 not required
7. MSGCC confirmation of preferred route
8. Email FAT accumulation currently not an issue at PBBWWPS

Appendix L: Constructive feedback from GHD and WC (Extracted from the project kick off meeting minutes).

Lessons Learnt

Water Corporation:

- GHD's level of responsiveness is sometimes inadequate. GHD should advise if there is a scheduling conflict with another WC project, or other event which impacts on delivery, to allow WC to make the necessary adjustments.
- GHD's drawings sometimes lack an appropriate level of quality control. WC may reject drawings if they are found to have 5 or more 'obvious' errors.
- GHD ESR's need to be cross checked for consistency.
- GHD shall provide Design Pressure AND Field Test Pressure on all Pipe Drawings (plan and long sections)
- GHD Disbursements require a receipt.
- GHD to allow sufficient time, for WC to engage the Contractual Review Team for a preliminary discussion, ahead of GHD drafting the Specification.

GHD:

- WC often changes the construction contracting methodology late in the project, requiring GHD to separate portions and rework specifications and other docs.
- WC will need to clarify early if there is to be one set of contract documents or two, for the pump station (Mech) and pressure main (Civil).

Following the Kick-off Meeting, WC confirms, WC plans to engage one contractor to complete all civil, mech and EIC work. As such, only one set of tender documents is required.

- WC agrees that only one ESR is required for both disciplines, combined.

Appendix M: Job Variation and Provisional Sum Activation.

| Design Job Variation and Provisional Sum Activation | | IDB | | | | | | | | | | |
|--|---------------------------------|---------------------|--|--------------------------------|--------------------------|---|--|-------------------------|------------------------------|--|--|--|
| <p>This form is used to request a variation to the provisional sum fee for a design job or a conversion of provisional sum to a revised purchase order. The variation will be used to determine the purpose of the variation.</p> <p>WORK UNDER THIS VARIATION SHOULD NOT COMMENCE UNTIL A REVISED PURCHASE ORDER IS ISSUED.</p> <p>If the requested variation is larger than can be accommodated on this form, or there are attachments, the form shall be used as a cover sheet for the other documents.</p> | | | | | | | | | | | | |
| To: Scott Pan | Organisation: Water Corporation | | | | | | | | | | | |
| From: Jason Nelson | Organisation: GHD | | | | | | | | | | | |
| Date: 12/02/2019 | Number of attached sheets: 2 | Variation Number: 5 | | | | | | | | | | |
| 1 Variation Requested <table border="1"> <tr> <td>Design Job Title: ESRDD PEBBLE BEACH BV WWPS PM 110LS UPRG</td> </tr> <tr> <td>Capital Works Number: C8003227</td> <td>IDB Order Number: 815043</td> </tr> <tr> <td>Conceptual / Engineering / Detail Design Stage: Detailed Design</td> </tr> <tr> <td>Date approval is required by: 22/02/2019</td> <td>P.O. Number: 4200437765</td> </tr> <tr> <td colspan="2">Introduction and Background:</td> </tr> <tr> <td colspan="2"> <p>The following variation request reconciles disbursements and schedule of rates items, and describes Cable Slack Pits as new design elements.</p> <p>Reconcile Disbursements and Schedule of Rates Items: The attached quotation breakdown summarises a mix of cost positive and negative tasks, based on actual vendor invoices and actual schedule of rate time for work on site.</p> <p>The net value of this variation is a Water Corporation savings: (\$5,297.69)</p> <p>Cable Slack Pits and Associated Design Works It is our understanding that the Water Corporation is in the process of updating design standards to incorporate cable slack pits for all pump stations. This variation request is to facilitate the incorporation of these pits in an effort to bring the existing (Type 90) Pebble Beach Blvd WWPS in line with the proposed changes. The Water Corporation requests that GHD undertake the design and drafting of the cable slack pits. As is expected of a competent design engineer, GHD will perform design calculations, undertake design and drafting quality assurance, assess and action safety in design, update design documentation and provide a detailed design drawing for the cable slack pits. However, the development of the cable slack pits cannot be undertaken in isolation. It is necessary to review and revise the previously completed Design Drawings for Bid Readiness. At a minimum, the following elements need to be readdressed:</p> <ul style="list-style-type: none"> • Mobile Pump Branch • Odour Vent Pipework • Core Holes in Wet Well • Cable Runs in Wet Well • Electrical Routing </td> </tr> </table> | | | Design Job Title: ESRDD PEBBLE BEACH BV WWPS PM 110LS UPRG | Capital Works Number: C8003227 | IDB Order Number: 815043 | Conceptual / Engineering / Detail Design Stage: Detailed Design | Date approval is required by: 22/02/2019 | P.O. Number: 4200437765 | Introduction and Background: | | <p>The following variation request reconciles disbursements and schedule of rates items, and describes Cable Slack Pits as new design elements.</p> <p>Reconcile Disbursements and Schedule of Rates Items: The attached quotation breakdown summarises a mix of cost positive and negative tasks, based on actual vendor invoices and actual schedule of rate time for work on site.</p> <p>The net value of this variation is a Water Corporation savings: (\$5,297.69)</p> <p>Cable Slack Pits and Associated Design Works It is our understanding that the Water Corporation is in the process of updating design standards to incorporate cable slack pits for all pump stations. This variation request is to facilitate the incorporation of these pits in an effort to bring the existing (Type 90) Pebble Beach Blvd WWPS in line with the proposed changes. The Water Corporation requests that GHD undertake the design and drafting of the cable slack pits. As is expected of a competent design engineer, GHD will perform design calculations, undertake design and drafting quality assurance, assess and action safety in design, update design documentation and provide a detailed design drawing for the cable slack pits. However, the development of the cable slack pits cannot be undertaken in isolation. It is necessary to review and revise the previously completed Design Drawings for Bid Readiness. At a minimum, the following elements need to be readdressed:</p> <ul style="list-style-type: none"> • Mobile Pump Branch • Odour Vent Pipework • Core Holes in Wet Well • Cable Runs in Wet Well • Electrical Routing | |
| Design Job Title: ESRDD PEBBLE BEACH BV WWPS PM 110LS UPRG | | | | | | | | | | | | |
| Capital Works Number: C8003227 | IDB Order Number: 815043 | | | | | | | | | | | |
| Conceptual / Engineering / Detail Design Stage: Detailed Design | | | | | | | | | | | | |
| Date approval is required by: 22/02/2019 | P.O. Number: 4200437765 | | | | | | | | | | | |
| Introduction and Background: | | | | | | | | | | | | |
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| <p>Document uncontrolled when printed  Document Control: Section Manager, Water Convergence Last Review Date: 28/04/2020 Level 2 Present: Design Assets</p> | | | | | | | | | | | | |
| <p>Page 1 of 4</p> | | | | | | | | | | | | |

