University of Southern Queensland
Faculty of Engineering and Surveying

Managing the repair of transport Infrastructure after a Natural disaster

A dissertation submitted by
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In fulfilment of the requirements of
Courses ENG4111 and ENG4112 Research Project

towards the degree of
Bachelor of Engineering (CIVIL)

Abstract

Hidayat and Egbu (2011), noted that disasters are not a common occurrence but when they do occur they have the potential to paralyse local government structures and systems. This was particularly true for Brisbane City after the January 2011 Queensland floods. With the Brisbane River at flood levels not seen since the 1974 floods, local Citycat and ferry passenger terminals where severely damaged, therefore causing major disruption to an important element of the public transport infrastructure.

The Brisbane City Council (BCC) started planning the response to the unprecedented damage to the Citycat and ferry infrastructure as soon as it was safe to do so. Approximately 48hours after the maximum height of the flood had passed water based site inspections of the passenger terminals and other associated infrastructure used by the BCC's ferry services where carried out. The inspections allowed the BCC too quickly determine what of the infrastructure was salvageable and what required replacement.

The BCC decided, after considering several options, that to avoid any prolonged inconvenience to the Citycat and ferry patrons that a rapid rebuild of the closed passenger terminals would be required. The time line for the salvage of the existing damaged terminals and consequently the rebuild was 90 days in total (33days for salvage and 57 days for re-construction).

This project focuses on the rapid reconstruction of transport infrastructure after an extreme event. The focus will be on a review of the Brisbane City Council (BCC) processes and procedures used when an essential part of their transport Infrastructure suffered major damage rendering it inoperative, due to an extreme event.

The project work undertaken incorporates a literature review of relevant similar research, an overview of the current Project Management methodologies used within the BCC as well as a case study that will follow the rapid reconstruction of six severely damaged passenger terminals after the January 2011 Queensland floods. Included with the case study will be the findings of a lessons learnt workshop discussing feedback provided by essential key staff involved in the reconstruction.

The results of the lessons learnt will be presented and following knowledge gained from the literature review, an alternative working model will be presented based on BCC practices. This working model identified provides when used in conjunction with other documentation, an alternative guide for the rapid reconstruction of minor capital works damaged after an extreme event.

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ENG4111 Research Project Part 1 & ENG4112 Research Project Part 2

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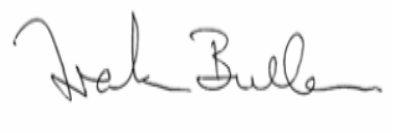

Professor Frank Bullen
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CERTIFICATION

I certify that the ideas, designs and experimental work, results, analyses and conclusions set out in this dissertation are entirely my own effort, except where otherwise indicated and acknowledged.

I further certify that the work is original and has not been previously submitted for assessment in any other course or institution, except where specifically stated.

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The Brisbane City Council (BCC) has provided assistance throughout this project through access to key personnel and documentation, however; it has not been endorsed by the Brisbane City Council and was not been completed as part of my paid role within the BCC.

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Abbreviations

BCC	Brisbane City Council
CBD	Central business district
DDA	Disability Discrimination Act
MSQ	Maritime Safety Queensland
NQ	North Quay
PMBOK	Project Management Book of Knowledge
PMCoE	Project management Centre of Excellence
QUT	Queensland University of Technology
RPEQ	Registered Professional Engineer of Queensland
UQ	University of Queensland
VFM	Value For money

Glossary

AECOM Consultancy firm used by the BCC to carry-out initial condition assessments of the passenger Terminals

CityCat Is the name given to the catamaran vessels operated by Brisbane City Council to provide a mode of public transport on the Brisbane River.

Figure 0-1 CityCat

CityFerry Is the name given to the monohull ferry vessels operated by Brisbane City Council to provide a mode of public transport on the Brisbane River.

Figure 0-2 CityFerry

Fender Piles. Piles along the water edge of the pontoon that were designed for vessel berthing

Headstocks Horizontal beams that connect the tops of the piles

Pontoon The actual pontoon structure, made up of a deck supported by either a steel plate box or steel tubes

Pontoon Restraint Piles. Piles that provide lateral restraint to the pontoon (attached via brackets)

TransdevTSL Holds the contract to maintain and operate Brisbane City Council's CityCat and CityFerry services.

Turning Piles Piles that is upstream or downstream of the pontoon that the vessels use as leverage to turn.

Chapter 1 Introduction

1.1 Introduction

Late December 2010 and early January 2011 saw significant flooding occur throughout Queensland, Australia with 75% of the state being declared a disaster zone Nine News (2011). As a consequence of the floods, on the 12th January 2011 the Brisbane River experienced riverine flooding that has not been seen since the 1974 floods, with the river reaching a peak height of 4.46m.(Government 2011). These flood waters converged on 67 Brisbane suburbs resulting in 14,100 Brisbane properties and businesses being adversely affected (Government 2011).

Located within the Brisbane River itself is the infrastructure for one of Brisbane main forms of public transport being the Brisbane Cities CityCat and Ferry services. The service extends throughout the city reaches of the river having 23 passenger terminals that are placed in carefully selected areas in order to meet a functional requirement. The CityCat and City ferry services operates seven days a week with approximately 16000 trips taken daily Calligeros Marissa (2011).

Post flood inspections were carried out on all 23 terminals 48 hours after the flood peak. The initial reports coming from the inspection showed that all 23 terminals had sustained some form of minor damage, with 10 of these terminals heavily damaged beyond repair. Eight of the ten were operating passenger terminals with the other two being mooring facilities for off peak or overnight mooring.

The heavily damaged operating passenger terminals were the following:

- University of Queensland , St Lucia, established 1996
- *West End, established 1946
- Regatta, Toowong, established 2004
- North Quay, CBD, established 1996
- Queensland University of Technology, CBD, established 1986
- Holman Street, Kangaroo Point , established 2000

- Sydney Street, New Farm, established 2000

*West End ferry terminal was scheduled to receive a major upgrade in early 2011, with flood damage rendering this terminal unserviceable, it was decided to proceed with this upgrade, and repair the other seven damaged terminals as required. This will be discussed further in the report.

Figure 1-1 Regatta Passenger terminal during 2011 flood

Figure 1-2 North Quay Passenger terminal during 2011 flood

1.2 Alternatives (Options) for restoration

With the prospect of the eight terminals being off line for an extended amount of time, causing major disruptions for the regular Citycat Patrons in the affected areas and also increasing congestion on what is already said to be at capacity, local road network. According to the Lord Mayor at the time, the honourable Campbell Newman, the closure of the passenger terminals caused an increase in the travelling time on selected bus networks by up to 35% and some road networks by 30% Nine News (2011). Therefore it was important for the BCC to ensure all possible avenues would be considered in reinstating the passenger terminals back to their post flood capacity.

The BCC after several workshops established four possible options for the rebuilding of the terminals

The options were as follows:

Option one. To do nothing- As the terminals are an essential public transport service this option was disregarded.

Option two. Permanent Reconstruction- This would have been ideal if it wasn't for the tight time frame to have the terminals up and running again. In order to permanently reconstruct, the BCC would have had to redesign the new terminals to be more flood resilient, gain approvals, go through the process of obtaining the contractor and finally construct the terminals

Option three. "Like for Like" Reconstruction- this option is not a permanent solution as the "like for like" structure would not be designed to current design standards such as the Disability Discrimination Act and would not withstand a similar flood event in the future.

Option four. Temporary and Permanent Reconstruction- this was the preferred option as it fulfils the needs for the community and will ensure the infrastructure will be made more flood resistant and have the provision for rapid recovery.

1.3 Selected option

Option four was selected as it provided the best overall solution for meeting the needs of the BCC and those of the community. The approach behind the selection of option four was to reconstruct the damaged terminals as 'like for like' temporary terminals. These temporary terminals where constructed with the purpose of having a life span of five years. The BCC's strategy being, the temporary terminal reconstruction would allow sufficient time to complete the planning, design approvals and other relevant documentation involved in the terminal reconstruction. Once this is completed the main passenger terminals will be systemically reconstructed one by one with the permanent structures.

Other advantages of selecting option four permits the BCC to:

Rebuild with Increased Flood Resilience through:

- Increase width, strength and depth into river bed of piles;
- Stronger pontoons (streamlined design, increased bracing);
- Stronger gangway design (increased flexibility and manoeuvring);
- Use of fender/protection piles (protect against debris impacts)

Fast Recovery of new pontoons through:

- Capability to sink pontoons in a controlled fashion and retrieve after the flood event;
- Capability to readily remove gangways and/or pontoons prior to a flood event.
- DDA compliance of all rebuilt facilities (including all access areas)
- Dual-berth and design life approximately 50 years
- Department of Environment and Resource Management (DERM) provided a state wide an exemption certificate under section 120C of the Coastal Protection and Management act 1995 to allow for the "like for like" replacement of marine structures damaged during the floods without having to apply for all the relevant approvals such as design approvals (DA) from the relevant authorities. (DERM 2011)

1.4 Time line

The time line selected for the reconstruction of the eight damaged passenger terminals was scheduled for 90 days; this was to include the salvaging of all the damaged terminals and

associated debris such as trees, boats and other private pontoons that could inhibit reconstruction phase of the project.

The question of how the 90 day time frame was established is still relatively unresolved, with the two popular reasons being

1. Political pressures and/or
2. Social pressures

1.5 Project Aim

The aim of this project is to:
"Identify strategies for the rapid re-construction of minor capital works that are damaged or destroyed by extreme events and are critical to the running of a city, such as a cities transport system. To develop the strategies identified into a working model for future rapid rebuilds"

1.6 Objectives

The objectives of the project are to:

- Complete a literature review
- Review the current structure of the Brisbane City Council's Project Management procedures and practices
- Carry-out a case study on the rapid reconstruction of the eight CityCat and City Ferry passenger terminals that were damaged beyond repair during the 2011 floods.
- Carry-out a lessons learnt workshop
- Create a model that can be used with other documentation for rapid re-construction.

1.7 Conclusion

The floods in Brisbane, January 2011, caused untold damage throughout Brisbane and several selected suburbs. As a consequence of the floods the Brisbane Citycat/Ferry services was closed down with several passenger terminals being totally destroyed.

BCC found themselves in an unprecedented position of having one of their main forms of public transport being closed down over night with no real idea of when they would be up and running again.

After several workshops and site investigations the BCC established several options for the reconstruction of terminals. The option selected was for the rapid reconstruction of the damaged terminals with the purpose of having then operational again in 90days.

Chapter 2 Literature Review

2.1. Methodology:

Initially, a review of available literature will be carried out focusing on but not limited to the 'rebuilding after a natural disasters'. This will include the reviewing conference papers, journal papers, technical reports and websites. As the project is to be completed within 90 days, in essence, this study will be conducting a post-audit and literature relating to post-audits will also be sourced.

2.2. Case Study

This study will include a case study using the 'case-study methodology' discussed by (Yin 2009), it will be focusing on the reconstruction of the Brisbane Cities Ferry passenger terminals after the January 2011 floods as discussed in chapter 1.

The case study will be broken up into three sections focusing on:

- Pre-construction – salvage operations
- During Construction –rebuilding activities
- After construction –lessons learnt

2.3. Introduction

This chapter presents a summary of the previous research that has been undertaken into post disaster reconstruction. It was found that the previous research into this field is rather extensive and comprehensive. Even though a lot of the literature is based on the rebuilding of a community after a large scale natural disaster one can still use the methodologies and lessons learnt from previous disasters to draft an appropriate set of guidelines, as per the aim of this project.

Natural disasters are defined as a serious or sudden ecological event such as hurricanes, tornadoes, earthquakes, floods and tsunamis brought about by climatic changes or tectonic shifts of earth crust (Chua 2007). Between 1990 and 2007, there has been a marked increase in the number and severity of natural disasters. (Marquina 2010)

Schineider (2011) notes that it is indisputable that global climate change poses a challenge that will test nature, human populations, as well as markets and economics in the future (Schneider 2011). The need to systematically reduce the increased impact of natural disasters is gaining recognition and commitment among governments worldwide (Marquina 2010).

The loss of life, destruction of economic and social infrastructure is only expected to increase in the coming years (Marquina 2010) due to the effects of climate change increasing the frequency of heat waves, storms and heavy rains. This makes recovery after a disaster a perennial problem of growing complexity around the world.

2.4. Disaster management

According to (Alexander 2004) disaster management can be divided into four phases:

- **Mitigation:** Activities planned to reduce impacts of future disasters, these can be divided into two categories structural mitigation (Engineering solutions) and non-structural mitigation (planning such as land use)
- **Preparedness:** Actions to reduce the impact of forecasted disasters
- **Response:** This is the steps taken during the disaster and short term after disaster
- **Recovery:** Aims to repair damage, restore services, and to reconstruct facilities.

Da Silva (2010) further breaks down the recovery phase into a further 3 stages

- **Planning**
    - Understanding the context and impact of disaster
    - Understanding the local governance structures, regulatory framework and establishing methods of coordination.
    - Understanding funding steams and timescales
    - Identifying beneficiaries
    - Determining which method of assistance is appropriate
    - Establishing partnership with other stakeholders in order to provide assistance
    - Recognising natural hazards which pose a future risk in the programme plan (da Silva 2010)
- **Design** is about design of reconstruction project, the key consideration in this section are:
    - Selection of appropriate sites for reconstruction

- Resolving issues of land tenure
- Physical planning of settlement
- Definition of appropriate quality for reconstruction
- Identifying appropriate types of construction
- Minimizing the environmental impact of reconstructions
- Quality
- Incorporating disaster risk reduction strategies
- Capturing the scope of works, programme, resources, cost plan and risk management plans into detailed project plan to inform constructions (da Silva 2010)

- **Construction** section is implementation of reconstruction programmes:

    - Different methods of implementation
    - Management of construction projects
    - Specifications, procurement and transportation of materials
    - Management of labour and workmanship
    - Handover, maintenance and post –occupancy evaluation of completed projects (da Silva 2010)

Hidayat and Egbu (2011) note that disasters are not a common occurrence but when they do occur they have the potential to paralyse local government structures and systems, there seems to be a need for special laws or policies to cope with the disaster as being suggested by various scholars (Hidayat et al. 2010). This is further emphasised with previous cities that have disaster management plans that include planning polices during and after a disaster, will likely have a greater impact on reconstruction activities (Alexander 2004).

N.J. Smith (2002) notes that the primary objectives of a project is usually measured in terms of time, cost and quality (N.J.Smith 2002). This is also emphasised by Jo da Silva (da Silva 2010) noting quality, cost and timescale are three key elements of a reconstruction

programme that need to be carefully managed. Pressure to commence reconstruction and limited resources means budgets and timescales prevail and insufficient consideration is given to establishing a clear definition of quality (Alexander 2004).

Hidayat and Egbu (2010) also emphasises during reconstruction, common problems found in reconstruction are cost escalations, inadequate supply of material and labour (effecting programme) and quality of construction (Hidayat et al. 2010).

2.5. Rapid Re-construction

The difference between a common project and post disaster reconstruction is explained by, Mesurier.et al. (2006) noting that a greater degree of co-ordination with policy and legislation is required for large scale disaster. (Masurier. et al. 2006). Organisations (2006) emphasis this by noting where there is no provision in relevant legislation for post-disaster situations it can provide a barrier to reconstructions. Further challenges to the reconstruction are where conditions after the disaster are uncertain and resources for the project are scarce, as many local organisations are simultaneously competing for resources to carry out their repair works(Hidayat et al. 2010).

According to W.M Chan and M.kumaraswamy (2002) there are four categories that could affect construction duration. They are:

- **Project scope:**
    - Construction cost
    - Building type
    - Contract procurement type
    - Variations
- **Project complexity:**
    - Client's attributes
    - Site conditions/site access problems

- Project design
- Quality of design co-ordination
- Quality management
- Project environment:
- Physical
- Economical
- Socio-political
- Industrial relations

- **Management attributes:**
  - Client/design team management attributes
  - Construction team management attributes
  - Communication management for decision making
  - Human resources management
  - Productivity (W.M. Chan et al. 2002)

Olawale and Sun (2010) after extensive study have also established a list of time control inhibiting factors, their top five are:

1. Design changes
2. Inaccurate evaluation of projects time/ duration
3. Complexity of works
4. Risk and uncertainty associated with projects
5. Non-performance of subcontractors and nominated suppliers (Olawale et al. 2010).