| Design Job Variation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|----------|--------------------|--|----------|--------------------|--|--|--|--|----|---------|--|----|---------|---------------------------------|----|-----------|----------------------------------|----|----------|---|----|--------|---|----|-----------|--|----|---------|---|----|-----------|--|----|--------|-----------------|--|-----------|---|--|--|--------------------|----|----------|--|----|----------|-----------------------------------|----|----------|--------------------------------|----|----------|-------------------------------------|----|----------|--|----|----------|---|----|----------|---|----|--------|---|----|----------|------------------------------|----|--------|-----------------------------|----|--------|---------------------------|----|--------|-----------------|--|-------------|--|--|--|
| <ul style="list-style-type: none"> • Service Water • Kerb and Bumen details • Cadastral Boundaries • Operator Access • Drawing Lists • General Notes, and • Safety in Design reporting <p>These variations must be updated in the ESR and checked for continuity to avoid being flagged during the saved check.</p> <p>The net cost to Water Corporation for new design work, and revising previously completed work, is \$19,179.00</p> <p>The Combined Value of this variation request is \$13,881.31</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Details of requested Variation and/or Provisional Sum</p> <table border="1"> <thead> <tr> <th></th> <th>Fee type</th> <th>Fee variation (\$)</th> </tr> </thead> <tbody> <tr> <td>Reconcile Disbursements and SoP Items</td> <td></td> <td></td> </tr> <tr> <td>Item 1.09 – Review HDD mythology with contractor</td> <td>LS</td> <td>-537.42</td> </tr> <tr> <td>Item 2.01 – BYD and imagery disbursement</td> <td>DB</td> <td>-125.00</td> </tr> <tr> <td>Item 4.01 – Survey disbursement</td> <td>DB</td> <td>-2,704.00</td> </tr> <tr> <td>Item 4.02 – Geotech disbursement</td> <td>DB</td> <td>2,251.62</td> </tr> <tr> <td>Item 17.01 – First stage investigations (Geotech)</td> <td>SR</td> <td>170.00</td> </tr> <tr> <td>Item 19.01 – Traffic Management for Geotech</td> <td>DB</td> <td>-1,823.94</td> </tr> <tr> <td>Item 19.02 – Service Locating (Agree)</td> <td>DB</td> <td>-981.69</td> </tr> <tr> <td>Item 19.03 – Service Locating (Cable Locates)</td> <td>DB</td> <td>-1,814.76</td> </tr> <tr> <td>Item 20.01 – Service Locating (management and supervision)</td> <td>SR</td> <td>267.50</td> </tr> <tr> <td>SUBTOTAL</td> <td></td> <td>-5,297.69</td> </tr> <tr> <td>Cable Slack Pits and Associated Design Works</td> <td></td> <td></td> </tr> <tr> <td>Project Management</td> <td>LS</td> <td>1,390.00</td> </tr> <tr> <td>Conceptual Arrangement including options</td> <td>LS</td> <td>1,105.00</td> </tr> <tr> <td>New Drawing - Retaining Structure</td> <td>LS</td> <td>3,223.75</td> </tr> <tr> <td>New Drawing - Cable Slack Pits</td> <td>SR</td> <td>3,087.75</td> </tr> <tr> <td>New Drawing - Guardrail and Details</td> <td>LS</td> <td>3,087.75</td> </tr> <tr> <td>Update Civil Drawings - assume 4, but check all drawings</td> <td>LS</td> <td>2,054.75</td> </tr> <tr> <td>Update Electrical Drawings - UX and Cable Runs (x2)</td> <td>LS</td> <td>1,781.75</td> </tr> <tr> <td>Update Drawing - Pump Cable Lanyard Detail (x1)</td> <td>LS</td> <td>825.25</td> </tr> <tr> <td>Updated and resubmit ESR including appendices</td> <td>LS</td> <td>1,578.50</td> </tr> <tr> <td>Review and Update SoP</td> <td>LS</td> <td>420.50</td> </tr> <tr> <td>Update Design Specification</td> <td>LS</td> <td>312.00</td> </tr> <tr> <td>Update Schedule of Prices</td> <td>LS</td> <td>312.00</td> </tr> <tr> <td>SUBTOTAL</td> <td></td> <td>\$19,179.00</td> </tr> <tr> <td colspan="3"> <p>Total fee variation (\$): 13,881.31</p> <p>NOTE: A revised Price Schedule must be attached to this Variation</p> </td> </tr> </tbody> </table> | | | | Fee type | Fee variation (\$) | Reconcile Disbursements and SoP Items | | | Item 1.09 – Review HDD mythology with contractor | LS | -537.42 | Item 2.01 – BYD and imagery disbursement | DB | -125.00 | Item 4.01 – Survey disbursement | DB | -2,704.00 | Item 4.02 – Geotech disbursement | DB | 2,251.62 | Item 17.01 – First stage investigations (Geotech) | SR | 170.00 | Item 19.01 – Traffic Management for Geotech | DB | -1,823.94 | Item 19.02 – Service Locating (Agree) | DB | -981.69 | Item 19.03 – Service Locating (Cable Locates) | DB | -1,814.76 | Item 20.01 – Service Locating (management and supervision) | SR | 267.50 | SUBTOTAL | | -5,297.69 | Cable Slack Pits and Associated Design Works | | | Project Management | LS | 1,390.00 | Conceptual Arrangement including options | LS | 1,105.00 | New Drawing - Retaining Structure | LS | 3,223.75 | New Drawing - Cable Slack Pits | SR | 3,087.75 | New Drawing - Guardrail and Details | LS | 3,087.75 | Update Civil Drawings - assume 4, but check all drawings | LS | 2,054.75 | Update Electrical Drawings - UX and Cable Runs (x2) | LS | 1,781.75 | Update Drawing - Pump Cable Lanyard Detail (x1) | LS | 825.25 | Updated and resubmit ESR including appendices | LS | 1,578.50 | Review and Update SoP | LS | 420.50 | Update Design Specification | LS | 312.00 | Update Schedule of Prices | LS | 312.00 | SUBTOTAL | | \$19,179.00 | <p>Total fee variation (\$): 13,881.31</p> <p>NOTE: A revised Price Schedule must be attached to this Variation</p> | | |
| | Fee type | Fee variation (\$) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Reconcile Disbursements and SoP Items | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Item 1.09 – Review HDD mythology with contractor | LS | -537.42 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Item 2.01 – BYD and imagery disbursement | DB | -125.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Item 4.01 – Survey disbursement | DB | -2,704.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Item 4.02 – Geotech disbursement | DB | 2,251.62 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Item 17.01 – First stage investigations (Geotech) | SR | 170.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Item 19.01 – Traffic Management for Geotech | DB | -1,823.94 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Item 19.02 – Service Locating (Agree) | DB | -981.69 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Item 19.03 – Service Locating (Cable Locates) | DB | -1,814.76 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Item 20.01 – Service Locating (management and supervision) | SR | 267.50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SUBTOTAL | | -5,297.69 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cable Slack Pits and Associated Design Works | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Project Management | LS | 1,390.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conceptual Arrangement including options | LS | 1,105.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| New Drawing - Retaining Structure | LS | 3,223.75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| New Drawing - Cable Slack Pits | SR | 3,087.75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| New Drawing - Guardrail and Details | LS | 3,087.75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Update Civil Drawings - assume 4, but check all drawings | LS | 2,054.75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Update Electrical Drawings - UX and Cable Runs (x2) | LS | 1,781.75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Update Drawing - Pump Cable Lanyard Detail (x1) | LS | 825.25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Updated and resubmit ESR including appendices | LS | 1,578.50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Review and Update SoP | LS | 420.50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Update Design Specification | LS | 312.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Update Schedule of Prices | LS | 312.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SUBTOTAL | | \$19,179.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Total fee variation (\$): 13,881.31</p> <p>NOTE: A revised Price Schedule must be attached to this Variation</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Document uncontrolled when printed</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Page 2 of 4</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Design Job Variation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|----------|----------------|--------------------|----------|----------------|---|--|--|--|--|--|--|--|--|--|--|--|-------------------------------|--|--|--|--|--|-------------------------------|--|--|----------|--|--|
| <p>Current approved completion date: 18/01/2019</p> <p>Revised completion date: 09/03/2019</p> <p>Current approved fee (\$): 207,454</p> <p>Requested fee variation (\$): 13,881.31</p> <p>Revised fee total (\$): 221,335.31</p> <p>Submitted by: Scott Henderson Name: Signature: Date: 21/02/2019</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>2 Assessment and Recommendation (To be completed by the Design Manager)</p> <table border="1"> <thead> <tr> <th>Variation category</th> <th>Comments</th> <th>% of variation</th> </tr> </thead> <tbody> <tr> <td>1: Scope/Design change requested by Service Delivery Representative</td> <td></td> <td></td> </tr> <tr> <td>2: Scope/Design change requested by Design Manager</td> <td></td> <td></td> </tr> <tr> <td>3: Design change recommended by Designer</td> <td></td> <td></td> </tr> <tr> <td>4: Time variation, no change in scope or budget.</td> <td></td> <td></td> </tr> <tr> <td>5: Unanticipated design issue</td> <td></td> <td></td> </tr> <tr> <td>6: Rework (include comment on reason for rework)</td> <td></td> <td></td> </tr> <tr> <td>7: Inadequate design briefing</td> <td></td> <td></td> </tr> <tr> <td>8: Other</td> <td></td> <td></td> </tr> </tbody> </table> | | | Variation category | Comments | % of variation | 1: Scope/Design change requested by Service Delivery Representative | | | 2: Scope/Design change requested by Design Manager | | | 3: Design change recommended by Designer | | | 4: Time variation, no change in scope or budget. | | | 5: Unanticipated design issue | | | 6: Rework (include comment on reason for rework) | | | 7: Inadequate design briefing | | | 8: Other | | |
| Variation category | Comments | % of variation | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1: Scope/Design change requested by Service Delivery Representative | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2: Scope/Design change requested by Design Manager | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3: Design change recommended by Designer | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4: Time variation, no change in scope or budget. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5: Unanticipated design issue | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6: Rework (include comment on reason for rework) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7: Inadequate design briefing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8: Other | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Recommendation: Approve Variation Item(s): <input type="checkbox"/> Fee variation (\$): <input type="text"/> Reject Variation Item(s): <input type="checkbox"/></p> <p>Comments: <input type="text"/></p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Recommended by: Name: Signature: Date: <input type="text"/></p> <p>Design Manager to send original of this form to Client's Representative for endorsement then to Project Manager for review</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>3 Endorsement (Endorsement of the recommendation to be completed by the Client's Representative)</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Decision: Agree / Disagree: <input type="checkbox"/></p> <p>Endorsed by: Name: Signature: Date: <input type="text"/></p> <p>Document uncontrolled when printed</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Page 3 of 4</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Appendix N: Cost Estimate (Extracted from the Design Brief).

4.13 Cost Estimate

A Capital and Operating Costs Estimate to an accuracy of +20% / -5% is required.

All estimates shall be prepared in accordance with the Corporation's approved format and template structure. The appropriate and most up to date template shall be obtained from the Estimating Section in Project Management Branch. The estimate template shall be modified to reflect the scope of works and populated accordingly.

Quantities, unit rates, base and outturn dates, location/contingency percentages, and quantity/rate references are to be inserted against all identified line items.

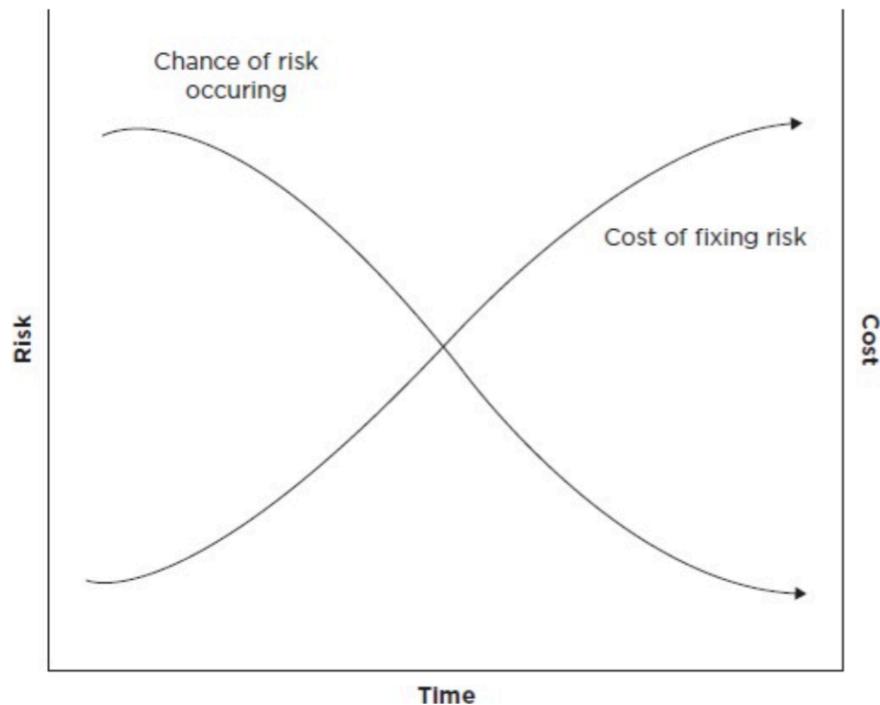
(Note: the estimate template is also to be used as the basis of the tender schedule (at the time of tendering), updated at the appropriate time to reflect detailed design).