Other suggested points affecting the speed of reconstruction noted by (Hidayat et al. 2010) are:

- Organisation of reconstruction
- Roles of parties should be carefully arranged
- Coordination and communication between all parties
- Local government organisations must help construction agencies overcome bureaucratic problems. (Hidayat et al. 2010)

Bai et al (2006) noted during the rapid reconstruction of the Webbers Creek Falls bridge in Oklahoma, some factors that contributed to the success of the project were:

- Use of established contracting methods and procedures, utilizing both traditional contracting methods, such as cost plus, time and materials, and lump sum (Bai et al. 2006). Olawale and Sun (2010) also argue that poor contract management is one of the main variables that causes contract delays (Olawale et al. 2010).
- Huge incentive and disincentive clauses in the contracts played a very critical role in motivating design firms, contractors, and material suppliers to finish their work on or ahead of time (Bai et al. 2006).
- The spirit of cooperation among the parties involved in the replacement project was very high. The partnership atmosphere built trust, improved communications, reduced conflicts, and overcame the bureaucracies and other adversities during the reconstruction. Suggestions and ideas on how performance could be improved were discussed daily (Bai et al. 2006). W.M Chan and M.Kumaraswamy (2002), also concluded that effective communications and fast information transfer between project participants are crucial pre-requisites that help to accelerate the building construction process(W.M. Chan et al. 2002).
- Changing the operational procedures expedited the reconstruction. For example approval of the shop drawings on the day they were submitted (Bai et al. 2006). Olawale and Sun (2010) confirms this by noting that design change is the single most important factor considered by practitioners as hindering the ability to control not only time of construction projects but also cost (Olawale et al. 2010).

2.6. Lessons Learnt

Akatuka (1994) notes failures sometimes occur even in projects that have executed with thorough planning, surveys and designs, and that have kept focused on established project objectives (Akatsuka 1994). Minimisation of these failures can be achieved through ongoing improvement of organization's project execution methods through the implementation of lessons learned studies.

The purpose of a lessons learned study is to obtain information through the systematic review of project experiences (N.J.Smith 2002). It is commonly agreeable that there is no way of neutralizing all negative impacts resulted from disasters; however, efforts can be made in order to reduce their impacts (Moe et al. 2006).

So through the understanding of the nature of positive and negative experiences this allows future projects to avoid unfavourable influences (problems), and exploit favourable opportunities (N.J.Smith 2002). Koria (2009) explains the failure to capture previous leanings from previous similar operations has had various parties having to essentially reinvent the wheel in terms of setting up construction programmes and projects, and strategic indecisions during the post disaster reconstruction after the Sri Lanka Tsunami (Koria 2009).

Therefore to provide assistance in documenting any significant issues that occurred during the reconstruction phase of the terminals, a lessons learnt workshop will be undertaken. The lessons learnt will be carried out with the assistance of a qualified facilitator (independent of the key personnel), and will aim to involve all the major groups involved with the project.

2.7.Key Learning's:

Reviewing the available literature and information relating to reconstruction after a natural disaster, some key common themes quickly emerged and were consistent throughout the review.

These were:

- Improving legislation, especially at the local government level, will help enable the bypassing of local laws during post disaster reconstruction. The procurement process of the local government is one area for instance, where it could take up several weeks to go through all the appropriate processes, for e.g. the BCC has up to five or six steps prior to going to contract, each of these steps can usually takes up to two weeks to finalise.
- Open communication lines between all parties are an important step in gaining trust amongst the team and reduce conflicts, as well as providing an avenue for feedback from other parties on how to improve a certain process during construction.
- Design issues should be given high priority especially when it comes to approving any changes. Same day approval is also vital to maintain timeline deadlines.
- Well defined role descriptions, and ensuring key personnel have the qualifications to match their role description.

- During the planning phase of the rebuild, no assumptions should be made. Where required other resources, such as industry experts should be sought to obtain as accurate a programme of works as possible.
- Pena-Mora and park (2001), argues to meet a faster schedule an increase in work hours may be required, this can be met by either hiring more workers or working overtime. However this has to be monitored to ensure the overtime does not go beyond a certain threshold, causing workers to become fatigued, thus effecting productivity levels and quality (Pena-Mora et al. 2001).
- Innovating contract management, such as providing a day bonus/penalty for early/late completion.
- Resourcing should be provided as required to meet the limited timeline, this is emphasised by, Bai et al (2006) on a rapid bridge replacement a 13 member team of inspectors was formed to over-see construction, when under normal circumstances two inspectors would have been used on the same type of work with a customary timeline (Bai et al. 2006).

Chapter 3 Current Project Management Practices within the BCC

3.1 Chapter Overview

This chapter will endeavour to provide an overview of the current Project Management practices and procedures used throughout the BCC. This will provide better insight into the structure and methodology used throughout the BCC during the life of the rebuild as well as essential background material in which to shape the proposed rapid reconstruction model on.

3.2 Introduction

The BCC operates with a budget of in excess of two billion dollars a year with approximately one billion of this going towards infrastructure investment such as roads, bikeways and parks(Council 2011). With this amount of investment it is important that the BCC delivers all projects' as efficiently and professionally as possible, to both meet the client's needs and provide value for money (VFM) to the rate payers of Brisbane.

A Project Management Centre of Excellence (PMCoE) has been established within the BCC to ensure that the BCC's Project Managers have all the essential tools required to successfully deliver projects of all sizes and procedural difficulties. The PMCoE is accessed via the BCC local intranet portal which can be accessed by all key personnel that are involved throughout the life of a project.

The PMCoE encompasses the BCC project management methodology known as PM^2. The methodology has been based around project management best practice principles from both the BCC and those external to the BCC. It is an organisational wide set of processes and practices designed to enable council's project managers to successfully deliver projects. It is based on a dual approach, the first being to define the project management processes and the second identifying the project management functions that are required during the life of the project.

The first being based around a phased project lifecycle model, with the phases being divisions within a project where extra control is required to effectively manage the completion of major project deliverables. There are six phases in total during the lifecycle of a project. These project phases will be discussed later on in this chapter.

The second being the project management functions, being 10 in total with nine being selected based on the Project management book of knowledge (PMBOK) and are interrelated throughout the project phases.

O Conchuir (2010) explains the functional areas are as follows:

- **Scope management** means "what is in the project" This can relate to
    - Either the Project's Product;
    - Or what work needs to be done to complete the project (O Conchuir 2010)

- **Cost management**: In simple terms, the project team estimates the costs, then gets them approved in the budgeting process. Finally the costs are controlled with reference to the approved budget costs. Costs are particularly demanding to manage because they can be affected by any project change. (O Conchuir 2010)

- **Schedule management** includes all the scheduling tools that project managers use, such as bar (or Gantt) charts, schedule networks, time estimation etc

- **Risk Management:** means taking measures to reduce the chances and impact of negative events. Risk Management also means taking measures to improve the chances and impact of positive events. The negative part of this agrees with the instinctive description of risk which many people have. The measures taken depend on the type and size of the project. It is also necessary to define who is responsible for risk management (O Conchuir 2010)

- **Quality management:**
    - Establishment the quality plan to be used throughout the project Without this, quality will simply not be achieved
    - Performing quality control during the project, through inspections etc.

- **Resource management:**
    - Acquiring the project team that will be working on the project.
    - Management of the project team by maintaining the team so that they can carry out the project, such as communication, problem solving, negotiation and in particular Conflict Management(O Conchuir 2010)

- **Communication and engagement:** Project Communications Management "includes the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information". It emphasizes communication with stakeholders, who can be difficult to reach, either because of where they are or because they are busy managers, whose time is at a premium (O Conchuir 2010)

- **Procurement and contract management:** Procurement here means getting either products or services from outside the organization, this is quite a long process for the BCC having to go through quite a few checks and balances

- **Project integration**: Management means making sure that every process and project management activity is identified, defined, combined and coordinated within the Process Groups. It helps us to ensure that the project is treated as a whole, rather than as a collection of independent actions. Integration Management is the very center of project management. The project manager is responsible for making sure that the project is successful and this depends on everything being integrated and brought together. (O Conchuir 2010)

- **:** undertaking lessons learnt workshops or reviewing of the actual project and subsequently establishing a data base containing all the lessons are some ways a company can gain benefits from a project

Using a standard organisational wide methodology such as the PM_2 benefits the council by means of

- Accomplishing more work in less time, with fewer resources e.g. streamlining of corporate processes

- Reduction in project risk as these are identified and managed earlier in the project

- Project outputs are of a higher quality

- Less likelihood of repeating past mistakes through lessons learnt process

- All expectations for all levels of business and stakeholders are managed.

- History of the project is properly documented including project decisions
- Greater customer satisfaction
- Improved communication amongst the project participants. Brisbane City Council (2011a)

3.3 Governance

Governance within the BCC covers both the total organisational Governances and individual project Governance, which are: (see figure 3-1 for a graphical overview)

3.3.1 Council's Organisational Governance:

Council wide polices rules, procedures, guidelines and the City of Brisbane Act, these are rules followed by all council officers.

3.3.2 Council's Project Governance:

Are the rules and requirements of the BCC that the project must adhere to. These project policies, procedures and guidelines are documented with in what is called the project governance framework.

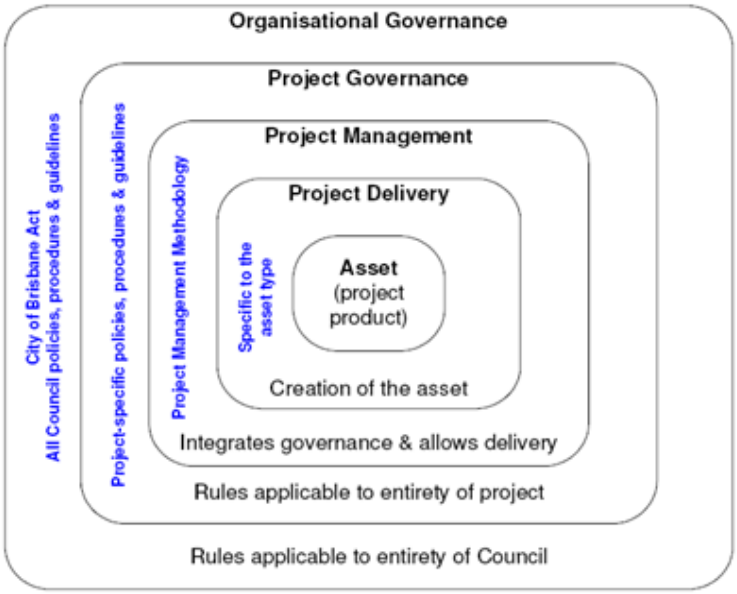


Figure 3-1 Project Governance-Management-Delivery Relationships Brisbane City Council (2011a)

3.4 Project Governance Framework

These define the actual policies, procedures, guidelines and associated practices for a positive outcome of a project. (See tables 3.2 – 3.4)

They mainly consist of the:

- PM^2 methodology
- Project classification
- Project assurance
- Project approvals
- Relationships with corporate governance processes. Brisbane City Council (2011c)

3.5 Project Management role

Under the project governance roles and responsibilities the BCC's Project Manager is responsible for day to day running of the project that also includes the reporting to the project owner and control groups.

3.5.1 Key activities and responsibilities of the Project Manager:

As defined under the project BCC's Governance roles and responsibilities:

- Management and communication of project stakeholders
- Consult with the project owner and the PCG for project decisions
- Manage project team
- Prepare project deliverables such as project management plan and business case
- Manage and coordinate procurement and contract documentation
- Manage the delivery of the project product
- Manage cost, schedule, budget, risks and constraints
- Manage the contracts
- Establish project team members
- Partake in project assurance activities Brisbane City Council (2011d)

Depending on the complex of the project the project manager could delegate significant responsibilities to their project team members. This could include contract management and construction inspections. These members are still accountable to the project manager who in turn is still accountable to the project owner

3.6 Tier classifications for Projects

The projects tier classification determines the project governance framework that applies to the project. There are currently three tier classifications for projects in the BCC's project Governances frame work as follows:

Tier 1

This type of project would have significant impact and repercussions for the BCC should it fail to achieve the desired outputs.

Some types of projects that would be classified as tier one are:

- Significant capital investments
- Has significant implications for the council and its stake holders
- Complex, highly technical and difficult to deliver
- Strategically or politically critical

Tier 1 projects require a rigorous governance model that ensures the projects decision making process and progress is extremely well monitored. These projects also require a well detailed and comprehensive project management methodology that has to provide the Council's Executive management, such as the CEO or Lord Mayor, the assurance the project will be delivered as planned. Brisbane City Council (2011c)

Tier 2

This type of project would have moderate impact or repercussions for the BCC should it fail to achieve the desired out comes.

Some types of projects that would classified as tier one are:

- Moderate capital investment

- Important implications for the council and stake holders
- Comprising of some inherent challenges in delivery
- Strategically or politically important. Brisbane City Council (2011c)

This differs from tier 1 as the governance model is not as critical, and should be flexible when it comes to decision making process and progress. They also require a level of assurance for the BCC executive management that an appropriate project management methodology is in place. Brisbane City Council (2011c)

Tier 3

These are defined as low profile projects that would have minimal impacts and repercussions for the BCC if the failed to be delivered as planned

3.7 Project Profile Assessment (PPA)

In order for a project to be categorized into its appropriate tier level, the project undergoes a project profile assessment. It is a measurable assessment of a project based on its strategic context, impact on the council and its stakeholders and the difficulties accompanying the procurement and delivery.

Any project over two million dollars must undergo a PPA. The PPA assessment is carried in the form of an interview between the project assurance and capability team that is part of the BCC's City project office and the project owner/project manager. Brisbane City Council (2011b)

Once the interview has been completed the PPA questions are scored and weighted to determine the applicable project governance framework. The criteria are grouped as follows:

- **The strategic content**
    - Establishes how the project fits into the larger picture of the council planning such as
        - Council's strategic plans
        - Funding programs and budget line items
        - Divisional strategic plans

- City wide outcomes- such as ‘effective road network’

- Essentially ask what the justification for the project is, and what external issues may affect it.

- Seeks to find any negative impact that may occur upon implementation such as impacts on

- The community, organised groups, residents and individuals. Brisbane City Council (2011b)

- **Impact and issues on council**
  - Investigates the impacts of the project on BCC as a business by examining the internal issues such as;
    - Potential cost to the BCC as this is a good indication of the size of project. Some cost to be considered are development and planning, land acquisition and project delivery (construction and materials
    - Funding models are investigated to establish if external funding is required or whether the current funding or budget allocation represents the total project scope
    - Examines the general impact on the council’s business such as requirements for training, logistical changes and changes to process and /or systems
    - Are staff and contractors within the BCC effected
    - What business areas are effected by the project especially areas that are negatively effected
    - Delivery time frame is examined to establish if it will be delivered according to a standard, lengthen or compressed time-frame. Brisbane City Council (2011b)

- **Complexities of the procurement and delivery**
  - This examines if there are going to be any delivery issues , both externally and internally to the BCC such as:
    - Experience of the project team in delivery the proposed project
    - If the market is able to supply the needs of the project

- If the market is able to supply the recourses required to complete the market. This includes skilled people and raw materials
- If the organisational resources will be supplied by the BCC or external staff
- Examine the type of delivery model being considered for the project. It covers the funding; procurement strategies and the type of contract (design and construct alliance etc.). Brisbane City Council (2011b)

- **Technical issues, related to the type of project**
  - Examines if the project will depend on an innovative solution or technology.
- **Property & construction related Criteria**
  - Inspects the project scope and how well it has been defined
  - Examines the location or site of the project establishing if it is a new (Greenfield) or existing (Brownfield) site and site conditions
  - If the public require access to the site and to what extent the site will be occupied during the project
  - Identification of site constraints that could affect development of the site such as environmental issues, heritage issues and cultural issues. Brisbane City Council (2011b)

3.8 Project Management Methodology structure

No matter what tier the project has been allocated, the methodology still follows a six phase project lifestyle it just the degree of documentation and accountability that changes under each of these phases. The following can be referenced from Brisbane City Council (2011a)

The Six phases being:

1. **Phase Zero:** Concept development

The purpose of this phase is to:

- Ensure that the project is clearly defined and aligned to council's corporate plan
- Meets best value for money

The mandatory activities of this phase include the completion of:

- Project Budget Proposal
- Complete gateway review
- Ratification of the project tier

Deliverable

- The project proposal

Review

- The purpose of the review is to investigate and guarantee the proposed project budget and:
    - Is aligned with the BCC's corporate plan
    - Outlines the business need
    - Defines the tasks and actions to deliver the objectives
    - Defines the appropriate requirements including plans, schedules, resources and budgets

The review process for tier 1 and 2 project is completed via a formal Gateway review, Gateway review being a formal review that scrutinizes projects at critical stages (or gates) in a projects lifecycle, giving assurance that the project can proceed to the next phase or level. In comparison tier 3 is completed at a divisional level, divisional meaning the project managers own internal section.