The estimate shall also include cash flows and project timelines.

Appendix O: The key parameters that contributed to cost variations (Adapted from GHD's Approval to Exceed Project Budget).

| Item | Causes | Amount |
|------------------------------|--|------------------|
| 1 | The client was offered a 7.5% discount on lump sum items at the time of proposal submission. | \$11,110 |
| 2 | Old rates were utilised to estimate the scheduled rates for the survey team. | \$3060 |
| 3 | An additional 37.5 working hours were required due to an error in the pipe diameter design. | \$4465 |
| 4 | Conflicting expectations on the scope of services between WC and GHD. | \$18,929 |
| 5 | There was a variation in the estimated project hours by 147 hours. | \$ 22,932 |
| Cost variation (21%): | | \$60,496 |
| Final cost: | | \$349,084 |

Appendix P: The Risk Management Dilemma (Hartley 2018, p.379).



Appendix Q: Outcomes from Bid Clarification Meeting (Extracted from Proposal).

Pipe Route: the pipe route provided in the design brief has been selected by Water Corporation, the detailed alignment of the pipe will require development during the design process based on services location, significant trees and City of Mandurah (CoM) preferences to maintain native trees, constructability and construction methodology to limit the risk issues as highlighted in the design brief and outlined in the Executive Summary above.

Appendix R: Stage 3 Stakeholder Management Assumption (Extracted from the Engineering Summary Report).

By the commencement of Stage 3 it is anticipated that feedback from key stakeholders will have been received; construction issues will have been identified, survey and service locating data will be assimilated and incorporated and all this data will be incorporated into the design drawings and the alignment and long sections developed. The plan and long section will not be fully detailed at this stage but will include sufficient information to identify critical risk areas, to show the location of air and scour points, and to include schematic connection details for the connection points to existing pressure main to Gordon Road WWTP site and the future connection to the Future Type 270 pump station adjacent to the existing PS site.

Appendix S: Unresolved Items (Extracted from the Engineering Summary Report).

Unresolved Items

The following need to be resolved and most can be addressed during the constructability and operability review prior to commencing detail design.

- Environmental issues relating to trees along the pipeline route are to be advised by Water Corporation.
- The City of Mandurah have indicated that the pipeline route is acceptable to them verbally (and this has been confirmed by return email), however, no formal approval has been received. This has been discussed with the design manager and the Pre-Requisites process will be used to capture formal approval.
- Flow Management Plan – tie-ins need to be developed for the project and are not within GHD scope
- Availability of RCR to carry out work is required to be assessed, keeping in view that RCR has gone into administration.
- Noise modelling and further monitoring may be required if the vibration mitigation measures proposed to be implemented under this project do not resolve the issues.

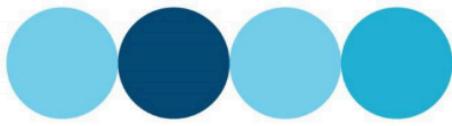
Appendix T: Sewage Pump Quality Management System (Extracted from the Engineering Summary Report).

1.3.29 Quality System

A management system that establishes, documents, implements and maintains organizational structures, resources, responsibilities, processes and procedures for the manufacture of Product and provision of Product related services in accordance with the requirements of AS/NZS ISO 9001.

Appendix U: Notice of Water Corporation and GHD's upcoming Geotechnical Work.

Water Corporation Upcoming geotechnical work Meadow Springs - August 2018



What is happening in your area?

Our authorised contractor, GHD, will soon start geotechnical work in Meadow Springs to investigate ground conditions for a future wastewater pipeline route. This pipeline is required to increase the capacity of the wastewater network to cater for population growth in the area.

You are receiving this notification as a resident, owner or property manager of a property in this work area.

When?

Work will begin from Monday 20 August 2018 and be complete by Monday 27 August 2018. Work will be carried out between 7am and 5.30pm as endorsed by the City of Mandurah.

This investigative work is required to determine the most suitable design and construction method for the new wastewater pipeline route. Please note this project is in the planning phase and residents will be informed as the project progresses.

How will this impact me?

Residents may notice an increase in noise and activity in the area during work hours.

Temporary traffic management will be in place as required to direct vehicles, pedestrians and cyclists safely around the work area.

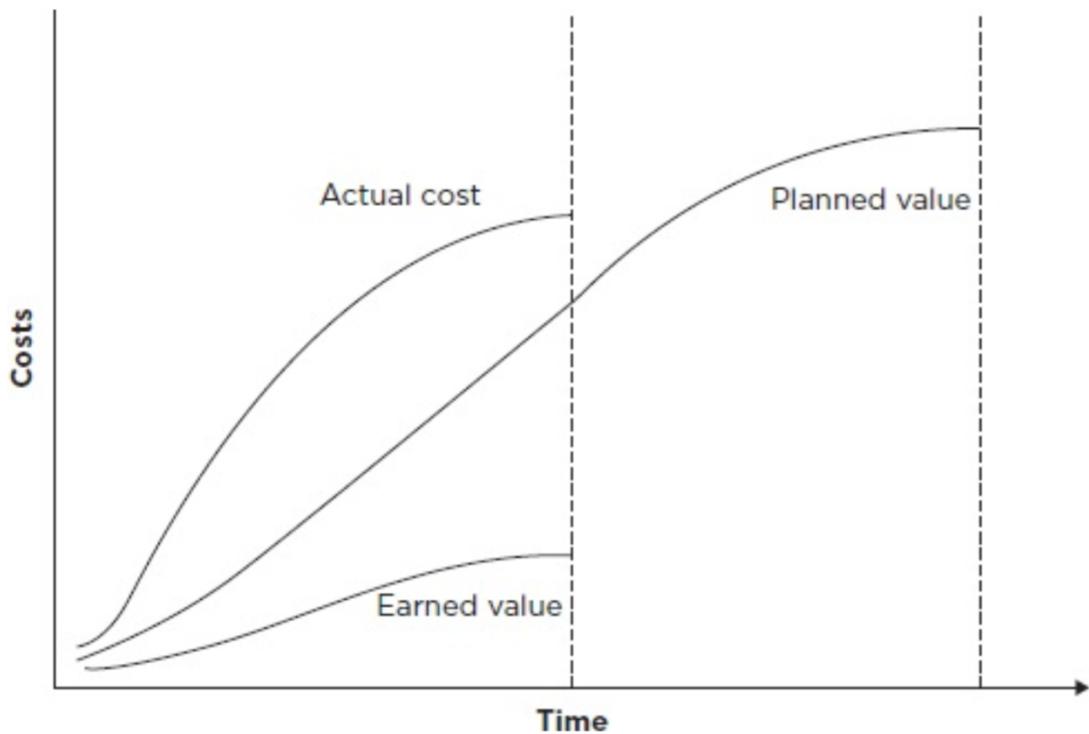
We thank you for your understanding and cooperation while this important work takes place.

Who can I contact?

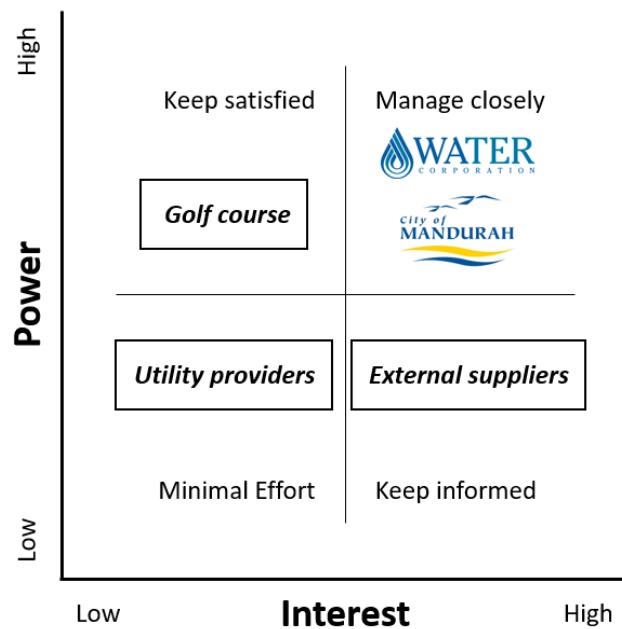
- Water Corporation Project Manager, Janarthan Ganesh on (08) 9420 2178 or Janarthan.Ganesh@watercorporation.com.au
- Water Corporation Community Engagement Advisor, Chantelle Blight on (08) 9420 2057 or Chantelle.Blight@watercorporation.com.au

Faults, emergencies and security – 13 13 75 (24 hours)

Appendix V: Planned value, earned value and actual costs (Hartley 2018, p.255).



Appendix W: Power and Interest Matrix.



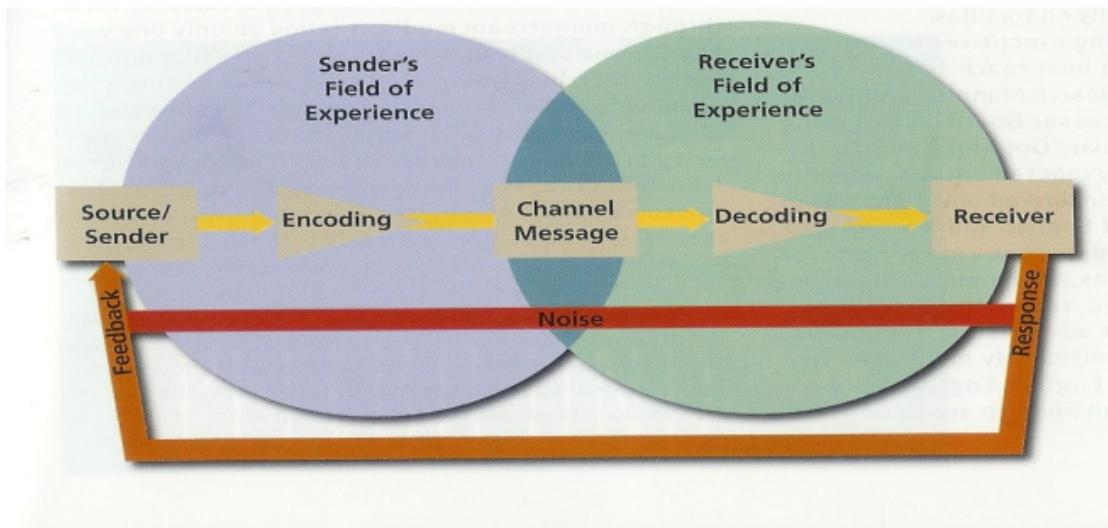
Appendix X: Stakeholder Management Matrix (Hartley 2018, p.160).

| Stakeholder Responsibilities | | Information required | Format | Frequency | Who |
|------------------------------|--|---|-------------------------------------|-----------|----------------------------|
| Sponsor | Determine the overall business objective | <ul style="list-style-type: none"> ■ Schedule delivery ■ Budget ■ Expenditure ■ Priority status | Meeting | Monthly | Project manager |
| Project manager | Manage project performance | <ul style="list-style-type: none"> ■ Cost overruns ■ Delays ■ Team issues | Meeting | Weekly | Team SME |
| SMEs | Design and installation | <ul style="list-style-type: none"> ■ Technical performance issues | Walkthroughs | Daily | Project manager |
| Contracts manager | Contract administration | <ul style="list-style-type: none"> ■ Performance breach ■ Variations | Meeting | Monthly | Project manager |
| Quality manager | Quality assurance | <ul style="list-style-type: none"> ■ Inspection data ■ Defect lists ■ Replacement details | Inspection test results and reports | Weekly | Project manager Auditor |

Appendix Y: RACI or PARIS Matrices (Hartley 2018, p.161).

- **Responsible** (nominate the stakeholder charged with doing the required activities)
- **Approve** (nominate the stakeholder who needs to approve all decisions)
- **Consult** (nominate the stakeholder who needs to be consulted prior, during or after an action)
- **Inform** (nominate the stakeholder who needs to be kept informed of progressive actions).
- **Participate** (nominate the stakeholder charged with doing the required activities)
- **Approve** (nominate the stakeholder who needs to approve all decisions)
- **Review** (nominate the stakeholder charged with conducting the review)
- **Inform** (nominate the stakeholder who needs to be kept informed of progressive actions)
- **Signoff** (nominate the stakeholder who provides official signoff).

Appendix Z: Communications Process Model (Belch & Belch 2004).



Appendix AA: Project Control Diagram (Hartley 2018, p.353).



Appendix BB: Quality Control Procedures (Hartley 2018, p.276,277,278).

| Brainstorming | Group participation in generating ideas |
|---------------------------|--|
| Control charts | Setting upper and lower limits to determine a stable or predictable pattern of performance |
| Flowcharts | Sequential display of steps and their branching possibilities |
| As-Is diagram | Mapping the ‘current state’ of a process |
| Pareto chart | Graphical representation of the vital few sources responsible for causing most of the effects |
| Cause and effect diagram | Narrowing down possible causes to the main cause (primary, secondary and tertiary causes) |
| Force field analysis | Identifying reasons for and against a change |
| Five ‘whys’ | Asking ‘why’ five times to uncover the main cause |
| Histograms | Simple bar charts showing dispersion rate, central tendency and the shape of a statistical distribution |
| Scatter diagrams | Correlation charts explaining a change in the dependent variable as observed by a change in the corresponding independent variable |
| PDCA cycle | An iterative four-step management method (plan–do–check–act) for the control and continuous improvement of processes and products |
| Affinity diagrams | A mind-mapping process creating structure around an issue |
| Tree diagrams | Visualising parent–child relationships in any decomposed hierarchy |
| Prioritisation matrix | Prioritised and weighted criteria to obtain mathematical scores and option ranking |
| Network diagrams | Precedent (logic) diagrams showing activity sequencing |
| Data flow diagram | A graphic overview of the flow of data or a process through a system |
| Tick sheet | A structured method of capturing data by making marks (checks) |
| Circling | Sharpening problem definition by circling key words |
| Interrelationship digraph | Maps moderately complex scenarios possessing intertwined logical relationships |
| Pie charts | Circular graphs depicting percentage slices of the whole 100 per cent |
| Checklists | A component specific set of required steps |
| Statistical sampling | Choosing a random part of a population for inspection |
| Benchmarking | Comparisons with comparable projects to identify best practice; a basis for measuring performance and generating ideas for improvement |
| Design of experiments | Statistical method for identifying factors influencing specific product or process variables |
| Meetings | Opportunity to discuss, review and amend information |
| Audits | Structured and independent process to assess compliance |
| Change requests | Provision for full consideration of proposed changes, for taking corrective action, preventative action or to perform defect repairs |
| Inspection | Onsite, physical compliance check |
| Lessons learned logs | Historical database of variance causes, corrective action and other lessons |

Appendix CC: Group Churros - Agenda, Minutes, Gantt Chart (Attached)

MEETING MINUTES #1 – GENG5505 Group Churros

Date: 29/07/2019

Time: 4:00pm – 5:00pm

Location: : Science Library, Group Study Room 2

In Attendance: Sophia Li, Yi Wei Leong, Rohan Patel, Adarsh Ravi, Hiruni Kellapatha

AGENDA

| Agenda Items | Desired Outcome | Time Allocated |
|--|---|----------------|
| Introductions Read over the group report outline and decide on a method of approach to the first allocated task | All group members are clear of their responsibilities and what is expected of them prior to the next meeting. | 60 minutes |

Total meeting time: 60 minutes

MEETING NOTES

- Reflection: ongoing progress of the project/ meeting summaries
 - ✓ Introductions
Sophia Li - Civil Engineering
Yi Wei Leong - Civil Engineering
Rohan Patel - Civil Engineering
Adarsh Ravi - Mechanical Engineering
Hiruni Kellapatha - Civil Engineering
 - ✓ For the one-page summary to be submitted on the 9th of August, the group is expected to list five potential projects that could be used for the group report with a project background/ scope of their first preference. The one-page summary must also include brief answers to the provided questions regarding group work.
 - ✓ Prior to the next meeting (scheduled for the 1st of August), each group member is required to reach out to either personal contacts from the industry or other corporations that are engaged in insightful projects. Following are potential corporations each group member could reach out to;
Sophia Li – WSP, MRWA
Yi Wei - WGA
Rohan Patel – CPB, MRWA
Adarsh Ravi – PACT
Hiruni Kellapatha – GHD, WGA
 - ✓ Check whether these corporations are happy to provide permission/ access to relevant documents. Gain a general idea of the project scope, the completion date and associated successes and complications. Report back findings at the next meeting.

- Progression of Agenda Items:

| Agenda Items | Progress/ Notes |
|---|-----------------|
| Introductions | Completed |
| Read over the group report outline and decide on a method of approach to the first allocated task | Completed |

- Task Allocation:

| | |
|-------------------|----------------------|
| Yi Wei Leong | ➤ Contact WGA |
| Sophia Li | ➤ Contact WSP & MRWA |
| Hiruni Kellapatha | ➤ Contact GHD & WGA |
| Rohan Patel | ➤ Contact CPB & MRWA |
| Adarsh Ravi | ➤ Contact PACT |

ACTIONABLE ITEMS

| Item | Allocated Group Member/s | Deadline |
|------------------------------|--------------------------|---------------------------|
| Finding 5 potential projects | Everyone | 1 st of August |

Group Performance Summary #1

Meeting 1 - Kick Off Meeting

1. Objective of Meeting:

- a. The first meeting highlighted the characteristics of the forming stage of team development.
- b. This included introductions to break the ice, gain a common understanding in terms of team goals and roles of each member.
- c. The main objectives of this meeting were to build a common goal, clarify roles and responsibilities, understand personal expectations and assess and acknowledge individual capability.

2. Success of Meeting:

- a. This meeting covered all aspects required for team members to begin researching.

3. Issues from Meeting:

- a. One aspect of the meeting that could've been handled better was understanding that not everyone knew each other to the same extent, as some group members were great friends while others did not know everyone.
- b. To facilitate the forming stage of team development better this should've been considered. The team should have done more to respect different personalities and make sure that everyone felt welcome as some team members are more introverted than others.
- c. Thus, to make the next meeting more effective, all team members should actively work to make everyone feel included and welcome.