Project manager's role for phase zero:

- Manage and coordinate the following:
    - Define the project need
    - Identify the stakeholders and document stakeholder register
    - Prepare the proposed project governance structure, schedule, requirements for resources and risk
    - Prepare project budget proposal

- Project solution options for e.g. the project need might be for a river crossing, the project solution options could include building a bridge, a tunnel, or doing nothing.
- Participate in review zero

This phase concludes with the proposed project budget being approved and confirmation of the project tier

2. **Phase One**: Initial design and planning

The purpose of this phase is to:

- Identify the best solutions to meet the identified needs in terms of
    - Cost
    - Time
    - Benefits to the community, environment and end user group

Mandatory activities for this phase are the completion of the:

- Business Case
- Project Management Plan

Other deliverables for this phase depending on the project include:

- Procurement strategy
- Stakeholder matrix
- Communication and engagement plan
- Risk profile and register
- Feasibility study
- Budget breakdown
- Proposed project schedule

Review:

- The purpose of this review to ensure the right project at the right time, so the required business case requires:

- To be aligned with BCC corporate plan
- Stakeholders support
- Validate best means of project requirements

Role of the Project Manager for Phase one:

- Recruit the project team that may include
    - Contract, finance and planning specialist
- Manage the following
    - Investigation studies
    - Refine budget, governance structure and recourses requirements
- Work with the project owner to identify a best solution option

This phase will conclude with the approval of the business case and project management plan (PMP)

3. **Phase Two**: Detailed design, planning and procurement

The purpose of this phase:

- Further research options/solution as determined in phase 1
- Coordinate and document specific aspects of the projects procurement requirements

Mandatory activities for this phase:

- Completion of the business case
- Completion of the PMP
- Completion of the request for tender/quotation documentation etc and tender evaluation plan
- Undergo a project evaluation from project evaluation group
- Approval from the divisional manager to proceed to the next phase

With the PMP and business case being mandatory in phase 2, they should include the following:

- Market engagement documentation

- The contract used to go to market
- Communication plan
- Procurement strategy
- Risk profile/register
- Break down of the budget and cash flow
- Responsibility schedule
- Variation and issue registers
- Project schedule

Review:

- The purpose of this review is to assess if the project is ready to progress to the market. The business case at this stage needs to demonstrate that:
- The scope is clearly defined
- Recommends a delivery model
- Outlines resources and a budget for the project
- Seeks approval to proceed to procurement and implementation

This review can be completed as a gateway review, project health check or self- compliance activity this is determined by the project owner at the end of phase zero.

Role of the Project Manager for Phase Two:

- Recruit and manage project team
- Manage the following
    - Investigation studies
    - Asset procurement strategy and plan
    - Communication strategy and plans
    - Further define project governance structure, budget, schedule, recourse requirements and risk.
- Develop project delivery options with the project owner
- Mange the communication with the stake holders
- Prepare business case
- Prepare project management plan
- Participate in phase two project assurance review

The project management plan and business case should be approved at the end of this phase.

4. **Phase Three:** Investment decision

The purpose of this phase:

- Involves the engagement and evaluation of the market responses in order to determine best value for money.

Mandatory activities of this phase:

- Business case
- PMP
- The review from the project evaluation group

Output and deliverables:

- Business case
- PMP
- Contract or agreement

Review:

- Occurs when the results of the market evaluation are finalised.
- The purpose of this review is to assess whether the project as defined by the business case:
    - Is still the preferred option and is still viable
    - Endorse that the approved procurement approach as defined in the business case has been followed
    - Management controls are in place for the completion of the project

Role of the Project Manager for Phase Three:

- Manage the following
    - Revision of the procurement strategy
    - The market response evaluation
    - Document the tender evaluation panel
    - Prepare and award the contracts
    - Project risk
    - Communication with all stakeholders

- Prepare the business case
- Participate in phase 3 assurance review

The project management plan and business case should be approved by the divisional manager at the end of this phase.

5. **Phase Four**: Implementation and delivery

The purpose of this phase:

- Manage the implementation of the delivery of the project that is construction or development.
- Mandatory activities for this phase:
- Regular completion of project status reports
- Completion of task required by contract

Output and deliverables:

- Delivery of asset
- Commissioning/testing of the asset and acceptance of the asset
- Project status reports for divisional manager, project owner and stakeholders
- PMP updated that includes any changes made during the implementation and delivery phases
- Updated business case with again any changes made during the implementation and delivery phases
- Risk profile/register updated and maintained that includes any changes during the implementation and delivery phase
- Updated communication and engagement plan with all changes made during the implementation and delivery phase
- Project schedule
- Breakdown of the cost against forecasted cost

Reviews:

- A health check or self-compliance review is carried out to investigate the organisations readiness to make the transition from the specification to implementation.

Role of the Project Manager for Phase Four

- Manage/coordinate the following:
    - Completion of pre-contract requirements e.g. site handover
    - The contract
    - Risk including the risk register
    - Project program/schedule
    - Budget that includes cash flow and variations
    - Communication
    - Scope variations
- Prepare the communication and status reports
- Prepare the commissioning and testing documentation

This phase concludes with an assessment of the asset's fitness for purpose and testing in preparation for the hand-over of the asset in phase five.

6. **Phase Five**: Project finalisation

The purpose of this phase:

- Review and close the project operations, is preformed once the asset delivery and implementation is complete, also involves the finalising of the contract.

Mandatory activities for this phase:

- Completion of the project evaluation review
- Completion of the business case evaluation report
- Completion of the project management evaluation report
- Approval of the divisional manger to close the project

Outputs and deliverables:

- Business case evaluation
- Project management evaluation
- Handover report if required
- Finalisation of the contract
- Capitalisation of the assets

Review:

- This review starts after the project has been completed and closed out and the learning's has been completed
- The purpose of this review is to assess whether the project has:
    - The delivered project is in compliance with what was set out to deliver
    - Objectives and deliverables have been achieved
    - Have the stakeholders received value for money
    - Demonstrates that the business case justification was realistic

Role of the Project Manager for Phase Five:

- Manage/ coordinate the following:
    - The project evaluation review
    - Defect rectification
    - Contract finalisation
    - Handover of asset to operational management
- Practical and final completion as specified by the contract documentation
- Prepare Evaluation reports for the business case and management evaluation
- Handover report preparation
- Participate in gateway review five.

The phase five review closes out with the formal project close out.

3.9 Conclusion

A Project Management Centre of Excellence (PMCoE) has been established within the BCC to ensure that the BCC's Project Managers have all the essential tools required to successfully deliver projects of all sizes and procedural difficulties. The PMCoE is accessed via the BCC local intranet portal which can be accessed by all key personnel that are involved throughout the life of a project.

Projects are first classified according to its overall risk to the BCC and follow the BCC project management methodology known as PM_2. The classification groups range from tier one to tier three, with tier one project being classified as high risk to the BCC and tier three having the lowest risk to the BCC. The tier selection essentially dictates the project governances. The project then follows a phased project life, with the phases starting at zero, the concept phase and finishing at phase five being project finalisation. Interrelated throughout the project phases are the project management functions

based on PMBOK. Being nine in total with the addition of benefits management, for more details on the functions they were discussed earlier in this chapter.

Table 3-1 Tier 1 and Tier 2 project Governance Framework Brisbane City Council (2011a)

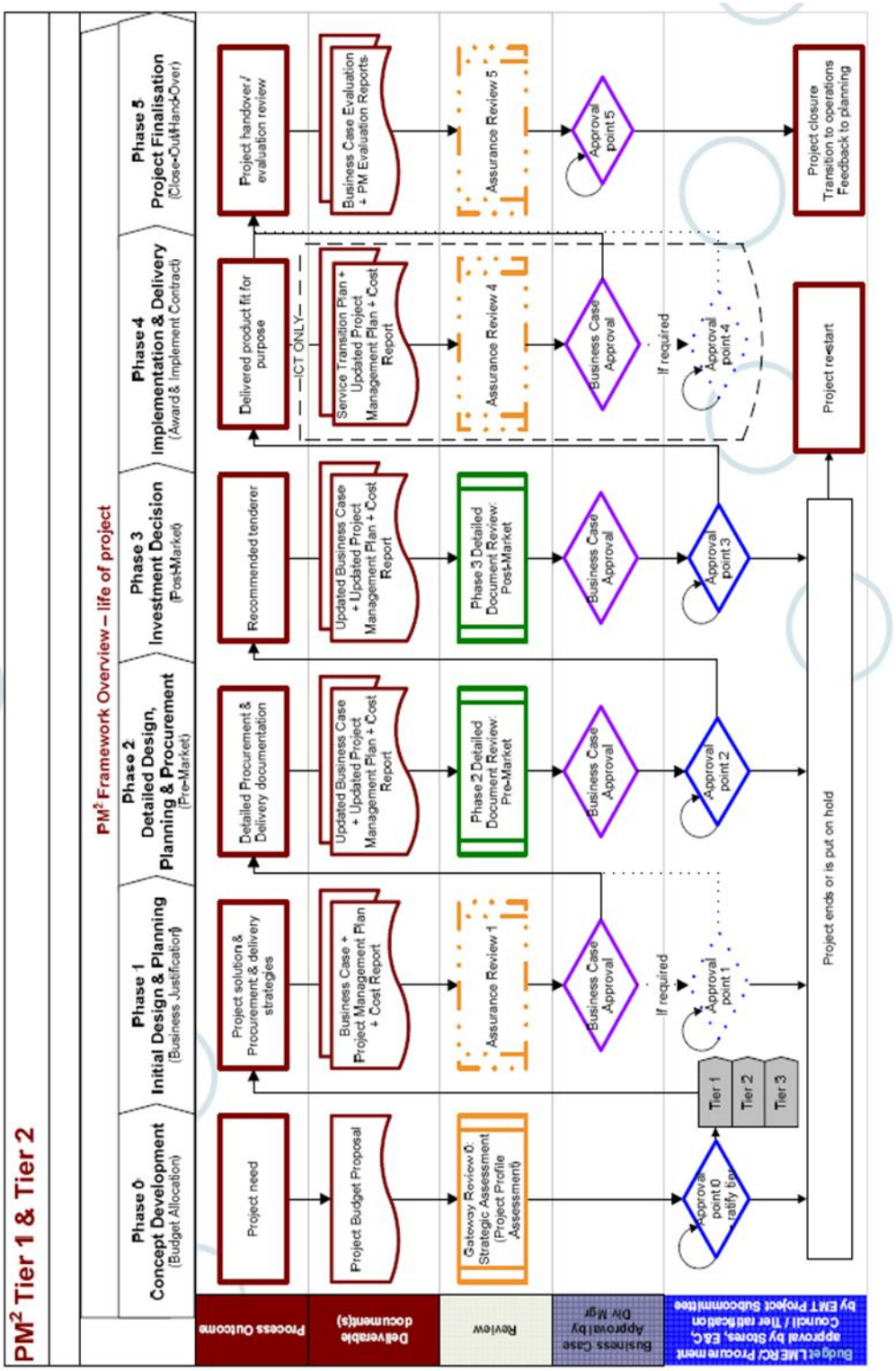


Table 3-2 PM functions Tier1 and Tier 2 Brisbane City Council (2011a)

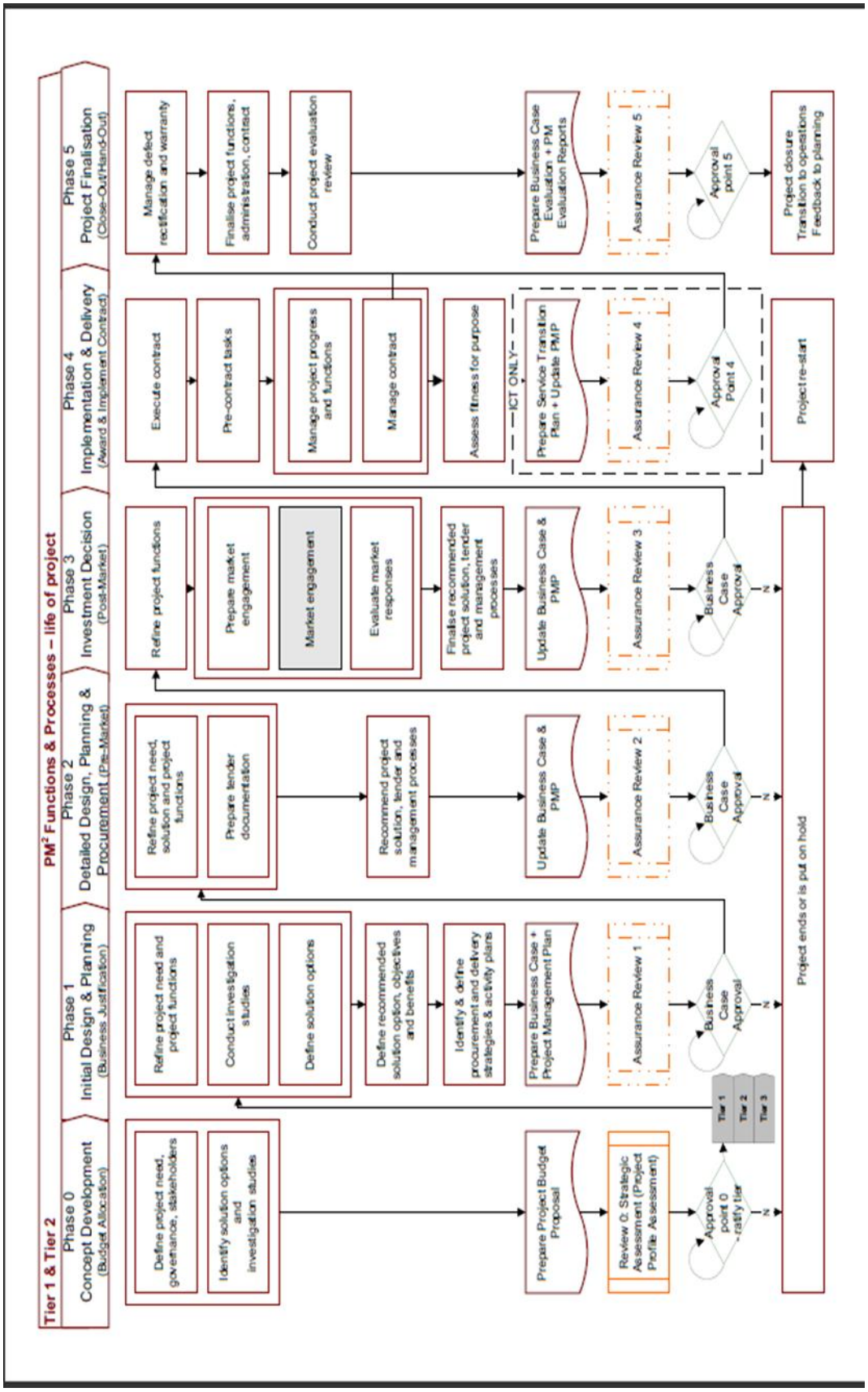
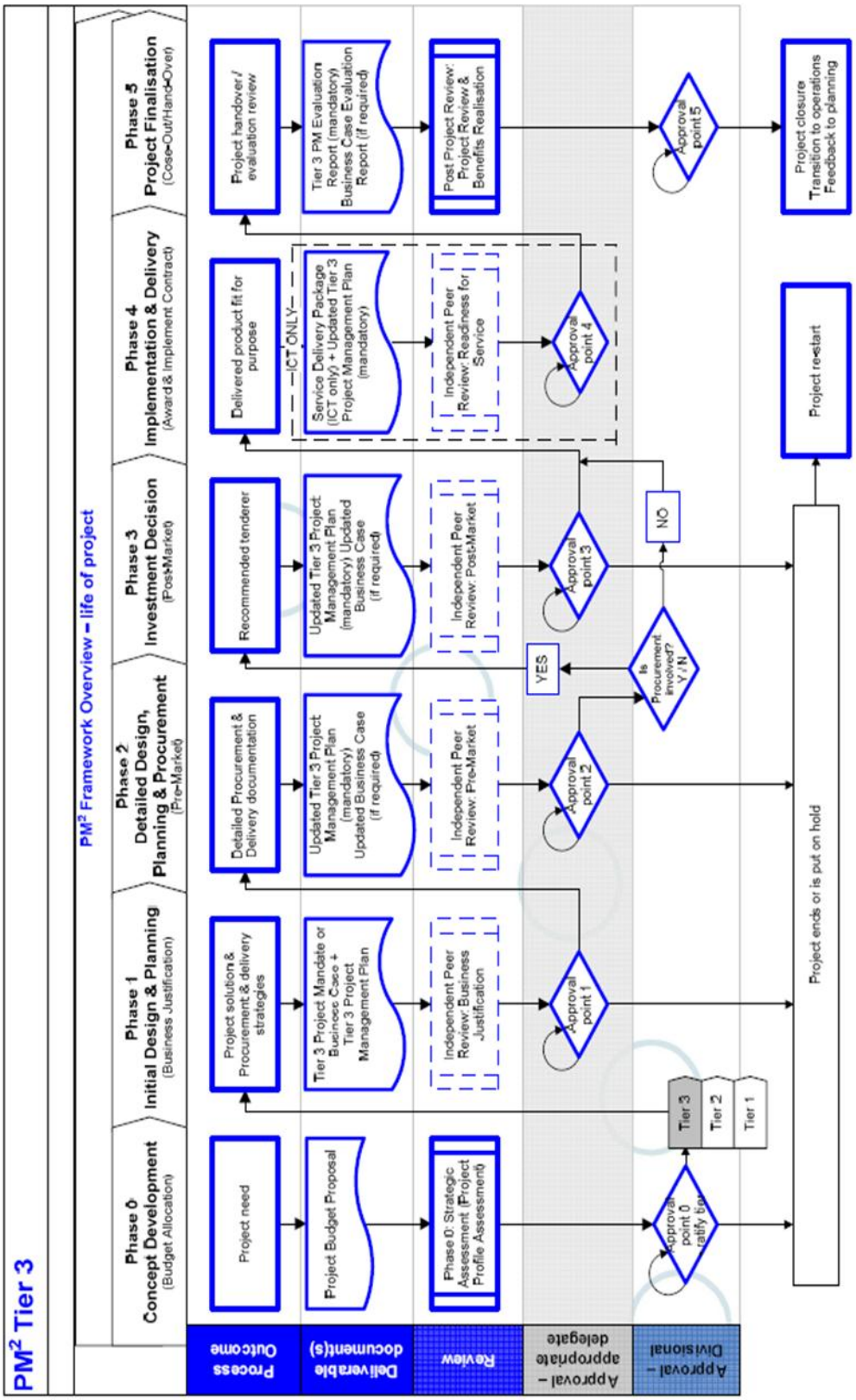


Table 3-3 Tier 3 Project Governance Framework Brisbane City Council (2011a)



Chapter 4 Case Study

4.1. Introduction

Late December 2011 and early January 2011 saw significant flooding occur throughout Queensland, Australia with 75% of the state being declared a disaster zone Nine News (2011) As a consequence of the floods, on the 12th January 2011 the Brisbane River experienced flooding that has not been seen since the 1974 floods, with the river reaching a peak height of 4.46m.(Government 2011). The flood waters converged on 67 Brisbane suburbs resulting in 14,100 Brisbane properties and businesses being affected (Government 2011).

Located within the Brisbane River itself is the infrastructure for one of Brisbane main forms of public transport being the Brisbane Cities CityCat and City Ferry services. These services extend throughout the city reaches of the river having 23 passenger terminals that are placed in carefully selected areas in order to meet a functional requirement. The CityCat and City ferry services operates seven day a week with approximately 16000 trips taken daily Calligeros Marissa (2011).

Post flood inspections were carried out on all 23 terminals 48 hours after the flood peak. The initial reports from the inspection showed that all 23 terminals had some sustained some form of damage, with 10 of these terminals being heavily damaged beyond repair, eight of which were operating passenger terminals the other two being mooring facilities for off peak or overnight mooring.

The heavily damaged operating passenger terminals included:

- University of Queensland , St Lucia, established 1996
- *West End, established 1946
- Regatta, Toowong, established 2004
- North Quay, CBD, established 1996
- Queensland University of Technology, CBD, established 1986
- Holman Street, Kangaroo Point , established 2000
- Sydney Street, New Farm, established 2000

*West End ferry terminal was scheduled to receive a major upgrade in 2011, with flood damage rendering this terminal unserviceable, it was decided to proceed with this upgrade, and repair the other seven damaged terminals as required

4.2. Research Objective

The aim of this project

“Identify strategies for the rapid re-construction of minor capital works that are damaged or destroyed by extreme events and are critical to the running of a city, such as a cities transport system. Use these strategies to form a working model for future rapid rebuilds”

4.3. Case Study Methodology

This Case study was conducted using a three-step approach.

First step, documentation related to the project was scrutinized, such as programming charts, contract documentation, project management plans, meeting minutes and daily construction diary notes.

Second step. Interviewing key personal that were directly involved in the project, by telephone, in person or email.

The identification and position of the interviewed key personnel are as follows:

- **Contact management / Procurement**
    - From the Strategic Procurement office
        - Sourcing analyst
        - Program manager
- **Project management**
    - From the Transport Planning and strategy office
        - Role during project: Project Manager ferry terminal upgrades
- **Construction management**
    - City Design Brisbane Infrastructure
        - Role during project: Contract manager/superintendent
- **Communications**
    - Corporate Communications
        - Role during project: Marking and communications officer

Third step: lessons learnt

According to (Heerkens 2007) one of the best ways to spread benefits of a project beyond the project boundaries and support continuous improvement in project management in an organisation is in the form of a lessons learned study ,therefore; as the third step a lessons learnt workshop will be organised.

An independent facilitator linked to the Brisbane City Councils Project management centre of excellences will be used to facilitate the workshop, for their experience and perception of their non-bias connection to the project. This is in keeping with (Williams 2007) observation that a number of factors correlate with more effective learning, including maturity of use of formal procedures and having a specific department to run lessons learnt.

A major limitation of the workshop was that permission was not provided by the BCC to involve any contractors in the lessons learnt workshop.

Once the lessons learnt workshop was completed, with the assistance of the facilitator the data was correlated. The use of an experienced facilitator was an advantage at this point as according to (Heerkens 2007) if you do not structure your information so that others can actually apply the lessons you've learned, your organisation hasn't really benefited.

4.4. Typical layout of a BCC Passenger terminal:

In order to give the reader an idea of the design of a typical passenger terminal, a brief outline of the main components that make up the Passenger Terminal below are detailed below (also See figure 4-1 for further details).

- The waiting area: this is usually fixed to the river bank, it comprises of lighting, signage, balustrading, seating and electrical outlets.
- Aluminium gangway: Runs from the fixed waiting area to the floating pontoon ranging in lengths on different terminals from15 to 25 metres.
- A steel pontoon that is essentially a steel box that comes in three sections that are bolted together. The size is approx. 10 x 9 x 3metres deep with the thickness of plate being 10mm thick.
- Shade structures, balustrading and electrical services that are connected to the pontoon
- Restraint Piles (steel) and fender panels that are bolted to the restraint panels. (wood)

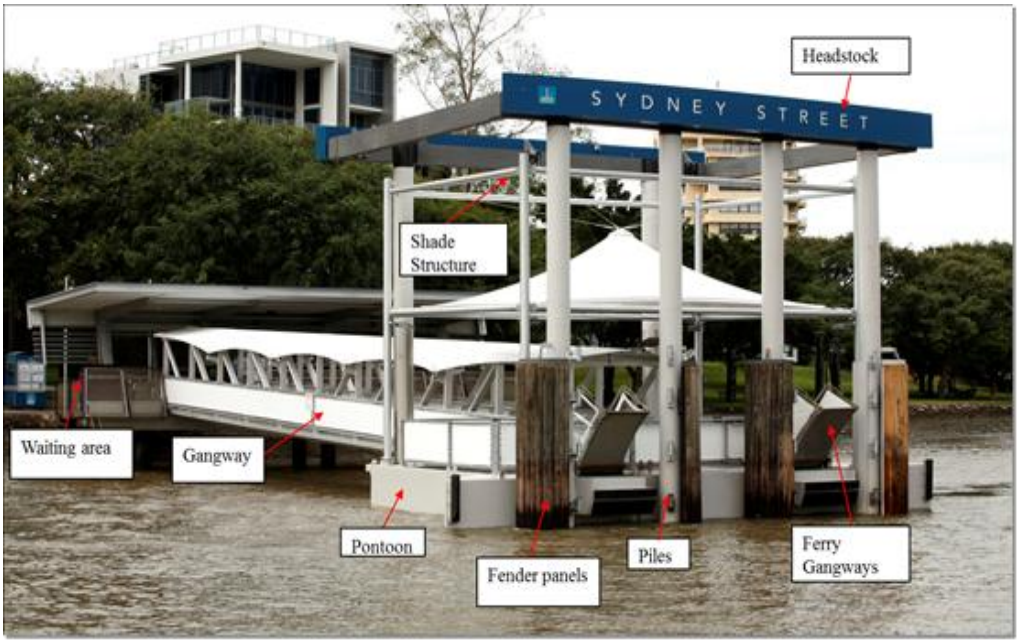


Figure 4-1 Typical Passenger Terminal layout

4.5. Salvage Operations

4.5.1. Outline

This part of the case study will explain the salvage operation that took place prior to the main reconstruction work being carried-out. The salvage operations was included for the following reasons:

- The 57 day re-construction timeframe was only possible by reusing as much of the existing terminal infrastructure as possible i.e. waiting areas and pontoons, therefore; the salvaging operations was important in recovering as much of the damaged terminals as possible so they could be assessed, repaired and reused.
- Second being related to the literature review with Hidayat et al (2010) recognising the importance of the salvage operation as part of the overall recovery phase after a natural disaster.

Salvaging operations would allow the BCC to

- Carry-out a through engineering assessment of the damaged terminal sections once on dry land
- To ensure the areas surrounding the passenger terminals were clear of all debris to prevent any site access problems once re-construction works began.

- Allow the CityCat and ferry terminals to resume operations to the undamaged terminals while repairs were carried out on the others.

4.5.2. Preliminary Assessments

Within 48 hours of the Brisbane River peaking (15 January 2011), Brisbane City Council (BCC) working with other agencies, such as TransdevTSL carried out an inspection of all 24 terminals via boat. Based on these inspections, they prepared a list of locations requiring further inspection and/or retrieval of components or debris.

The initial salvage scope of works was as follows:

- **Dutton Park**

  The pontoon and gangway required retrieval from the floor of the river, then transported to storage facility located at Fisherman Island.

- **University of QLD**

  Pontoon to be removed and then relocated to storage facility located at Fisherman Island.

- **West End**

  Pontoon missing and gangway partially submerged, gangway to be transported to storage facility located at Fisherman Island and the pontoon to be located, possibly by diver and then transported to the storage yard.

- **Regatta**

  Pontoon missing and requiring diving inspection and if found transported to a storage facility located at Fisherman Island.

- **Davies Park**

  Retrieve UQ gangway and transport to storage facility located at Fisherman Island.

- **North Quay**

  Remove all debris (pontoons, boats and large rubbish) and transport to agreed lay down area. Unload and remove existing gangway and transport to storage facility located at Fisherman Island.

- **SouthBank 2**

  Remove gangway caught on pile and transport to storage facility located at Fisherman Island.

- **QUT**

Partially submerged gangway to be removed and relocated to storage facility located at Fisherman Island.

- **Holman Street**

Retrieve the sunken pontoon and then transport to storage facility located at Fisherman Island.

- **Sydney Street**

Retrieve the sunken pontoon and then transport to storage facility located at Fisherman Island.

- **New Farm**

Remove sunken private gangway then transport to storage facility located at Fisherman Island

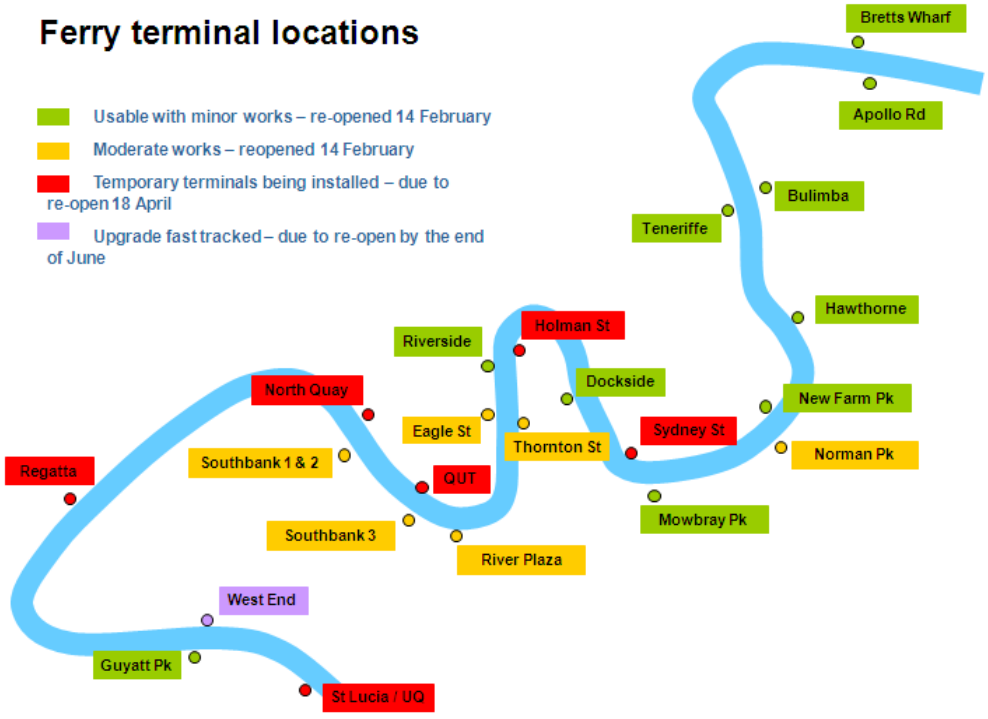


Figure 4-2 Terminal locations and damage assessment

4.5.3. Procurement

On the 20th January 2011, BCC sent out a salvage proposal brief, contract number E110138-10/11, to all the contractors registered on the BCC pre-qualified register. The salvage brief provided the contractor with the following:

- The project purpose
- Objectives of the project
- A broad scope of works
- The contract type and conditions
- The communication guidelines
- And the deliverable required by contractor.

Within 24hours of sending the salvage proposal brief out to contractors, BCC had received and assessed the submitted tenders.

The tenders were assessed by a team of council officers, using the standard BCC tender assessment matrix that scores each tender submission against already pre-determined weightings based on their importance within the contract. The matrix values for the salvage works evaluation are outlined in table 4-1 below. In this case the weighting of the team capability and project cost were the highest.

The procedure and formula used to select Value for Money Matrix (VFM):

- The values for each criteria weightings are discussed and decided during the pre-tender phase of the project
- Received tender documents are then examined by each member of the tender evaluation panel and scored accordingly

  1 Very Poor, non-existent
  2 Poor, very basic
  3 Average, lacking depth and detail
  4 Good understanding, key elements included
  5 Excellent, detailed ,capable

- The criteria scores are then multiplied with their individual weightings

- All scores for each criterion (once multiplied against their weighting values) are added together and then divided by five, which subsequently gives a raw score for criteria.
- All raw scores are then added to give a total weighted non price score, with the highest score winning.

Table 4-1 Salvage Tender evaluation Matrix Salvage

		Contractor name	
Mandatory		**Acceptable (Y/N)**	**Comment**
maritime construction projects that have been completed within the past 5 years			
Pre-checking		**Completed (Y/N)**	**Is Clarification Required?**
Financial Statements			
Statement of Non-compliance			
Minimum Insurance			
Legal Actions			
Evaluation Criteria	**Weighting**	**Raw Score**	**Comment**
Project Team capability and resources	**30%**	**0.00%**	
Key personnel	5%	0	
Team Capabilities	5%	0	
Adequacy of Team Numbers and Availability	5%	0	
Plant and Equipment	15%	0	
Price	**50%**	**0.00%**	
Company Capability and Experience in Maritime Construction	50%	0	
Project Program / efficiency	**10%**	**0.00%**	
Project Program	10%	0	
Methodology demonstrating understanding of Council's Specifications and general requirements	**10%**	**0.00%**	
Methodology demonstrating understanding of Council's Specifications and general requirements	10%	0	
Company polices and commitment to Health Safety & Environment and Quality Assurance, Systems and Control	**0%**	**0.00%**	
WH&S	0%	0	
Environment	0%	0	Submited with previous tender
QA	0%	0	Submited with previous tender
Commercial	**0%**	**0.00%**	
Financial Statements	0.0%	0	SPO to Score
Non Compliances	0.0%	0	SPO to Negotiate
Total Weighted Non Price Score		**0.00%**	

Due to the vague scope of works and noting also that the scope of works may increase or decrease based on the results of further diving inspections, it was difficult for the contractors to supply a lump sum price. At the same time it was difficult for the BCC to supply an accurate scope for the overall salvage project. Therefore, a schedule of rates contract, in this case essentially a cost plus contract, was awarded to Smithbridge Australia Pty Ltd with an overall 20 day time line.