MEETING MINUTES #2 – GENG5505 Group Churros

Date: 01/08/2019

Time: 9:00am – 12:30am

Location: Science Library, Group Study Room 7

In Attendance: Sophia Li, Yi Wei Leong, Rohan Patel, Adarsh Ravi, Hiruni Kellapatha

AGENDA

| Agenda Items | Desired Outcome | Time Allocated |
|---|---|----------------|
| Analysis of the five chosen projects. Choose a project to proceed with for the group report. | Clear idea of task allocation for the one page summary (expected to be submitted by the 9 th of August). | 3.5 hours |

Total meeting time: 180 minutes

MEETING NOTES

- Reflection: ongoing progress of the project/ group formation

The following list contains the project recommendations by each group member for the report;

Rohan - MRWA & CPB: Northlink 3

Hiruni - Water Corporation & GHD: Pebble Beach Bvd WWPS & PM Upgrade

Sophia - MRWA: Mitchell Freeway Southbound Widening from Cedric to Vincent Street

Yi - WGA: Westfield Carousel Development

Adarsh - PACT Construction: Belmont Community Centre

- Following are the five projects listed in order of preference;

1. Water Corporation & GHD: Pebble Beach Bvd WWPS & PM Upgrade

2. MRWA & CPB: Northlink 3

3. PACT Construction: Belmont Community Centre

4. WGA: Westfield Carousel Development

5. MRWA: Mitchell Freeway Southbound Widening from Cedric to Vincent Street

The project matrix presented below was utilised when ranking the five projects in order of preference. It takes into consideration of factors such as; the information accessible, potential improvements, successes, difficulties/ challenges faced and environmental/ social impacts. As Water Corporation & GHD's Pebble Beach Bvd WWPS & PM Upgrade project reflected the highest weighting, it was chosen as our first preference.

Project Matrix

| | | Project | | | | |
|-----------------|---------------------------------|----------|--------|--------|----------|--------|
| | | WGA/MRWA | WC/GHD | MRWA | MRWA/CPB | PACT |
| Characteristics | Project information accessible | 4 | 5 | 4 | 3 | 2 |
| | Project potential improvements | 3 | 3 | 2 | 4 | 2 |
| | Project difficulties/challenges | 2 | 3 | 2 | 4 | 1 |
| | Project sustainability | 3 | 4 | 2 | 2 | 4 |
| | Project environmental impact | 3 | 4 | 2 | 1 | 4 |
| | Project social impact | 2 | 4 | 3 | 4 | 4 |
| | Project successes | 2 | 4 | 3 | 3 | 3 |
| | % Score/35 | 54.29% | 77.14% | 51.43% | 60.00% | 57.14% |
| Rank | | 4 | 1 | 5 | 2 | 3 |

| Key | |
|-----------|---|
| Very good | 5 |
| Good | 4 |
| Average | 3 |
| Poor | 2 |
| Very poor | 1 |

- Progression of Agenda Items

| Agenda Items | Progress/ Notes |
|--|-----------------|
| Analysis of the five chosen projects. | Completed |
| Choose the project to proceed with for the group report. | Completed |

- Task Allocation

| | |
|-------------------|--|
| Yi Wei Leong | ➤ Commence creating the gantt chart to be included in the final group report. |
| Sophia Li | ➤ Edit the summary after all the information is filled out. |
| Hiruni Kellapatha | ➤ Contact GHD to obtain relevant documents. ➤ Write the project summary with the information provided by GHD. |
| Rohan Patel | ➤ Answer the questions that are required for the summary. |
| Adarsh Ravi | ➤ Create the format for the submission document. ➤ Finalise and submit the summary once completed. |

ACTIONABLE ITEMS

| Item | Allocated Group Member/s | Deadline |
|------------------|--------------------------|---|
| One page summary | Everyone | Submit by the 5 th of August |

Group Performance Summary #2

Meeting 2

Objective of Meeting:

- a. The second meeting was essentially the storming stage of team development.
- b. The objective of this meeting was to finalise a decision on which project the team would be analysing.

2. Success of Meeting:

- a. While a final decision was eventually made, the success of how the meeting was run was questionable as it was a tedious and long process, that likely was unnecessarily drawn out.

3. Issues from Meeting:

- a. While the different personalities were noted in the previous meeting, not enough action was taken to integrate this into how the team acted in the meeting.
- b. Due to these differences in personality, there were both role and leadership clashes.
- c. After analysing the five project recommendations, we had difficulties in deciding on the preferred project to proceed with for the group report. The method we applied to overcome this problem was to utilise a project matrix to rank the five projects in order of preference. It took into consideration the accessibility of information, potential improvements, successes, difficulties and environmental and social impacts. This allowed the team to make an unbiased decision.
- d. To make the next meeting more effective, the team decided to practise open communication where everyone has a valid opinion, which enables issues, differences and conflict to be discussed and resolved as they arise.

MEETING MINUTES #3 – GENG5505 Group Churros

Date: 08/08/2019

Time: 9:00am – 10:00am

Location: Ezone lvl 1, conference room

In Attendance: Sophia Li, Yi Wei Leong, Rohan Patel, Adarsh Ravi, Hiruni Kellapatha

AGENDA

| Agenda Items | Desired Outcome | Time Allocated |
|---|---|----------------|
| Analysis of the information/documents obtained from GHD in regards to the Pebble Beach project. | The team is to categorise the obtained information into the four stages of the project lifecycle (conceptualisation, planning, execution and finalisation). | 60 minutes |

Total meeting time: 60 minutes

MEETING NOTES

- Reflection: ongoing progress of the project/ meeting summaries

Following are the allocated items for each stage of the project life cycle. These still need to be confirmed prior to commencing section A and B of the written group report.

| | |
|---|---|
| <u>Stage 1: Conceptualisation</u> ➤ Proposal ➤ Design Brief ➤ Safety in Design Report ➤ Engineering Summary Report ➤ Design Hazard Register ➤ Health Check ➤ Meeting Minutes – Kick off ➤ Compiled Contract ➤ Constructability Minutes ➤ Engineering Summary Report (ESR) ➤ JSEA ➤ Proposal Schedule ➤ External Supplied documents | <u>Stage 2: Planning</u> ➤ Drawing Checklist ➤ Relevant Gantt Charts ➤ Review responses for the Engineering/ Detailed Design Documents from Water Corporation ➤ Outstanding Issues Register ➤ ESR Drawings Design ➤ Price Schedule (quotation and detailed breakdown) |
| <u>Stage 3: Execution</u> ➤ Schedule ➤ Relevant Purchase Orders ➤ Approval to exceed Project Budget ➤ Design Job Variation and Provisional Sum Activation Form ➤ Price Schedule | <u>Stage 4: Finalisation</u> ➤ Evaluation ➤ Performance Evaluation of Subconsultants and Subcontractors |

This list still needs to be confirmed against the following lecture slide (Failello, 2019);

| Concept outputs | Planning outputs | Execution outputs | Finalization outputs |
|--|---|---|--|
| <ul style="list-style-type: none"> > Client brief > Business case > Feasibility study > Risk assessment > Scope documentation > Stakeholder analysis > Budget forecasts > Procedures & policies > Meeting minutes <p>Approvals</p> | <ul style="list-style-type: none"> > Stage, task & milestone detail – including duration, sequencing & resources > Revised timelines (PERT/Gantt) > Revised cash flows & budgets > Resource matrix > Baseline project schedule <p>Approvals</p> | <ul style="list-style-type: none"> > Performance standards > Inspection & monitoring /testing plan > Purchase orders > Performance reports > Change of scope request > Progress claims > Corrective action > Contracts > Revised schedules <p>Approvals</p> | <ul style="list-style-type: none"> > Handover > Acceptance testing > Project audit > Completion checklist > Feedback & evaluation <p>Approvals</p> |



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- Progression of Agenda Items

| Agenda Items | Progress/ Notes |
|---|-----------------|
| Analysis of the information/documents obtained from GHD in regards to the Pebble Beach project. | Completed |

- Task Allocation

| | |
|-------------------|--|
| Yi Wei Leong | <ul style="list-style-type: none"> > Confirm the documents categorised under the conceptualisation stage. |
| Sophia Li | <ul style="list-style-type: none"> > Confirm the documents categorised under the planning stage. |
| Hiruni Kellapatha | <ul style="list-style-type: none"> > Identify documents that are required but are yet to be provided by GHD. Try set up a meeting with the Project Manager of the project. |
| Rohan Patel | <ul style="list-style-type: none"> > Confirm the documents categorised under the execution stage. |
| Adarsh Ravi | <ul style="list-style-type: none"> > Confirm the documents categorised under the finalisation stage. |

ACTIONABLE ITEMS

| Item | Allocated Group Member/s | Deadline |
|---|--------------------------|----------------------------|
| Confirm the information allocated to each of the stages in the project lifecycle. | Everyone | 19 th of August |
| Identify any documents that are required for the analysis but not yet received. | Everyone | 19 th of August |

Group Performance Summary #3

Meeting 3

1. Objective of Meeting:

- a. This meeting remained in the storming stage of team development with an evident improvement in open communication from the last meeting.

2. Success of Meeting:

- a. The objectives of the meeting were thoroughly achieved as we analysed the information obtained from GHD in regard to the project and categorised the documents into the four stages of the project life cycle.