The contract used for the Salvage operations was a standard ‘minor works high risk’ contract; this can be downloaded directly from the BCC website. <http://www.brisbane.qld.gov.au/payments-eservices/tenders/conditions/tenders-advertised-before-1-june-2010/index.htm>

The contract included the following items

- Works instrument of agreement
- Works contract conditions
- Salvage brief.

To minimise as much risk as possible to the BCC, the contractor was supplied with a list of the minimum deliverable required for the works, these were as follows:

- Proposed Plant and equipment to be used
- Propsoed other resources to be used
- Proposed Personnel including roles and responsibilities
- Basic methodology to undertake diving operations, lifting operations, marine movements
- Site of proposed laydown area
- Insurances and other requirements of the Contract documentation
- Proposed program
- Hourly **and** Daily rates for:-
    - Key personnel
    - Divers
    - Barges (including generators and other ancilaries)
    - Cranes
    - Tugs
    - Laydown area (Daily only)
    - Other resources required by the Contractor

- **Salvage Works**
    - Working hours shall be 6:30am to 6pm Monday to Saturday, working outside these hours required superintendent authorisation

- Daily reports were required by 4pm each day. These were to detail the happenings of the day and a schedule of hours for other resources used such as divers and tug boats
- Final summary report

4.5.4. Site works

Smithbridge started salvage operations on the 24 January 2011, with the main scope being to remove large debris that was currently inhibiting safe operations at the terminals, as well as remove and relocate damaged or unattached ferry terminal structures for reahabilitaion and repair**.** Other works where to be confirmed by ongoing diver inspections.

To undertake all the salvage works, Smithbridge utilised their 48m x 24m, 519 tonne crane barge '*Maeve Anne'*, which included a 200 tonne crawler crane mounted on a 20m x 10m area strengthen deck at bow (see figure 4-3). In addition to '*Maeve Anne'* a smaller Flat Top Barge (figure 4-4) was used for transporting the salvaged materials and off-loading the salvaged materials at the loading facility at Fisherman's Island.

The flat Top barge, once loaded to capacity via Maeve Anne, was assisted to the unloading facility with the aid of a tug boat. In trying to keep cost at a minimum, the tugs were called upon when required. Potential scheduling problem with the Tugs being in high demand was overcome with an agreement between the tug boat operators, contractor and the BCC that the BCC Salvage works would take precedent over any other works being carried out in the river by the Tugs. The Tugs still required appropriate notification, however as long as Smithbridge provide enough notice to the tug operator's no issues arose and transportation occurred in a timely manner.

To undertake all the underwater salvage works, Smithbridge engaged a local diving crew who operated from a separate craft to the barge. These divers played a critical role during the salvage operations. The divers operated in terrible diving conditions with no visibility underwater, however they managed to successfully salvage all the sunken pontoons and gangways without incident.

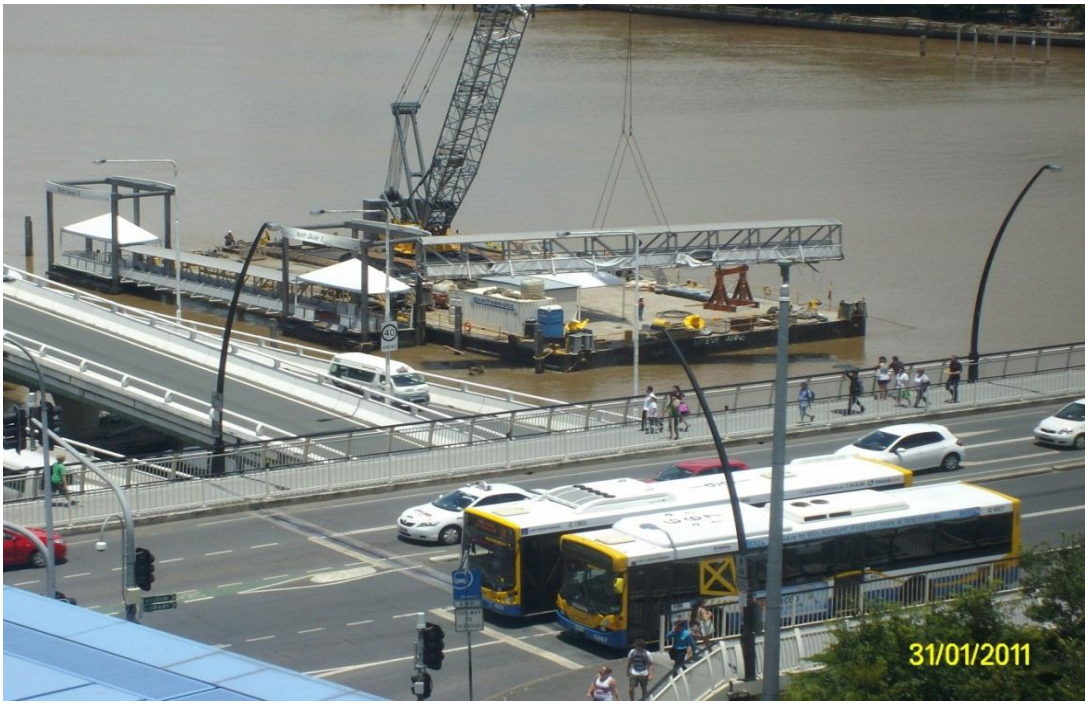


Figure 4-3 519 Tonne Crane Barge 'Maeve Anne' removing Gangway from North Quay

The Brisbane City Council had a representative on the barge at all times during the salvage operations. This was essentially for four main reasons;

- As the contract was based on a schedule of rates (Cost Plus) it was important to observe and document hours worked by the contractors, divers and the tug boats. These notes were weighed up against the contractor's payment schedule prior to sign off and payment.
- Ensure care was taken removing the sections of infrastructure so as not to cause further damage (as mentioned previously the BBC wanted to reuses as much of the existing Infrastructure as possible for the rebuild)
- Maintain a constant line of communication between the salvage operations and BCC management.
- Ensure all works are carried out in a safe manner and in accordance with all the contract documentation.
- Have a BCC representative on the barge to communicate with the public if required.

Figure 4-4 small flat top barge used for transporting salvaged materials to Fisherman's island

Figure 4-5 Retrieval of sunken pontoon from Brisbane river during the 2011 flood, being loaded onto the *'Maeve Anne'*

Figure 4-6 Salvaged Gangway from University Of Queensland

4.5.5. Completion of salvage works

Even though the salvage operation was continuously changing scope from day to day with reports from the divers finding additional debris not initially recorded on the original scope of works, the salvage operations completed works one week ahead of schedule and 25% under budget.

4.6. Reconstruction of the Passenger Terminals

4.6.1. Outline

This part of the case study will cover the actual rebuilding of the salvaged passenger terminals. The planning was well under way for the reconstruction of the salvaged terminals prior to the actual salvage operation concluding. As mentioned previously in this report, it was important to try and reuse as much of the damaged terminals as possible as the timeline for completion would not allow for a total rebuilding of all of the passenger terminals. Therefore, BCC engaged an external engineering consultancy firm "Architects Engineers Consultants Operations and Maintenance" (AECOM) to try and gauge what part of the terminals could be reused and what had to be scrapped and rebuilt from scratch. This was determined by inspections of the salvaged components at the landing area located at Fisherman's island, which was located at the mouth of the Brisbane River.

4.6.2. Final Repair assessment (Scope)

Holman Street Ferry Terminal

- Piles
    - Replace 12 timber rubbing strips on existing piles (i.e. piles not being replaced)
    - Repair and re-install recovered fender panel
    - Replace 2 turning piles
- Pontoon
    - Blast and paint pontoon.
    - Repair/replace pontoon furniture (balustrades, handrails etc) as required (like for like) to return to pre-flood condition.
    - Repair/replace pontoon roof structure
    - Install pontoon on site
- Gangway
    - Fabricate and install new 23.1m gangway
    - Fabricate and install new gangway hinges to waiting area
- Waiting Area
    - Repair concrete around gangway hinges
    - Replace 2 balustrade panels, associated handrail and balustrade posts as required
- Services (Access ramp, Waiting Area, Gangway and Pontoon)
    - Replace all electrical cabling and conduits
    - Replace all light fittings
    - Replace all GPO's

University of Queensland, Ferry Terminal

- Piles
    - Replace 15 timber rubbing strips on existing piles
    - Reattach fender panels hanging at incorrect angle
    - Replace 1 terminal sign located on the pontoon pile frame

- Pontoon
    - Blast and paint pontoon.
    - Repair/replace pontoon furniture (balustrades, handrails, timber floor boards etc)
    - Repair/replace pontoon roof structure
    - Install pontoon on site
- Gangway
    - Fabricate and install new 16.8m gangway
- Waiting Area
    - Remove remaining ceiling lining and clean ceiling cavity with fresh water (including removal of debris)
    - Replace ceiling lining
    - Replace 3 balustrade panels, associated handrail and balustrade posts as required
    - Replace aluminium floor panels adjacent to the gangway transition plate
    - Replace 2 damaged roof struts

Sydney Street Ferry Terminal

- Piles
    - Fabricate and -install new fender panel
    - Replace 1 turning piles
    - Replace 2 pontoon restraint piles
    - Replace 4 fender piles
- Pontoon
    - Blast and paint pontoon
    - Repair/replace pontoon furniture (balustrades, handrails etc) as required (like for like) to return to pre-flood condition.
    - Repair/replace pontoon roof structure
    - Install pontoon on site
- Gangway

    - Fabricate and install new 23.1m gangway
    - Fabricate and install new gangway hinges to waiting area
- Waiting Area
    - Repair concrete around gangway hinges
    - Replace 3 balustrade panels, associated handrail and balustrades posts as required
- Access Ramp
    - Replace 2 balustrade panel, associated handrail and balustrade posts as required
- Services (Access ramp, Waiting Area, Gangway and Pontoon)
    - Replace all electrical cabling and conduits
    - Replace all light fittings
    - Replace all GPO's
- Electrical Cabinet on Land
    - Test all incoming lines
    - Replace all breakers and switches
    - Replace GPO's
    - Replace security equipment

Regatta Ferry Terminal

- Piles
    - Replace 40 timber rubbing strips on existing piles Replace 2 turning piles
    - Replace 2 pontoon restraint piles
- Pontoon
    - Blast and paint pontoon.
    - Repair/replace pontoon furniture required (like for like) to return to pre-flood condition.
    - Repair/replace pontoon roof structure
    - Install pontoon on site

- Gangway
    - Fabricate and install new 23.1m gangway
    - Fabricate and install new gangway hinges to waiting area
- Waiting Area

- Replace ceiling lining
- Replace 10 balustrade panels, associated handrail and balustrade posts as required
- Replace mesh to 1 balustrade panel
- Repair damaged concrete around gangway hinges and transition plate
- Repair damaged roof flashing

- Access Ramp
  - Refix stainless steel mesh to 2 balustrade panels
- Services (Access ramp, Waiting Area, Gangway and Pontoon)
  - Replace all electrical cabling and conduits
  - Replace all light fittings
  - Replace all GPO's
- Electrical Cabinet on Land
  - Test all incoming lines
  - Replace 3 phase outlet on the outside of the cabinet (32 amp)

QUT Ferry Terminal

- Piles
  - Replace 8 timber rubbing strips on existing piles (i.e. piles not being replaced)
  - Repair/paint corroded sections of piles
  - Replace 1 turning pile
- Pontoon
  - Design fabricate and install temporary pontoon
  - Temporary pontoon to have BCA compliant handrail
- Gangway
  - Fabricate and install new temporary aluminium gangway and fixed walkway section
  - Repair damaged concrete headstock
- Services (Access ramp, Waiting Area, Gangway and Pontoon)
  - Replace all electrical cabling and conduits
  - Provide adequate lighting (LED) to fixed walkways, gangway and pontoon

North Quay Ferry Terminal

- Piles
    - Replace 40 timber rubbing strips on existing Replace 1 turning pile
    - Replace 1 terminal sign located on the pontoon pile frame
- Pontoon
    - Refurbish
- Gangway
    - Fabricate and install new 23.1m gangway
    - Fabricate and install new gangway hinges to waiting area
- Waiting Area
    - Wash down waiting area to remove debris
    - Replace damaged support column
    - Replace 2 balustrade panels and associated balustrade posts as required
    - Replace mesh to 1 balustrade panel
    - Replace gangway transition plate
- Services (Access ramp, Waiting Area, Gangway and Pontoon)
    - Replace all electrical cabling and conduits
    - Replace all light fittings
    - Replace all GPO's
    - Replace 4 light fittings on the outside face of the waiting area slab
    - Replace 3 fluorescent lights per pontoon
    - Replace 5 fluorescent lights on the pontoon gangway
- Electrical
    - Replace all electrical wiring
    - Replace 4 GPO's

4.6.3. Procurement

Prior to the flood occurring in late 2010, the BCC had let/signed several contracts for the construction of several new passenger terminals. During the tender period for the new terminals the BCC worked with the tenders to establish a prequalified register panel for future marine construction works (panel number A110141-10/11). The panel consisted of a

list of pre-qualified contractors that had been assessed for capacity, quality, financial capacity, commitment to health and safety and past contract history. The panel had a lifespan of two - five years.

The initial 2010 contracts awarded for the construction of the new terminals where consequently withdrawn after the flood event. This was due to the changed circumstance and the rapid reconstruction of the temporary terminals taking precedents over the construction of the new terminals. After negotiations with the effected contractors, the BCC paid the contractor compensation for lost Project management cost, plus product and material purchase costs.

With the new register already established prior to the floods, the BCC utilized this in order to go the market for the rebuilding of the temporary passenger terminals.

The BCC issued a brief, design specification and contract to all the prequalified Maritime construction companies on the 1 February 2011.

The Brief provided these companies with the following key information:-

- Objectives;
- Scope of Work;
- Contract conditions;
- Base Bill of Quantities; and
- Deliverables

Proposals were received from all four companies by 5pm on 8 February 2010.

Evaluation of the proposals were carried out by the

- Contract Manager, City Design
- Project Manager , Ferry Infrastructure
- Procurement Specialists, Strategic Procurement Office

With additional input from

- Principal Project manager, Capital Procurement Efficiency Program
- Program Manager, Capital Procurement Efficiency Program

The contract standard used for the rebuild was AS4902 design and construct contract, it was

a guaranteed capped cost contract with risk and reward provisions. It was also established, that it was possible to reduce the capped cost as the full details were made available of the scope for each terminal.

In order to achieve the desired completion of the Ferry Terminal reconstruction of 16 April, it was negotiated with the contractor Waterways (WW) Pty Ltd, that:

- The contractor will place at risk $ 50,000 per terminal for each terminal that has not achieved practical completion by 28 April, 2011, and,
- The Council will pay a bonus of $ 50,000 per terminal that achieves practical completion on or before 16 April, 2011.

Evaluation

A tender evaluation plan was approved on the 7 February 2011 based on an evaluation using the Value for Money (VFM) method using the same format and formula as used in the salvage operation.

For evaluation purposes the contractors were requested to provide the following deliverables

- Understanding of the Scope;
- Basic methodology to undertake the works including the efficiencies of interaction between the design team and the Construction team;
- Proposed Plant and equipment;
- Proposed other resources including sub-contractors;
- Proposed Personnel including roles and responsibilities;
- Insurances and other requirements of the Contract documentation, if not already submitted to Council;
- Proposed program per seperable portion, with end date of 28 April 2011; and
- Rates for the base Bill of Quantities

The proposals were evaluated on the following criteria shown in the table below:

Table 4-2 VFM table for construction works

		Contractor name	
Mandatory		**Acceptable (Y/N)**	**Comment**
maritime construction projects that have been completed within the past 5 years			
Pre-checking		**Completed (Y/N)**	**Is Clarification Required?**
Financial Statements			
Statement of Non-compliance			
Minimum Insurance			
Legal Actions			
Evaluation Criteria	**Weighting**	**Raw Score**	**Comment**
Project Team capability and resources	**20%**	**0.00%**	
Key personnel	5%	0	
Experience in the Management of Maritime Construction Projects - D7.3	0%	0	
Adequacy of Team Numbers and Availability	0%	0	
Plant and Equipment	5%	0	
Strategic fit	**25%**	**0.00%**	
Strategic Fit into overall scope of works	25%	0	
Project Program	**25%**	**0.00%**	
Project Program	25%	0	
Methodology demonstrating understanding of Council's Specifications and general requirements	**30%**	**0.00%**	
Methodology demonstrating understanding of Council's Specifications and general requirements	30%	0	
Company polices and commitment to Health Safety & Environment and Quality Assurance, Systems and Control	**0%**	**0.00%**	
WH&S	0%	0	
Environment	0%	0	Prequalified tenderer
QA	0%	0	Prequalified tenderer
Commercial	**0%**	**0.00%**	
Financial Statements	0.0%	0	SPO to Score
Non Compliances	0.0%	0	SPO to Negotiate
Total Weighted Non Price Score		**0.00%**	

Once evaluation had been completed Waterways Constructions Pty Ltd had the highest non-priced weighted score. They agreed to absorb the risk of all design liability, using the appropriate plant and equipment to undertake the works. Therefore they were the recommended tenderer and subsequently were approved and awarded the contract on the 15 Feburary 2011.

With the huge amount of materials and resources required for the rebuilding of the passenger terminals and the extremely tight timeframe, it was important to ensure the contractor had

the opportunity to start procurement activities as early as possible once awarded the contract. Therefore, on Friday the 11th of February 2011, the Stores Board, (a group of high level managers (including the CEO) within the BCC, who assess proposals and authorize or decline proposals accordingly), authorized the commitment of the procurement of components of the Ferry Terminals to a value of $ 2.0 million to the Waterways Constructions WWC Pty Ltd.

4.6.4. Rebuilding Activities

The reconstruction of the passenger terminals was somewhat more complicated than the salvage operations. Whilst both where important and essential in their own right in in meeting the completion date, the rebuilding of the passenger terminals involved a great deal of different areas of expertise including aluminium fabrication/welding, electrical works, piling, painting, and the manufacturing of shade sails etc. Therefore; it was critical that WWC engaged a construction team that included subcontractors who were both efficient and had the resources to complete their contracted works.

The team of subcontractors who WWC engaged for the project was; see table 4-2

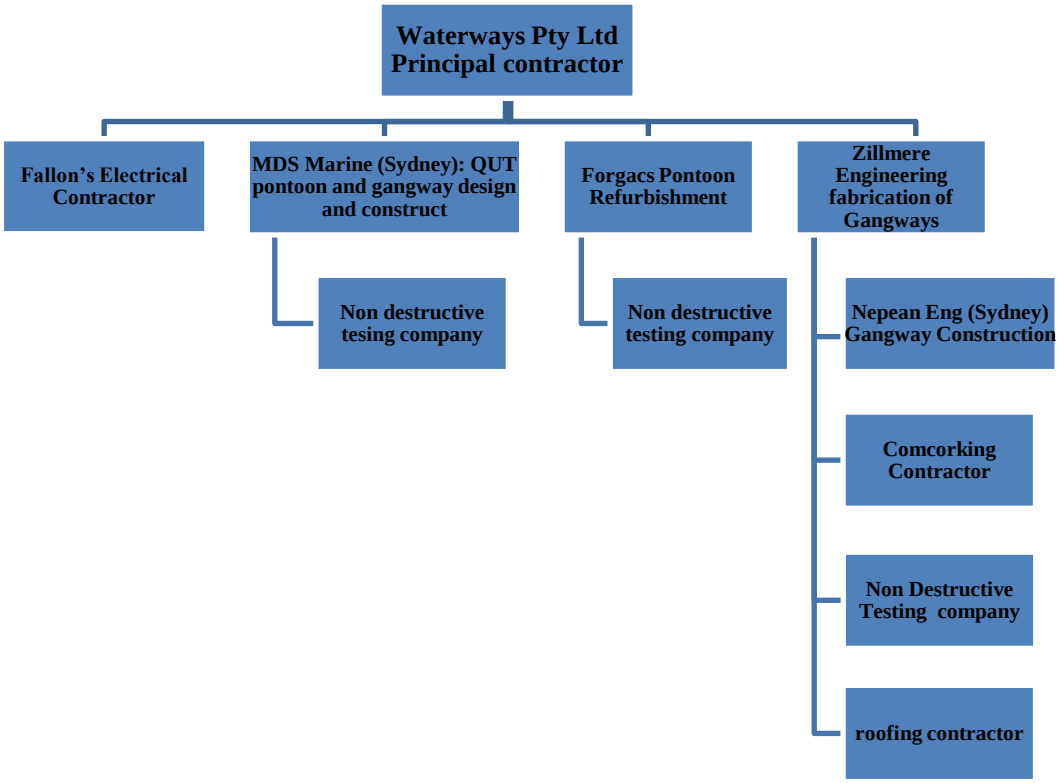
- Zillmere Engineering:
    - Construction of the five Aluminium gangways and associated fittings.

- Forgacs:
    - Refurbishment/repair of pontoons
    - Stainless steel balustrading
    - Fabrication of steel piles
    - Pressure testing of the pontoons

- Fallon's electrical
    - All electrical works on the passenger terminals

- MDS Marine
    - Design and construct new pontoon and gangway for University Of Queensland

Table 4-3 Contracting hierarchy



BCC in-turn established a team of council officers, who would manage, inspect and communicate on behalf of the BCC for the duration of the project. The individual team members were specifically selected for their skills; this would allow minimal supervision and training prior to carrying out their intended roles. In other words the ream will "hit the ground running" ensuring the project was constructed as fast as possible.

The BCC team was as follows see table4-3:

- Programme manager
    - Reports to the upper management on progress
    - Authorizes budget expenditure during the project
- Project manager
    - Attempts to adhere to the PM_2 methodology explained in chapter 3, as this is a rapid reconstruction all steps stipulated in the PM_2 methodology may not have been followed, this will be followed up in the conclusion.

- Two Superintendents
    - Acts as the link between the contactor and principal when any contractual issues arose during the project
    - It was agreed prior to construction to have two superintendents for the duration of the project,
        - One for approval for the construction side of the project such as variations, payments, extensions of time (EOT) and site instructions for the entire project.
        - One for contractual issues/negotiations –due to the high risk involved in the project it was important that any decision regarding the overall contract were made by an appropriate qualified officer. Therefore, the second superintendent had the authority to approve or deny any issues related directly to any direct contractual issues.

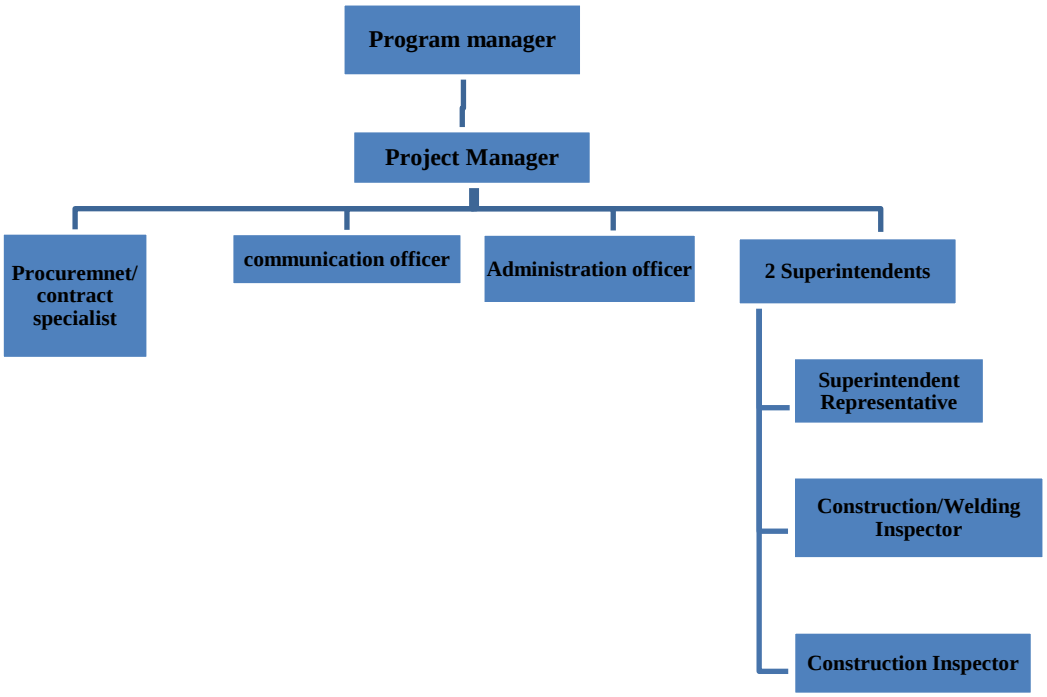
- Superintendent Representative (SR)
    - Acted on behalf of the superintendent on site when required, had the authority to issue site instructions under the contract only. All other instructions were to be issued by the superintendents themselves.
    - Main role being to oversee the actual re-piling of the effected sites and electrical works

- Construction/Welding Inspector
    - Main role was to inspect and report on all fabrication and welding works including the refurbishment of the pontoons. Ensured all the components had been constructed and tested to the appropriate standards prior to handover.
    - Later in the project inspected reconstruction of the terminals on site
- Construction Inspector:
    - Carried out site inspections, and was also in charge of procurement activities as required e.g. Signage for the terminals
- Procurement/Contract Specialist Officers
    - Established the original contractual documents for the project
    - Acted as the second superintendent on the project as discussed above.
- Communication officer
    - Provide daily updates to the program manager

- Mail outs to local residents affected by the construction works
- Provided Media updates as required

- Administration officer
  - Administration duties as required
  -

Table 4-4 BCC hierarchy for rebuilding activities



Design for replacement:

As the reconstruction of the passenger terminals was to be constructed using a "like for like" methodology, this ruled out nearly all major design works having to be completed. The University of Queensland terminal was the exception, being the only terminal that had to be designed and constructed, with the drawings having to be inspected by BCC and signed off by a Registered Practising Engineer Queensland (RPEQ) before construction commenced.

The "like for like" reconstruction allowed WWC to utilise the 'as constructed drawings' from the previous construction of the terminals. This was especially advantageous with the construction of the gangways as Zillmere Engineering had been the company to fabricate the

initial gangways and had all the approved drawings in archive. This was also important for another reason as the BCC had failed to have the ‘as constructed drawings’ for the gangways and pontoons archived from when they were originally constructed.

With the pontoons, the BCC were able to source the original drawings, but these drawings failed to supply details of the stainless steel balustrading and shade structure layout design on the pontoon. Therefore, WWC where required to piece together the layout of the balustrading and shade structure from the damaged balustrading and shade structures and hold down points on the salvaged pontoons.

The reconstruction of the passenger terminals started on the 17th February 2011 with WWC mobilising three barges to start works:

- “Pandala” Crane (10 tonne) Barge for minor works
- “Coomera” Crane (24 tonne) Barge for multipurpose works
- “Sterling” Crane (65tonne) Barge for piling

With a fourth “Kochi” Crane (150tonne) Barge for pile extraction and heavy lifting to be required further into the project.

Figure 4-7"Kochi" Crane Barge on the Brisbane River 2011

WWC utilised Forgacs dry dock and mooring facilities located at Morningside Brisbane for their main area of operations, as well as to offload and load components of the passenger terminals as required.

While the above barges carried out specifics task on the river, WWC subcontractors had to complete their part of the program as follows:

Gangway construction

One of the major challenges of the project was the fabrication of the five aluminium gangways. The first major issue was related to material supply, with the specified aluminium not being a stock item, therefore any aluminium ordered was required to be extruded, aged up to 48 hours and tempering to T6 grade, and then tested. Testing can take up to five days to get results. To ensure this did not affect the programme WWC arranged for the material to be progressively delivered whilst testing was proceeding on the other materials.

To meet the program Zillmere arranged for production of the gangways to be undertaken at both the Zillmere workshop in Brisbane (on a 12hr x 7day basis), and in their Sydney workshop (Nepean Engineering on an 18hr x 7day basis). Nepean Engineering was to fabricate two gangways with all the components of the gangways being pre-cut by laser to their appropriate sizes by Zillmere and delivered to Sydney who in turn fabricated and welded the gangway main frames. The frames where then transported by road to Brisbane to be fitted out.

With the project having to be constructed under rapid conditions it was critical to ensure that the quality of construction was maintained throughout the production of the gangways. To achieve this, the quality system employed by Zillmere (and replicated by Nepean Engineering) included:

- inspection and test plans
- weld mapping
- all welding and testing to AS1165-2004 (NDT was carried out by an independent NATA endorsed inspection company)
- BCC specified additional NDT outside of that specified by the codes, to be carried out during production.

Zillmere also constructed a 30mt long acid bath to wash down the completed gangways to ensure repassivation of the aluminium surface in the weld areas.

Installation of the electrical cabling, flooring, roofing, and light fittings where carried out in the Zillmere yard. Once fitted out the gangways were then transported to the Forgacs yard for WWC to load and transport to site by barge.

The BCC welding and construction inspector carried out regular inspections at the Brisbane workshop, and also travelled to Sydney to carry-out inspections of the works at Nepean.

A meeting involving Zillmere management, BCC superintendent and the welding inspector where held every Monday morning at Zillmere's Brisbane workshop to go over the program and discuss any possible risk to the program.

All the above documents were audited weekly by a BCC representative, and at practical completion (PC) Zillmere were required to submit all QA documents as part of the PC handover documentation.

Figure 4-8 Gangway construction in Sydney workshop

Figure 4-9 Gangway construction in Brisbane workshop

Figure 4-10 Ultrasonic testing of welds on Gangways

Pontoon refurbishment

The salvaged pontoons where transported from the salvage storage area located at Fisherman's Island to the fabrication yard at Forgacs. The pontoons where stripped of all balustrading, com-corking material (anti-slip floor covering), cleaned out, sealed and then subjected to pressure testing and assessed for leaks on the outer shell of the pontoons.

The repairs required where mainly caused by tearing around the hold down bolts for the shade structures, balustrading, damage caused by debris hitting the pontoons and overall wear and tear.

Figure 4-11 repaired section of pontoon were hold down bolts were pulled through

As with the gangways, Forgacs were required to maintain a quality system for all works carried out on the pontoons, this included:

- Inspection and test plans
- Weld mapping
- All welding and testing to the structural steel welding code AS1554.1 2009 (NDT was carried out by an independent NATA endorsed inspection company)
- BCC specified additional NDT to be carried out during production
- Painting certificates
- Pressure test certificates

The above documents were audited weekly by a BCC representative, and at practical completion Forgacs were required to submit all QA documents as part of the handover documentation.

Once the pontoons where repaired, they were subsequently sandblasted, then pressure tested and if approved, sandblasted again and painted with Interzone 485 to 1500 microns (Colour Grey) using Forgacs own painting facilities. The main framework for the shade structures was installed on the pontoon at the Forgacs fabrication yard and then the pontoon was floated and transported to site via a tug.

Figure 4-12 Pontoon section being repaired

Figure 4-13 Pontoon sections being painted

Piling

Under normal circumstances Council would have undertaken geotechnical investigations / inspections to confirm the river bed ground conditions. However, due to the tight timeframes in this instance the inspections could not be completed. Luckily, the driving depths were within the tolerance of the designs, no floating rocks / obstructions were encountered and where possible the same drive holes were used to mitigate this risk.

The construction of any new steel piles where completed by Forgacs. The construction of the new piles followed the same QA procedures as the pontoons with the welding and fabrication to AS1554.1-2009 and painted with Interzone 485.

To also meet the new flood height level classification some of the existing piles in certain locations had to have their heights extended. This was achieved through welding of an additional section to the existing sections, with the weld undergoing the appropriate NDT requirements.

Figure 4-14 Vibrating pile into place at North Quay

Terminal site works

During inspections during the salvage operations it was discovered that the head stocks on some of the terminals had occurred cracking in the areas where the pile connects into the headstock. Depending on the degree of cracking the headstock were repaired on site or subsequently the headstock had to be removed and repaired at the Forgacs fabrication yard than later returned and re-welded into position.

Once the pontoons and gangways were fixed into position the overall fit out began, that included the comcorking of the pontoon and gangway flooring, shade sales for the pontoon, electrical lighting for the waiting areas and pontoon/gangways , the stainless steel balustrading with the material in-fills and the replacement of the timber fender panels on the piles.

The greatest concern for the site works was the fabrication of the stainless steel balustrading on the pontoons, with no official drawing to go off WW had to use the initial hold down bolts for the stanchions as datum points as well as consult with the transdev maintenance crews and Citycat operators to ensure the balustrading was in the correct and safe position.

QUT pontoon and gangway

With the QUT terminal being completely destroyed and unsalvageable it was decided the fasted option was to design and construct a new temporary pontoon and gangway. MDS Marine, located in Sydney NSW, was used to design and construct the entire structure.

The pontoon was designed and built using a relative new design that allowed for rapid construction. The material used for the pontoon itself was MDS Marine Polyethylene floatation modules approx. 1800Ltr, F2700 foam filled with closed Cell Polyurethane. These modules were bolted together than encase by an RHS steel frame and poly fenders connected to the outside of the pontoon.

Figure 4-15 floataion modules used to construct pontoon for QUT terminal

Figure 4-16 Constructed QUT pontoon

The gangways and balustrading were constructed from aluminium and had to adhere to the BCC QA documentation requirements such as ITP, weld testing and weld mapping.