3. Issues from Meeting:

- a. During the meeting, we experienced conflict whilst categorising the information, due to confusion in regard to the scope of the group report.
- b. This issue was mitigated by referring to the lecture that defined the inputs and outputs for each stage of the cycle, which clarified our team member's confusion.
- c. To make the next meeting more effective, it was decided that everyone must pre-read the agenda, lecture notes and any relevant information in order to effectively prepare for the next meeting.

MEETING MINUTES #4 – GENG5505 Group Churros

Date: 19/08/2019

Time: 8:00am – 9:30am

Location: Ezone, lvl 1 conference room

In Attendance: Sophia Li, Yi Wei Leong, Rohan Patel, Adarsh Ravi, Hiruni Kellapatha

AGENDA

| Agenda Items | Desired Outcome | Time Allocated |
|--|--|----------------|
| Task Allocation | All group members to have a clear understanding of what is expected of them for the entire group report. | 60 minutes |
| Set deadlines | Identify clear deadlines for each component of the group report. | 10 minutes |
| Evaluate/ confirm the information allocated to each stage of the project lifecycle | All the information should be categorised into the stages accordingly. Documents that are still required should be recognised so further action can be taken to access them. | 20 minutes |

Total meeting time: 90 minutes

MEETING NOTES

- Progression of Agenda Items

| Agenda Items | Progress/ Notes |
|---|--|
| Task Allocation | Sections A, B & C - allocated Appendices Items - allocated |
| Set deadlines | Section B: 25 th of August Theory research component of section C: 25 th of August Section A: 29 th of August Items for Appendices: Ongoing progress |
| Evaluate/ confirm the information allocated to each of the stages | Confirmed |

- Task Allocation

| | |
|--------------------------|--|
| Yi Wei Leong | <ul style="list-style-type: none"> ➤ Section A: Major Complications in relevance to the stages of the project lifecycle. ➤ Section B: Critically analyse the project for the execution stage. ➤ Gantt Chart throughout the group report. |
| Sophia Li | <ul style="list-style-type: none"> ➤ Section A: Sustainability (economic, environmental and social) in relevance to the stages of the project lifecycle. ➤ Section B: Critically analyse the project for the planning stage. ➤ Group performance summaries throughout the semester. |
| Hiruni Kellapatha | <ul style="list-style-type: none"> ➤ Section A: Project background. ➤ Section B: Critically analyse the project for the conceptualisation stage. ➤ Meeting minutes throughout the semester. |
| Rohan Patel | <ul style="list-style-type: none"> ➤ Section C: Research applicable theories for each of the stages in the project lifecycle. Refer to the textbook and lecture slides to obtain relevant information. ➤ Executive Summary and conclusion. |
| Adarsh Ravi | <ul style="list-style-type: none"> ➤ Section A: Purpose and requirements of the project in relevance to the stages of the project lifecycle. ➤ Section B: Critically analyse the project for the finalisation/ evaluation stage. ➤ Group performance summaries throughout the semester. |

ACTIONABLE ITEMS

| Item | Allocated Group Member/s | Deadline |
|----------------------------|-----------------------------|----------------------------|
| Section B: completion | Yi, Sophia, Hiruni & Adarsh | 25 th of August |
| Section C: theory research | Rohan | 25 th of August |
| Section A: completion | Yi, Sophia, Hiruni & Adarsh | 29 th of August |

Group Performance Summary #4

Meeting 4

1. Objective of Meeting:

- a. This meeting also remained in the storming stage of team development.
- b. The objective of this meeting was to review project objectives, expectations, deliverables, outcomes and benefits, as well as review all scope inclusions and exclusions.
- c. Additionally, the meeting would serve as a discussion of the project work and project management approach.

2. Success of Meeting:

- a. This meeting was highly successful, as it ran on time, all agenda items were met, and the team was able to get together to agree upon further dates to meet.
- b. The meeting was successful from the point of view of discussing different perspectives between team members, confirming the report requirements and establishing deadlines.

3. Issues from Meeting:

- a. The main issue arising from this meeting was regarding how busy everyone was with their own study, work and extracurricular commitments as everyone was studying full-time, had jobs and was on student clubs.
- b. This was only an issue now as the project was nearing its due date, and additional meetings were required to complete the work required.
- c. To resolve this, a doodle poll was created to see when everyone was free, and where everyone was not free, to see who could make compromises with their own commitments.
- d. To ensure future meetings run more effectively, it was agreed that an updated doodle poll of everyone's availability would be kept, as this would easily facilitate the organisation of emergency or last-minute meetings if required closer to the due date.

MEETING MINUTES #5 – GENG5505 Group Churros

Date: 26/08/2019

Time: 8:00am – 10:00am

Location: Ezone, lvl 1 Conference Room

In Attendance: Sophia Li, Yi Wei Leong, Rohan Patel, Adarsh Ravi, Hiruni Kellapatha

AGENDA

| Agenda Items | Desired Outcome | Time Allocated |
|--|--|----------------|
| Read through everyone's written parts for section B, make sure it flows, there's no repetition and discuss potential improvements. | Everyone to gain a better understanding of the project throughout the whole lifecycle. | 60 minutes |
| Evaluate section C theories researched by Rohan. | Identify theories applicable to each stage of the project life cycle. | 15 minutes |
| Come up with clear steps in writing section A and section C. | In order to ensure that the final report will flow accordingly. | 15 minutes |
| Gantt Chart update by Yi. | Progress update – input from other team members. | 10 minutes |
| Draft an email to meet with the Project Manager, including questions we have/ documents we require. | Meet with the Project Manager of our project to mitigate any queries. | 10 minutes |
| Adarsh to update the group regarding Cosi's response to our questions. | Mitigate queries regarding the report. | 10 minutes |

Total meeting time: 90 minutes

MEETING NOTES

- Reflection: ongoing progress of the project/ meeting summaries

Review of section B – draft

Stage 1: Conceptualisation (Hiruni)

- Scope and Cost Management – completed

Info taken from the text book, design brief, proposal and preferred supplier contract

- Stakeholder and Communication Management – completed
Info taken from the text book, proposal, kick off meeting minutes and preferred supplier contract
- Risk Management – completed (note form)
Info taken from the text book, proposal and project risk register

Stage 2: Planning (Sophia)

- Scope Management – completed
Info taken from the proposal and preferred supplier contract
- Time Management – completed (note form)
Info taken from the design brief
- Cost Management – completed
Info taken from the proposal
- Risk Management – completed (note form)
Info taken from the proposal and risk register
- Procurement Management – completed (note form)
Info taken from the proposal

Stage 3: Execution (Yi)

- Quality Control – completed
Info taken from the over budget document and job variations document
- Communication Management – completed
Info taken from the over budget document and job variations document
- Change Control – completed
Excluded in the writing component – verify later

Stage 4: Finalisation (Adarsh)

- Project Quality Assurance – completed
Info taken from the ESR and proposal
- Triple Bottom Line – completed
Info taken from the ESR and proposal
- Stakeholder Management – completed
Info taken from the ESR and proposal

Review of section C – notes (Rohan)

- Comprehensive Notes
- Still needs to be structured according to the four project life cycle stages
- Needs to be put into paragraph format

Email to Project Manager

 Hiruni Kellapatha
 Mon 26/08/2019 8:10 PM

To: Jason Nielson;

Hi Jason,

I hope you are well! Once again, thank you for meeting with me to hand over relevant documents for the Pebble Beach project. My group is very appreciative of all your assistance and happy to say that we received permission to proceed with the analysis of this project for our Project Management unit!

We are currently in the process of evaluating the provided documents against each of the four stages of the project life cycle and was wondering if you'd be able to help us with any of the following queries:

1. We were wondering if you had access to any of the documents/ meeting minutes regarding the hand over process into the construction phase of the project (between GHD and the designated contractor). Or any information regarding the construction phase, including GHD's involvement. This is because we are required to analyse the finalisation stage of the project if complete, or make appropriate assumptions (on the finalisation process) if the project is not yet complete.
2. As the project went over the proposed budget, does GHD have a graph portraying the variations between the actual cash flow and the planned cash flow?
3. Could we gain access to Water Corporation's environmental/ social analysis and the sustainability assessment by any chance?

Please let me know if you are able to help us gain access to any of the above documents. If it's difficult to send via email, I'm more than happy to collect them from you at GHD.

Thank you!

Warm Regards,
 Hiruni

← REPLY ← REPLY ALL → FORWARD ...

Mark as unread

- Hiruni: notify the group in regards to the Project Manager's response during the week.

■ Clearing up queries with Cosi

Adarsh Ravi <21984585@student.uwa.edu.au>

to cosimo.faiello ▾

Hi Cosi,

Hope you are doing well. Our group had a quick query regarding our project.

Our project is about the Water Corporation's proposed upgrade to the Pebble Beach Boulevard Wastewater Pumping Station (WWSP) and Pressure Main (PM), focusing on GHD's involvement in the engineering and detailed design.

Water Corp. is yet to pick a contractor to go ahead with the construction, so we were wondering if it was okay to focus on the engineering and detailed design component from GHD's perspective, as this is essentially a self-contained project within itself, being handled by project managers from GHD's end, and clearly demonstrating the project lifecycle stages, such as

- Conceptualisation stage: engineering consultants are involved in data collection, review and concept development, the identification of potential project risks and the initial establishment of stakeholder relationships.
- Planning stage: engineering consultants are involved in site investigations, preparation of strategic plans to mitigate identified risks and the commencement of drafting the detailed design.
- Execution stage: engineering design is completed. This stage involves the confirmation of drawings, the production of the Engineering Summary Report (ESR), the Safety in Design Risk Register and the completion of many other vital documents.
- Finalisation stage: involves the hand over process of the detailed design, geotechnical investigation reports, preliminary design drawings along with the tender documents, which may include the Schedule of Prices, Project Specific Preliminaries and Appendices and the Safety in Design Report. This report explores GHD's involvement in the Pebble Beach project, reinforcing the requirements of efficient project management from an engineering consultancy perspective.