Figure 4-17 QUT Gangway in position

Even though this was a design and construct project, WW allowed the BCC officers to review the design once the design was completed, allowing the Ferry terminal operators to have input to the design to ensure a safe and to avoid any last minute design changes. The BCC also had officers visit the Sydney workshop to carryout inspections of the fabricated works and overall progress.

The fabrication of the pontoon and the two gangways for QUT started on the 19 October 2011 and was completed and delivered by the 4 April 2011. The pontoon required further buoyancy attachments be fitted on site as the initial designed pontoon did not pass the original Citycat docking test it was too unstable in the water. Consequently MDS had several of their workforces travel from Sydney overnight and had the pontoon repaired and safe for operation in a day. The final design was certified by an RPEQ arranged by WW and MDS Marine.

Programming

One of the major challenges of the project was the fact that the project was affected by many variables such as priorities changing (mainly due to political motivations), material delays, unfavourable tidal conditions for the barges and resource availability; these had the effect of changing the project by the hour. Therefore it was essential that Project Manager was regularly updated regarding the program by all his team and the principal Contractor WW.

The Project Manager had to try and balance work and meetings, with the tight time frame it was important that the key personal were not taken from their roles on a regular basis to answer questions regarding the program this would also include the WW Project Manager. Therefore the BCC Project Manager had an office meeting every morning with the BCC team going over the program ensuring all possible risk were discussed as well as try to discuss the proposed work for the day ahead, the team members would also provide photos (electronically uploaded) and a daily diary showing the previous day's work. Regarding WW, BCC had a fixed meeting, one day a week (Monday) with WW's Project Manager and Construction manager, who would travel from Sydney to attend. Here WW would provide a Microsoft Project Gant chart showing the proposed work for the coming week and discuss any issues or risk.

With the daily updates from the BCC team and the weekly meeting with WW, the BCC project manager was able to maintain control of the program.

Communications:

It was important to ensure all levels of external and internal stakeholders were constantly aware and up to date with the projects progress. To carry this out the project manager engaged the services of a dedicated communications officer. The communication officer developed a communication plan that essentially had three main elements that would be implemented throughout the various phases of the project, these were:

1. Ensure all stakeholders receive up-to-date information ensuring consistency around the construction scope, project status and programming. One of the ways this was achieved was by maintaining communication flows with key government and industry agencies, such as TransLink.

2. Provide the community with the opportunity to provide feedback regarding the

project. This was achieved by proactively identify issues and responding to community enquiries, complaints and issues within 48 hours of identification.

3. Actively promote the reinstatement of the temporary terminals citywide, displaying BCC commitment to the flood recovery. To try and meet this element was to design and produce a range of activities and materials that are audience-specific to inform residents of ferry terminal recovery efforts, construction impacts and terminal reinstatement.

Practical completion (PC)

To reach practical completion the passenger terminals had to meet the following criteria.

- Had to pass a CityCat docking test
    - Involved a CityCat pulling up to the pontoon as they normally would, tie off on the pontoon and load and off load passengers. Provide a load testing on the turning piles using the CityCat and then finally having a Work Health and Safety officer representative from ferry operations to inspect pontoons. This also involved a wheelchair test on the new QUT terminal.

- Be signed off on BCC check list
    - This list for most terminals had up to 70 items to be checked and co- signed by representatives from WWC, BCC ferry Infrastructure, BCC ferry operations and TransdevTSL.

- RPEQ sign off
    - Prior to each terminal being open to the public they had to be inspected and subsequently signed off by an accredited RPEQ. In this case Forest Systems Australia Pty Ltd was used.

Practical completion for all five terminals was finally granted on the **15 April 2011 at 6.00pm.**

4.7. Conclusion

The reconstruction of the passenger terminals occurred over two distinct phases being the salvage of the destroyed terminals and then the actual construction and re-instalment of the destroyed passenger terminals. Both of the phases achieved the outcomes as specified by the contractual documentation, and in both cases even exceeded sections of the contractual documentation by completing the phases prior to the dates specified within the contract, while still maintaining a high level of safety and quality throughout the project.

Even though the BCC will look upon this project as being successful, if it wasn't for a degree of luck during the project the outcome could have been much different.

An example of several instances follows:

- The BCC having gone through the process of setting up a panel of prequalified marine contractors, prior to the floods occurring, for the construction the proposed new passenger terminals, subsequently this panel was used for the flood recovery of the passenger terminals.

- The fabrication drawings for the gangways were not archived by the BCC as they should have been from when the gangways were previously constructed. If it wasn't for the contractor tracking down the original fabricator of the gangways, the BCC would have had to go through the long process of designing and then drafting of the gangways. This in itself would have drastically put the 90 day construction period at risk.

Even taking the above into account, the managing of the project still required a great deal of managerial skills and innovative thinking. This was particularly evident with the procurement team utilising different contractual methods, such as cost plus and bonus clauses to achieve the required outcomes. Their procurement method also essentially cut down the procurement program from approx. 100 days to 11days.

Bai et al (2006) revealed success factors for the rapid reconstruction of a road bridge as being, the spirit of corporation among the parties involved in the project was high, creating a partnership atmosphere builds trust, improves communications, reduces conflicts and helps overcome government bureaucracies and other adversaries during the reconstruction. These

success factors could be mirrored when you look at some of success factors that enabled the success of the overall project.

Figure 4-18 Sydney St before and after

Figure 4-19 Holman St before and after

Figure 4-20 Regatta before and after

Chapter 5 Lessons learnt

5. Introduction

(Heldman 2002) notes that Lessons learned can be some of the most valuable information you'll take away from a project. They'll also prevent repeat mistakes in the future if you take the time to review the project documents and lessons learned prior to undertaking your new project.

There are many factors that contributed to the success of the rapid reconstruction of the passenger terminals. In order to document what was learned from this extreme event a lessons learnt workshop was conducted shortly after the completion of the project that included all the key personnel involved in the project. Notwithstanding the terrible consequences of the actual flooding, the terminal destruction could provide useful lessons for the BCC and other government agencies in order to plan for future incidents of this type.

An independent facilitator linked to the Brisbane City Councils Project management centre of excellences was used to facilitate the workshop, due to their experience and participants perception of their non-bias connection to the project. This is in keeping with (Williams 2007) observation that a number of factors correlate with more effective learning, including maturity of use of formal procedures and having a specific department to run lessons learnt.

Once the lessons learnt workshop was completed, my-self and the facilitator correlated the data. Again I needed help correlating the data due to my lack of experience in this area and according to (Heerkens 2007) if you do not structure your information so that others can actually apply the lessons you've learned, your organisation hasn't really benefited.
The following is a summary of the lessons learnt.

5.1. Salvage

5.1.1. Scoping:

What went well according to the lessons learnt participants:

- Immediate site visits after flood that included industry experts in marine construction and ferry operational teams.

- Scoping document allowed for flexibility to make scheduling easier
- Established a cross-functional team with a range of capabilities

What didn't go well according to the lessons learnt participants:

- Components salvaged were stored on private land owned by contractors, BCC were subsequently charged for storage.
- Scoping should have focused on whole of BCC instead of individual components (River walk, Community Pontoons, Ferry Terminals). This would have allowed the salvage contractor to have completed entire salvage operations apart from just the passenger terminals. Consequently three contracts were awarded for salvage operations within the Brisbane River.

What would you do differently (Future improvements):

- Take a program approach (whole of BCC) rather than a project approach
- BCC were not sure on what required storage for Insurance purposes and what could be scrapped. More detail required by insurance representatives and to be communicated prior to salvage operations
- A dedicated BCC site for material and storage

5.1.2. Planning

What went well according to the lessons learnt participants:

- Proactive in engaging stakeholders
- The procurement of the salvage contractor was completed within a week.
- A logical approach to salvaging and inclusion of contractor in planning
- BCC carried out the scoping of repairs of all terminals, in parallel to engineering inspections, carried out by a consultant Engineer, therefore; saving time in waiting for a repair report to come from the consultant.
- Proactive engagement of Communications team, this ensured the public and BCC management was regularly updated on the salvage operations

What didn't go well according to the lessons learnt participants:

- Internal and External (MSQ) Stakeholders were not informed to give BCC advice and therefore it took time for DERM to supply emergent works.
- Dealing with a perception that it is council's responsibility to clean the river where it is actually the Queensland State Governments responsibility.

What would you do differently (Future improvements):

- Disaster recovery plan should include river recovery & be communicated to stakeholders
- Agree roles & responsibilities of stakeholders ie create service level agreements
- Confirm who is responsible for disaster recovery plan
- Combine all existing flood reports and feed into disaster recovery plan and communicate to all areas

5.1.3. Procurement

What went well according to the lessons learnt participants:

- Ability to leverage off of existing approved pre-qualified contractors to fast track rebuild
- Not many problems along the way risk minimised through risk workshops prior to salvage operations.
- Good Team built to meet deliverables from an engineering perspective
- Dedicated procurement resource
- Acted quickly to get to market
- Contingency was high but risk was allowed due to the speed to deliver

What didn’t go well according to the lessons learnt participants:

- Lack of knowledge/understanding of some strategic procurement officers to the project requirements and urgency, therefore caused roadblocks when approvals were sort.

What would you do differently (Future improvements):

- Minimise approval requirements for Recovery process
- Review financial delegation for flood recovery

- Don't go through procurement board for approval go straight to CEO and stores board.

5.1.4. Execution

What went well according to the lessons learnt participants:

- Time saved by not having the scoping document go through relevant processes, such as those stipulated by PM_2 and Gateway.
- Having a full time Council rep on barge to enable quick decisions to be made.
- Good contractor being flexible and getting project done
- Having additional work that contractor was interested in bidding for, therefore BCC was able to use this as leverage in negotiating
- Regular communication to the public and internally
- Having a designated communication officer
- Dropping off debris to parks and having LAS retrieve from parks
- Community perception and media worked well
- Proactive communication
- Relationship with state government stakeholder (MSQ) was exceptional ie. Both being proactive in salvage operations and providing help when required.

What didn’t go well according to the lessons learnt participants:

- Daily reports used a lot of time that the Project manager should have been spending on the actual project
- Limitation of tug boat support would have been good to have a designated tug for the entire project, but due to cost and availability this was not possible.

What would you do differently (Future improvements):

- Exception reporting rather than daily reporting
- Identify Council land for storage to not incur additional costs

5.2. Rebuild Activity:

5.2.1. Scoping:

What went well according to the lessons learnt participants:

- Established a cross-functional team with various capabilities
- Having continuity of resources for tender evaluations, Procurement methodology
- Early start to scoping and working with contractors to determine what needs to be done
- Salvage activities happened early to provide scoping of rebuild activities
- Able to get design drawings from original designers and able to get shop drawings from fabricator
- Were able to reuse, salvage pontoons, and "Fenders etc. as part of the rebuild

What didn't go well according to the lessons learnt participants:

- North quay shop drawings didn't depict what was physically there on site
- It was fortunate that the shop drawings were able to be secured from the contractors as BCC did not have the original terminal as-constructed drawings archived
- On previous projects BCC hasn't been capturing trial hole and geo technical information.
- Three days from opening of all terminals, the QUT fixed walkway that was left out of the original scope had to be added at the last minute, and required extensive repairs
- Issues with contractor's views of what was to be accomplished during the project
- Did not fully scope out the Fendor panels required (piles)
- Scope didn't include provision for pressure testing of the pontoons

What would you do differently (Future improvements):

- More time to fully scope out project
- More vigorous approach to advising decision makers
- 'As con' plans need to be captured and stored appropriately
- Consider more holistic view on solution to consider future works
- Previous damage to assets needed to be repaired; therefore regular maintenance to be carried out regularly on all passenger terminals.
- Scope needed to include better detail quality requirements e.g. pressure testing on pontoons and weld testing.

5.2.2. Planning

What went well according to the lessons learnt participants:

- Good effort to deliver within the tight time frame of 90 days
- All the team even though from different locations all established a ‘control centre’ and all worked in this one area for the duration of the project

What didn’t go well according to the lessons learnt participants:

- Change in timeframe, from delivering one pontoon in 90 days to delivering the six was very poorly handled by senior management and politicians.
- DERM & QRA guidelines to rebuild emergent works were not advised quick enough

What would you do differently (Future improvements):

- As the team was made up of different sections of the BCC they all had different filing systems therefore the BCC should have a broader configuration management approach to project documentation filing and archiving

5.2.3. Procurement

What went well according to the lessons learnt participants:

- Able to create an incentive payment to contractor to achieve the 90 day deadline
- The principal contractor engaged the same contractor, who previously did the fabrication of the Gangways, this was very critical to the overall outcome of the project.
- Fortunate to have adequate and qualified resources to work on the team and support the team when required
- Handling of contract management negotiations and signing was handled well

What didn’t go well according to the lessons learnt participants::

- Detailed document agreements were not captured as well as they could have been
- Contractor did not understand AS4902 document as well as they should have, causing unnecessary tension between contractor and BCC representative.

What would you do differently (Future improvements):

- Several times during the project verbal agreements were made between different partiers to be later denied or misinterpreted, therefore, ensure all critical verbal decisions are detailed and documented.
- Provide contractor with education on expectations of AS4902 contract.

5.3. Execution

5.3.1. Piling

What went well according to the lessons learnt participants:

- All piles were installed as per requirements
- Same contractor put in all the piles therefore consistent
- Quality was excellent, having weld tested and painting tested
- Piles were procured to plan
- Changing the colours of the paint - couldn't get original colours, Council approved new colour quickly
- Piles procured matched the length of the piles that were taken out - was unsure if drawings were up-to-date

What didn’t go well according to the lessons learnt participants:

- One pile at Holman Street was cut off at the wrong level by the contractor (turning pole) - possibly surveyor wasn't consulted thoroughly
- One pile at Regatta, when it was going in there was a problem with the position by about 200

What would you do differently (Future improvements):

- Ensure a surveyor is on site at all times when beginning the job (client side) - Hold point
- Is it worth Council having their own surveyor on site - independent expert?
- Verify length of piles if possible before cutting new ones and/or have spare tube available in case the drawings were not correct and pile length didn't match the drawings

5.3.2. Pontoons

What went well according to the lessons learnt participants:

- Rebuilt to higher quality than original
- Subcontractor (Forgacs) had the in house capability and capacity to do everything that needed to be done on the pontoon including painting
- Adequate onsite supervision for prioritisation of work

What didn't go well according to the lessons learnt participants:

- Scope change from what originally required (i.e. like for like) went to a higher standard.
- Subcontractor painting facility needed to be able to be climate controlled - to ensure quality of paint job and allow wet weather painting.
- As this work was really a one off, the subcontractor had to maintain their other work and subsequently towards the end of the project their urgency started to fade on the pontoons
- There was confusion as to whether pressure testing was supposed to be conducted

What would you do differently (Future improvements):

- Asset management condition assessments need to document condition of the asset (in detail) - they don't currently provide detailed to the level required.
- Need to define the condition that an asset will be allowed to degrade to before action is taken
- Consider long term plan for subcontractor and suppliers for ferry infrastructure
- Possibly include a provision for pressure testing in the scope document for future work

5.3.3. Gangways

What went well according to the lessons learnt participants:

- Subcontractor had previously constructed the exact same gangways as what was required.
- High level of quality from the contractor
- Inspections were carried out regularly at the Brisbane and Sydney fabrication Workshops by BCC officers

- Meetings held every Monday morning at the Brisbane fabrication workshop regardless, to ensure program on track.

What didn’t go well according to the lessons learnt participants:

- Capability of Brisbane to build the asset, having to go to Sydney for gangways and QUT passenger terminal
- Assumption made that the North Quay gangway was supposed to be the same as the Regatta gangway as they did not have the shop drawings, therefore modifications were required once on site.
- The drawings did not include covers over the gangway rollers

What would you do differently (Future improvements):

- Confirmation of holding actual shop drawings - perhaps need to ensure that shop drawings are including in the handover process
- Verify dimensions for each gangway for each site via surveyor
- Any modifications to the structures need to be captured in documents and 'as constructed' drawings and fed back into design.

5.3.4. Waiting Area:

What went well according to the lessons learnt participants:

- Most waiting areas were not significantly damaged (only 1 was significantly damaged - UQ)
- Work required was scoped very well and very few variations
- Division of labour - brought in the operation (Trans Dev) to do a lot of the cleaning works to allow the contractor to do concentrate on construction works
- Sites kept very secure during rebuild day and night

What didn’t go well according to the lessons learnt participants:

- Areas that couldn't easily be seen e.g. within ceiling cavities, resulted in extra work to do that included extra costs
- Didn't engage internal stakeholders (LAS) early enough, therefore there was a rush toward the end to have landscaping completed around the terminals.