Thanks for your time,

Adarsh

Group Churros

Fri, 30 Aug, 15:58 (3 days ago)



Cosimo Faiello

to me ▾

Hi Adarsh,

I'm well, thank you, and trust you are well too.

If you are able to identify the project's lifecycle stages, it will be absolutely fine for you to focus on the sub-project you are proposing.

All the best,

Cosimo Faiello
Associate Professor
Department of Electrical, Electronic and Computer Engineering • M018, 35 Stirling Highway, Crawley WA 6009
T +61 8 6488 2841 • M +61 417 984 470 • E cosimo.faiello@uwa.edu.au

Sat, 31 Aug, 08:28 (2 days ago)



- Hence, the group is to continue analysing/ writing for each stage in terms of the work layout stated in Adarsh's email.

- Progression of Agenda Items

| Agenda Items | Progress/ Notes |
|--|---|
| Read through everyone's written parts for section B, make sure it flows, there's no repetition and discuss potential improvements. | Completed |
| Evaluate section C theories researched by Rohan. | Half completed due to time restrictions |
| Come up with clear steps in writing section A and section C. | Completed |
| Gantt Chart update by Yi | Not completed - next meeting |
| Draft an email to meet with the Project Manager, including questions we have/ documents we require. | Completed |
| Update on Cosi's response to our questions. | Completed |

- Task Allocation

| | |
|-------------------|--|
| Yi Wei Leong | ➤ Finalise section A and section B for stage 3 ➤ Gantt Chart |
| Sophia Li | ➤ Finalise section A and section B for stage 2 ➤ Group Performance Summaries |
| Hiruni Kellapatha | ➤ Finalise section A and section B for stage 1 ➤ Meeting minutes, ➤ Liaise with PM ➤ Project Background |

| | |
|-------------|---|
| Rohan Patel | ➤ Finalise section C draft |
| Adarsh Ravi | ➤ Finalise section A and section B for stage 4 ➤ Group Performance Summaries |

ACTIONABLE ITEMS

| Item | Allocated Group Member/s | Deadline |
|-----------------------------|-----------------------------|------------|
| Section B: full completion | Yi, Sophia, Hiruni & Adarsh | 02/09/2019 |
| Section A: draft completion | Yi, Sophia, Hiruni & Adarsh | 02/09/2019 |
| Section C: draft completion | Rohan | 02/09/2019 |

Group Performance Summary #5

Meeting 5

1. Objective of Meeting:

- a. From the way the team members interacted and worked together, it was evident that this meeting transitioned the team into the norming stage of team development.
- b. The objective of this meeting was to go through the finalised versions of section A part B, and to review the draft completed for section C, as well as to reconfirm deadlines and to schedule additional meetings to meet project requirements.

2. Success of Meeting:

- a. The success of the meeting was varied for different team members, as due to poor time management and tracking of the meeting, some team members were able to receive in-depth feedback on their work, whilst others hardly received any.
- b. Trust and openness were developed between team members, with work rhythms being established as well as individual differences being accepted and appreciated.

3. Issues from Meeting:

- a. As mentioned previously, a major issue arising was poor time management of the meeting, as firstly some team members came late which pushed our meeting back.
- b. Secondly, time was not tracked and divided among agenda items, which meant there was an uneven time spent reviewing some people's work whereas others did not get much feedback.
- c. To ensure the next meeting is more effective, it was decided that all team members would arrive 10 minutes early to make sure the meeting runs on time, as everyone is busy with other commitments.
- d. Additionally, this extra time would provide an opportunity for the group to catch up and get to know each other more, facilitating cohesiveness.

MEETING MINUTES #6 – GENG5505 Group Churros

Date: 02/09/2019

Time: 8:30am – 9:30am

Location: Ezone, 102C Meeting Pod

In Attendance: Sophia Li, Yi Wei Leong, Rohan Patel, Adarsh Ravi, Hiruni Kellapatha

AGENDA

| Agenda Items | Desired Outcome | Time Allocated |
|--|---|----------------|
| Evaluate all written parts for section A, B and C. | Progress update of how the report is going – areas of improvement/ adjustments. | 35 minutes |
| Gantt Chart update by Yi. | Input from other group members. | 10 minutes |
| Group Performance Summary update by Sophia & Adarsh. | Input from other group members. | 5 minutes |
| Action items for the following week. | Report is due in a week – need to accelerate progression! | 5 minutes |
| Discuss questions to ask Cosi during the tutorial. | Mitigate any pending queries. | 5 minutes |

Total meeting time: 60 minutes

MEETING NOTES

- Reflection: ongoing progress of the project/ meeting summaries

Review of Section C draft completed by Rohan:

Stage 1

- There aren't as many recommendations for stage 1 in comparison to the other stages. As this stage mainly includes winning the job, concept development/ proposal production and initial establishment of stakeholder relationships.
- Include recommendations for GHD to price their bids for future projects more accurately (it was over priced in comparison with competitors).
- Recommend GHD to provide more detailed and comprehensive scope of design services. As there were around 30 scope variations throughout the whole design phase.
- Recommend GHD to provide a more detailed flow chart of stakeholder involvement – the one included in the proposal was very brief and didn't include information regarding any external stakeholder relationships.
- There aren't any recommendations to be made in regards to risk management for the concept stage as risks were identified and briefly addressed – more recommendations to be made in the planning stage.

Stage 2

- Elaborate the paragraph exploring recommendations for procurement management.
- Cost management recommendations are done really well.
- Scope management recommendations – follow up from the recommendations mentioned in stage 1 (GHD should have a more detailed design scope to mitigate having so many variations).
- For risk management recommendations – for future projects, GHD should have more comprehensive strategies in how they will attack each identified project risk.
- For time management recommendations – refer to the milestone recommendations from WC's design brief and compare to the actual project timeline.

Stage 3

- Quality control recommendations – the drawing deliverable recommendations are explained very comprehensively. However, need to include recommendations in regards to the other deliverables included in this phase (refer to the table below- extracted from GHD's proposal).

| Design Stage | Deliverable | Design Stage | Deliverable |
|---|--|---|---|
| Stage 1 Data collection, review and concept development | Concept Sketches (PDF) of the proposed pipe route and preliminary alignment highlighting the constraints that may impact construction. | Stage 4 – cont'd Detail design and bid-ready documentation | Pump Station Site plan update EM52-3-1 General arrangement update EM52-4-1 Pump station pipeline special drawing update Inlet dropper pipe detail Mobile pump branch drawing – if required Update Switchboard SLD for new motor Update Switchboard Cable schedule for new motor Primary design drawings - update Primary SLD Primary Grading and protection drawing Update electrical site plan if required |
| Stage 2 Site investigation and detail design | Email summary of Ground conditions following 1 st stage of investigation | | Geotechnical Investigation Report Dewatering Management plan – If required Baseline noise monitoring report – if required |
| Stage 3 Engineering Design | Flora and Fauna survey / environmental assessment - if required Pre-requisites to works drawings Draft pipeline plan and long section drawings Diagrammatic connection detail to existing pressure Main Pump Station General arrangement plan and section update drg EM52-4-1 Characteristic curve – update EM52-1-2 Pump NPV Pump SPS 503 Valve selection (non return, air valves) Hydraulic modelling summary memo Draft engineering design summary report Memo on review of electrical drawings identifying any upgrades required for the pump upgrade Recommendation on changes to inlet dropper arrangement to suit pumps Noise modelling report if required Pipeline / vibration isolation details Electrical Primary design Operability and constructability Review minutes Safety in Design Risk Register | | Tender Documents Schedule of Prices Project Specific Preliminaries and Appendices Switchboard Type Specification – if Required Safety in Design Report |
| Stage 4 Detail design and bid-ready documentation | Pressure main: Locality plan Plan and Long Section Drawings Air and scour valve drawings Connection details x 3 – Connection at Pebble Beach Blvd PS, Connection to existing DN250 pressure main, Future connection to Type 270 PS Air Valve and pit details Scour pit details General notes Asset identification details Road Crossing details – if required | Note: Items labelled "If required" are subject of provisional sum items | |

- Communication and stakeholder management recommendations are done well.
- Budget adherence recommendations – need to refer to all items summarised in the table (from Section B).
- Change control recommendations are done well.
- Project quality assurance recommendations - done well (still needs more detail)

Stage 4

- Triple Bottom Line – incomplete
- Stakeholder management – incomplete

Overall Notes

- Rohan has done a good job in drafting section C – now other group members are to extract the information provided by Rohan and make the writing/ information for their respective stage flow smoothly.
- Next two meetings for the week are scheduled for:
4th of Sep (5:00pm-6:30pm)
5th of Sep (3:00pm-5:00pm)

○ Progression of Agenda Items

| Agenda Items | Progress/ Notes |
|--|---|
| Evaluate all written parts for section A, B and C. | Only had enough time to review the draft of Section C. Hence, two additional meetings are scheduled for the week. |
| Gantt Chart update by Yi. | Completed. |
| Group Performance Summary update by Sophia & Adarsh. | Completed. |
| Action items for the following week. | Completed (Refer below). |
| Discuss questions to ask Cosi during the tutorial. | Incomplete. |

○ Task Allocation

| | |
|-------------------|--|
| Yi Wei Leong | ➤ Finish stage 3 (A, B, C) |
| Sophia Li | ➤ Finish stage 2 (A, B, C) |
| Hiruni Kellapatha | ➤ Finish stage 1 (A, B, C) ➤ Formatting of the final report |
| Rohan Patel | ➤ Finish draft for Section C in accordance to the notes made in this meeting minutes (especially stage 4) ➤ Conclusion for report |
| Adarsh Ravi | ➤ Finish group summaries ➤ Stage 4 (A, B, C) ➤ Exec summary |

ACTIONABLE ITEMS

| Item | Allocated Group Member/s | Deadline |
|--|--------------------------|-----------------------|
| Refer above – the ‘Task Allocation’ table. | Everyone | Prior to next meeting |

Group Performance Summary #6

Meeting 6

1. Objective of Meeting:

- a. This meeting highlighted the performing stage of team development.
- b. The objective of this meeting was to evaluate all written parts for sections A, B and C to ensure consistency and flow, as well as to outline the executive summary and conclusion structure.

2. Success of Meeting:

- a. This meeting was successful as the team agreed that sections A, B and C was completed to an acceptable standard.
- b. We are approaching the deadline and the majority of the report is complete.
- c. Balanced productivity and cohesion were observed between team members.

3. Issues from Meeting:

- a. The main issue that occurred during this meeting was conflicting solutions between team members regarding the structure of the executive summary. As a result, the time taken to make a decision was unnecessarily lengthened.
- b. To resolve this, the team decided to objectively analyse and summarise the main points identified in the three sections.

MEETING MINUTES #7 – GENG5505 Group Churros

Date: 04/09/2019

Time: 4:00pm – 6:30pm

Location: Ezone, lvl 1 Conference Room

In Attendance: Sophia Li, Yi Wei Leong, Adarsh Ravi, Hiruni Kellapatha

Apologies: Rohan Patel

AGENDA

| Agenda Items | Desired Outcome | Time Allocated |
|---|--|----------------|
| Evaluate the first draft of the report. Everyone will have the opportunity to voice their queries. | To have clear objectives in terms of report writing prior to the next scheduled meeting. | 150 minutes |

Total meeting time: 150 minutes

MEETING NOTES

- Reflection: Draft #1 of the report

Executive Summary:

- Layout + most of the information completed by Adarsh.
- Still needs to summarise the key issues, recommendations and outcomes – to be completed by Rohan after the conclusion is written.

Section A:

- Everyone has to have consistent subheadings throughout the whole report for each stage.
- Planning Stage
 - Cost Management: Analyse and summarise the revisions made to the Quotation and Detailed Breakdown.
 - Risk Management: Analyse and summarise surfaced risks (excluding the ones mentioned in the proposal) – found in the risk register.
- Execution Stage
 - Ensure that all subheadings are matched (throughout the whole report for this stage).
 - Introduce main points in section A, elaborate in section B and improvements in section C.
 - Choose appropriate sub headings from the following (if not all): Cost management, quality management, communication management, scope management and time management.
- Finalisation Stage
 - Needs to be put into appropriate sub headings.

Section B:

- Conceptualisation Stage
 - Mention external stakeholders.
- Execution Stage
 - Match subheadings from section A.

Section C:

- It was collaboratively decided that section C should be broken down into relevant competencies.
- Each competency should explore relevant facts and document the progression throughout the whole project life-cycle.
- Write an appropriate length for each competency – it will be decided on what competencies should be prioritised in terms of recommendations at the next scheduled meeting.
- Relevant competencies were distributed for members to write (refer to task allocation).

Conclusion:

- Incomplete – Rohan to complete before next meeting.

References:

- Everyone to do their own references so it's easy to combine when formatting.
- When referencing the text book – please take record of the page numbers for which the information is extracted from.

Appendices:

- Make evident of sections that require appendix items.
- Progression of Agenda Items

| Agenda Items | Progress/ Notes |
|--|-----------------|
| Evaluate the first draft of the report. Everyone will have the opportunity to voice their queries. | Completed. |

- Task Allocation

| | |
|--------------------------|--|
| Yi Wei Leong | <p>➤ Section A:</p> <ul style="list-style-type: none">- Ensure that all subheadings are matched (throughout the whole report for this stage).- Choose appropriate sub headings from the following (if not all): Cost management, quality management, communication management, scope management and time management. <p>➤ Section B:</p> <ul style="list-style-type: none">-Match subheadings from section A. <p>➤ Section C:</p> <ul style="list-style-type: none">- Time Management- Quality Management |
| Sophia Li | <p>➤ Section A:</p> <ul style="list-style-type: none">- Cost Management: Analyse and summarise the revisions made to the Quotation and Detailed Breakdown.- Risk Management: Analyse and summarise surfaced risks (excluding the ones mentioned in the proposal) – found in the risk register. <p>➤ Section C:</p> <ul style="list-style-type: none">- Cost Management- Procurement Management |
| Hiruni Kellapatha | <p>➤ Section B:</p> <ul style="list-style-type: none">- Mention external stakeholders. |

| | |
|-------------|--|
| | <ul style="list-style-type: none"> ➤ Section C: <ul style="list-style-type: none"> - Scope Management - Risk Management |
| Rohan Patel | <ul style="list-style-type: none"> ➤ Conclusion (1/2 a page) ➤ Complete the Executive Summary after the conclusion is written - summarise the key issues, recommendations and outcomes |
| Adarsh Ravi | <ul style="list-style-type: none"> ➤ Section A: <ul style="list-style-type: none"> - Needs to be put into appropriate sub headings. ➤ Section C: <ul style="list-style-type: none"> - Stakeholder Management - Communication Management |

ACTIONABLE ITEMS

| Item | Allocated Group Member/s | Deadline |
|--|--------------------------|--|
| Everything stated in the 'Task Allocation' table | Everyone | 05/09/2019 – 5PM (next scheduled meeting) |

Group Performance Summary #7

Meeting 7

1. Objective of Meeting:

- a. This meeting remained in the performing stage of team development.
- b. The objective of this meeting was to evaluate the first written draft of the report with all sections completed including references and appendices.

2. Success of Meeting:

- a. The team confirmed the first draft to be acceptable with all necessary items on the marking guide addressed.

3. Issues from Meeting:

- a. The issue arising from this meeting was that some team members had not completed their references and appendices to a high standard as required by the team. This could have been completed during the team member's own time as detailed in the actionable items.
- b. The team resolved this by allocating additional time during the meeting to complete this action.

MEETING MINUTES #8 – GENG5505 Group Churros

Date: 05/09/2019

Time: 5:00am – 7:30am

Location: Ezone, 102B Meeting Pod

In Attendance: Sophia Li, Yi Wei Leong, Rohan Patel, Adarsh Ravi, Hiruni Kellapatha

AGENDA

| Agenda Items | Desired Outcome | Time Allocated |
|---|---|----------------|
| Go through the current draft for all sections of the report. Discuss any areas that can still be improved upon. Make comments on the Google Doc as we analyse the draft. So each group member knows what changes they need to make after the meeting. | To ensure that the group report is up to a good standard. | 150 minutes |

Total meeting time: 150 minutes

MEETING NOTES

- Reflection: ongoing progress of the project/ meeting summaries

Important Comments:

- ✓ Currently, the execution stage identifies the problem in Section A, which is not consistent with the other stages. It was previously discussed that Section A would primarily include a brief explanation of the relevant competencies in relation to the PB project. So this needs to be changed in order to make the report more consistent.
- ✓ The conclusion was very brief; it needs to be more comprehensive.
- ✓ Appendix references are not done consistently.
- ✓ Everyone has referenced differently; this needs to be made consistent throughout the report.
- ✓ Sophia, Hiruni and Adarsh will be meeting on the 6th of September at 10am to begin formatting/ editing.

- Progression of Agenda Items

| Agenda Items | Progress/ Notes |
|---|-----------------|
| Go through the current draft for all sections of the report. Discuss any areas that can still be improved upon. Make comments on the Google Doc as we analyse the draft. So each group member knows what changes they need to make after the meeting. | Completed. |

- Task Allocation

| | |
|--------------------------|---|
| Yi Wei Leong | <ul style="list-style-type: none"> ➤ Re-write the execution stage parts to comply to the following method: <ul style="list-style-type: none"> - Section A: mention the relevant competencies. - Section B: elaborate in relevance to the PB project, identify problems. - Section C: provide recommendations for the identified problems in section B. |
| Sophia Li | <ul style="list-style-type: none"> ➤ Final Formatting and editing of the report. |
| Hiruni Kellapatha | <ul style="list-style-type: none"> ➤ Final Formatting and editing of the report. |
| Rohan Patel | <ul style="list-style-type: none"> ➤ Expand on the written conclusion – make it one page. |
| Adarsh Ravi | <ul style="list-style-type: none"> ➤ Final Formatting and editing of the report. |
| EVERYONE | <ul style="list-style-type: none"> ➤ Have clear appendix references (make it clear which appendix is referenced where). ➤ Wherever the textbook is referenced, please also note the page number in the in-text references. |

ACTIONABLE ITEMS

| Item | Allocated Group Member/s | Deadline |
|--|--------------------------|---|
| Everyone to contribute to finalising the group report (due on the 9 th of September). | Everyone. | 8 th of September (AT THE LATEST). |

Group Performance Summary #8

Meeting 8

1. Objective of Meeting:

- a. This meeting highlighted the adjourning stage of team development.
- b. The objective of this meeting was to confirm the final draft of the report.

2. Success of Meeting:

- a. This meeting was successful as project objectives have been achieved.

3. Issues from Meeting:

- a. The team used this last meeting as an opportunity to evaluate the overall performance of individual team members and detailed the improvements that can be made for future team projects.

Team name: Churros