What would you do differently (Future improvements):

- Condition reports in future might consider including roofing in their maintenance regime (TransDev)
- Ferry ops team to investigate better reporting on Asset condition from TransDev
- Independent inspections need to be more thorough (i.e. check the roof and the guttering) to better inform the scoping process prior to going to market
- Ensure the brief/condition report is in a standard format for independent inspections
- Engage internal stakeholders (LAS) earlier in the process

5.3.5. Electrical

What went well according to the lessons learnt participants:

- Energex were very helpful - built a relationship very quickly and case put forward was very robust
- Direct engagement with members of disaster committee, helping in acquiring key external contacts for recovery works e.g. Energex

What didn’t go well according to the lessons learnt participants:

- Main contractor took a long time to procure light fittings and replacement fittings
- Feedback from contractor shows they felt they didn't have enough time to scope and procure
- Contractor didn't have an established electrical subcontractor or internal expertise in delivering requirements - hence steep learning curve
- Access to QUT electrical board inhibited progress

What would you do differently (Future improvements):

- More clearly define the distribution boards in the scoping document - Ferry ops team to go back to "Fallons" to inventory electrical.
- Look at options for standardisation of electrical requirements for ferry terminals
- Make sure BCC has contacts/relationships with external projects occurring near/around Council Asset projects. This was due to an external contractor (not involved in the reconstruction) installing cabling in and around one of the terminals, shutting of power for an extended period.

- Where possible separate independent electrical connections to be established
- Prioritise electrical works and ensure sufficient continuity of focus and sufficient time for testing and fault finding
- Have an electrical engineer on the reconstruction team to provide definition of scope during scoping stage

5.4. Resources

What went well according to the lessons learnt participants:

- Took their time in putting the right team together
- Team was brought together and were all aligned to deliver this project.
- Selected contractor had the resources to be able to deliver - capability and capacity
- Were able to combine contracts (Passenger Terminals and the floating river walk) making it worthwhile for the contractor to float their major barge from Sydney to Brisbane to be used.
- Communication within the team was streamlined and efficient. Having meetings every morning and providing daily diaries every day.

What didn't go well according to the lessons learnt participants:

- Delivery model was different to standard Council protocols - this met some barriers in terms of stakeholders being on board

What would you do differently (Future improvements):

- In future consider partnership type arrangement (target cost)
- Look at identifying different delivery models depending on the environment and prioritisation of project type
- Project delivery team needs to be removed from the operational constraints and requirements (ie attending non critical non project meetings should not be required during project delivery)
- Bringing in the right expertise/specialists at the right time (e.g. electrical engineer)

5.5. Communications

What went well according to the lessons learnt participants:

- Dedicated Communications resource
- Shared email folders - removed silo effect
- Communication officer sitting with Ferry Infrastructure team
- Communication officer attending project meetings with contractor
- Weekly communication meetings and reports
- Development and circulation of communication plan
- Early approval of communication key messages
- Letters to residents – fast approval, print (internal) and distribution
- Web updates for launch of terminals
- Temporary signage – speedy turnaround by BT workshop, stickers for updates

What didn't go well according to the lessons learnt participants:

- Approvals process. Delays in approvals (manager, Chair). Newsletter (2 weeks for copy), final ads (nearly missed artwork deadline), IMAP. Needed to be flexible.
- No set format/description of signage required and where on each terminal

What would you do differently (Future improvements):

- Provide a copy of a project plan including the dates to the program area contacts at commencement of project and as updated
- Be clear about communication timeframes for design, production etc.
- Incorporate key communication deadlines in overall program area schedule
- Include both Ferry Operations & Ferry Infrastructure in communication meetings
- Communication items drawn from previously approved content should be considered approved (e.g. social media, web, contact centre briefings) without further process
- Define clear instruction/definition for signage on terminals (materials, format, colours, styles)

5.6. Other

What went well according to the lessons learnt participants:

- Procurement was focused on achieving results in contract negotiations while Superintendent was able to focus on delivery.
- Separation of responsibilities between the two superintendents

- Appropriate probity activities conducted so no holdups on project
- Decision making process was quick
- Project team was empowered to make decisions on the spot (where appropriate)

What didn't go well according to the lessons learnt participants:

- Some project team members having a degree of uncertainty about certain aspects of their role within the project team.
- No standardised project management tools/systems to run overall project.

What would you do differently (Future improvements):

- Risk workshops need to include all reps/stakeholders - review of risk register - to feed into lessons learnt report.
- Project needs to clearly understand the need for a probity process on their projects and clearly define what that process is.
- Standardise Project Management tools/system

5.7. Analysis of lessons learned

When carrying-out the analysis of the lessons learnt workshop the connection with the several findings from the literature review quickly became evident and have been provide below.

- BCC having no site for storage of salvaged materials, therefore subsequently paid to have the salvaged material stored. Were (da Silva 2010) suggest the importance of the selection of appropriate sites for reconstruction. The BCC could benefit by having land set aside for the sole purpose of recovery projects.

- Jo da Silva (da Silva 2010) noted that pressure to commence reconstruction and limited resources means budgets and timescales prevail and insufficient consideration is given to establishing a clear definition of quality.

  Producing high Quality workmanship and subsequently quality documentation during the project held as much relevance for the BCC as other key project items such as budget and time scale. This was evident by the engagement of an inspector for the sole purpose to monitor quality throughout the project and allowing travelling interstate to inspect quality.

- Jo da Silva (2010) calls for a detailed understanding of local governance structures, regulatory framework. To overcome this BCC engaged a specialised procurement officer who had a thorough understanding of the current BCC governance, regulations and procurement process enabled the project to be fast tracked through relevant approvals

Other suggested points affecting the speed of reconstruction noted by (Hidayat et al. 2010) are:

- Organisation of reconstruction
    - BCC met this:
        - If it wasn't for the fact that the BCC, previously to the floods, were in the progress of negotiating with several Marine Contractors for the construction of new Passenger Terminals having essentially already established several key roles within the construction organisation.
- Roles of parties should be carefully arranged
    - BCC met this by:
        - The Project Manager selected a team of suitably qualified officers after assessing the damage and work type to be carried-out. The only negative was no electrical specialist on the team.
- Coordination and communication between all parties
    - BCC met this
        - Engaged a sole communication officer within the team
        - Meetings with the team members held daily and contractors weekly
- Local government organisations must help construction agencies overcome bureaucratic problems. (Hidayat et al. 2010)
    - BCC met this:
        - "Like for like" reconstruction allowed for re-building to start without having to apply for the appropriate environmental and other legislative

approvals. DERM provided an exemption certificate for like for like reconstruction.
- The partnership atmosphere built trust, improved communications, reduced conflicts, and overcame the bureaucracies and other adversities during the reconstruction

- Use established contracting methods and procedures, utilizing both traditional contracting methods, such as cost plus, time and materials, and lump sum (Bai et al. 2006). Olawale and sun (2010) also argue that poor contract management is one of the main variables that causes contract delays (Olawale et al. 2010).

    - BCC met this by:

        - Used the already established prequalified panel allowing rapid procurement of contractors and also implementing a risk and reward provision into the contractor.
        - Using a cost plus contract for salvage operations.

Olawale and sun (2010) noted that design change is the single most important factor considered by practitioners as hindering the ability to control not only time of construction projects but also cost.

- As the construction was a ‘like for like’ there were minimal design changes required during the project through the use of the as-constructed drawings (provided by the contractors), subsequently this also found inadequacies within the current BCC procedure for archiving of any as-constructed drawings after a project has been completed. With no drawings existing for the previously constructed terminals being on record.

Pena-Mora and park (2001), argues to meet a faster schedule an increase in work hours, either buy hiring more workers or working overtime.

- The contractors worked up to 18hr x 7day to complete the gangways.

5.8. Conclusion

The lessons learnt workshop provided essential material needed in establishing an appropriate platform for the BCC to build off for future rapid rebuilds. It showed that even though the project objective was achieved there are still a lot of areas were the BCC still requires further work to be able have a smooth transition from the everyday construction works to rapid reconstructions projects.

Only limitation on the lessons learnt is the fact that the contractors were not involved in the lessons learnt process due to contractual issues at the time. Involving them in another lessons learned workshop would provide extra weighting behind the overall findings of the workshops.

Chapter 6 Model

6.1. Introduction

To effectively carry-out a rapid rebuild it is important for government organisations to have an established documented disaster management plan (Hidayat et al. 2010). These plans and policies should ensure there is provision in the relevant legislation and local Governance requirements to allow for post disaster construction instead of providing a barrier to the reconstruction process. (Masurier. et al. 2006). A good example of providing provisions within the legislation was during the reconstruction of the passenger terminals. DERM provided an exemption certificate allowing 'Like for Like' reconstruction of the terminals without having to apply for design approvals and environmental approvals.

This chapter will provide a rapid reconstruction model that has been established from the previous

- Literature review
- Case study of the rebuilding of the passenger terminals
- And the lesson learnt

The model is based around the phased lifecycle used within the BCC and the four key disaster management phases as specified by Alexander (2004) focusing on number one and four:

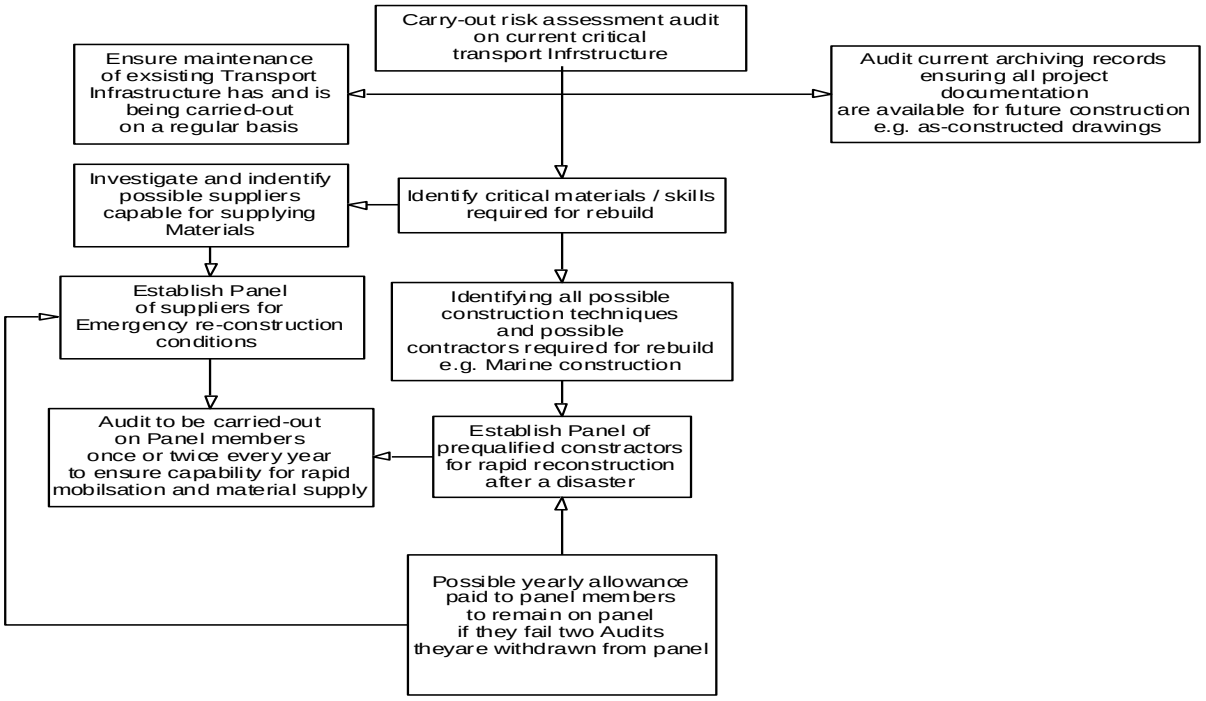
- Mitigation: Non-structural plans to reduce the impact of future disasters
- Recovery : Reconstruction activities

6.2. Mitigation

This model outlines possible steps that can be taken to reduce the impact of a disaster in terms of reconstruction. It essentially is based around establishing a panel of prequalified suppliers/contractors who are selected from the results of an audit on the cities essential civil infrastructure. The panels are used after a disaster and therefore any supplier/contractor on the panel have to undergo an audit once or twice a year to ensure of their capabilities for rapid mobilisation. It would also be beneficial to pay the companies on the panels to maintain the gear required for rapid mobilisation.

The use of prequalified panels were successful during the reconstruction of the passenger terminals by decreasing the procurement process significantly and ensuring the contractors used are of high quality.

Table 6-1 Mitigation model for emergency situations



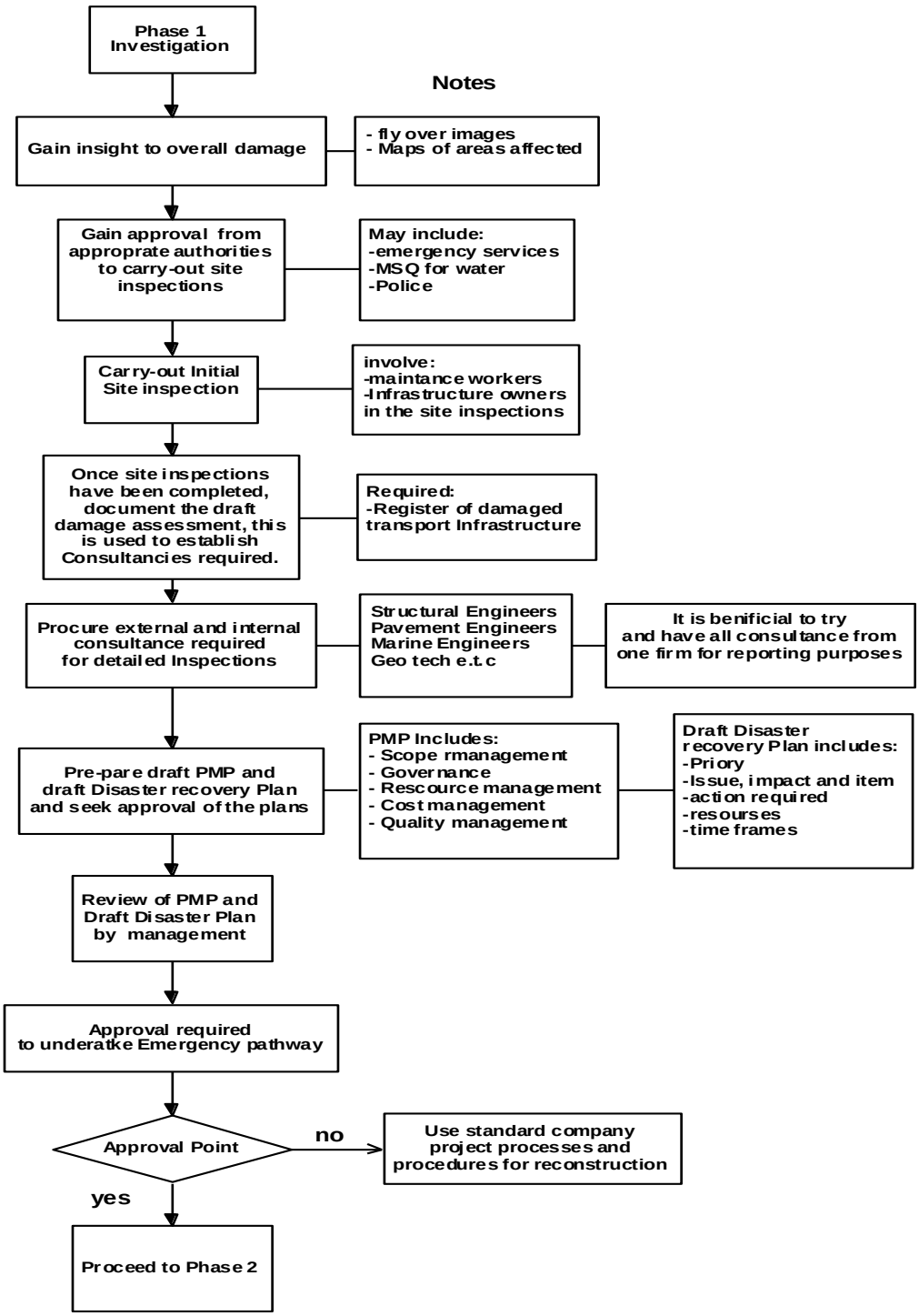
6.3. Recovery

The recovery model as stated earlier is based on the BCC project management methodology using a phased life cycle. It aims to provide the essential steps required to carry-out a rapid reconstruction post disaster.

The model starts at phase one as phase zero is essentially the concept phase that determines if the project is aligned with the BCC CityWide outcomes, the corporate plan and other strategic business plans. This is essentially already decided through the extreme event causing the destruction of the infrastructure, therefore; the project concept has already been decided.

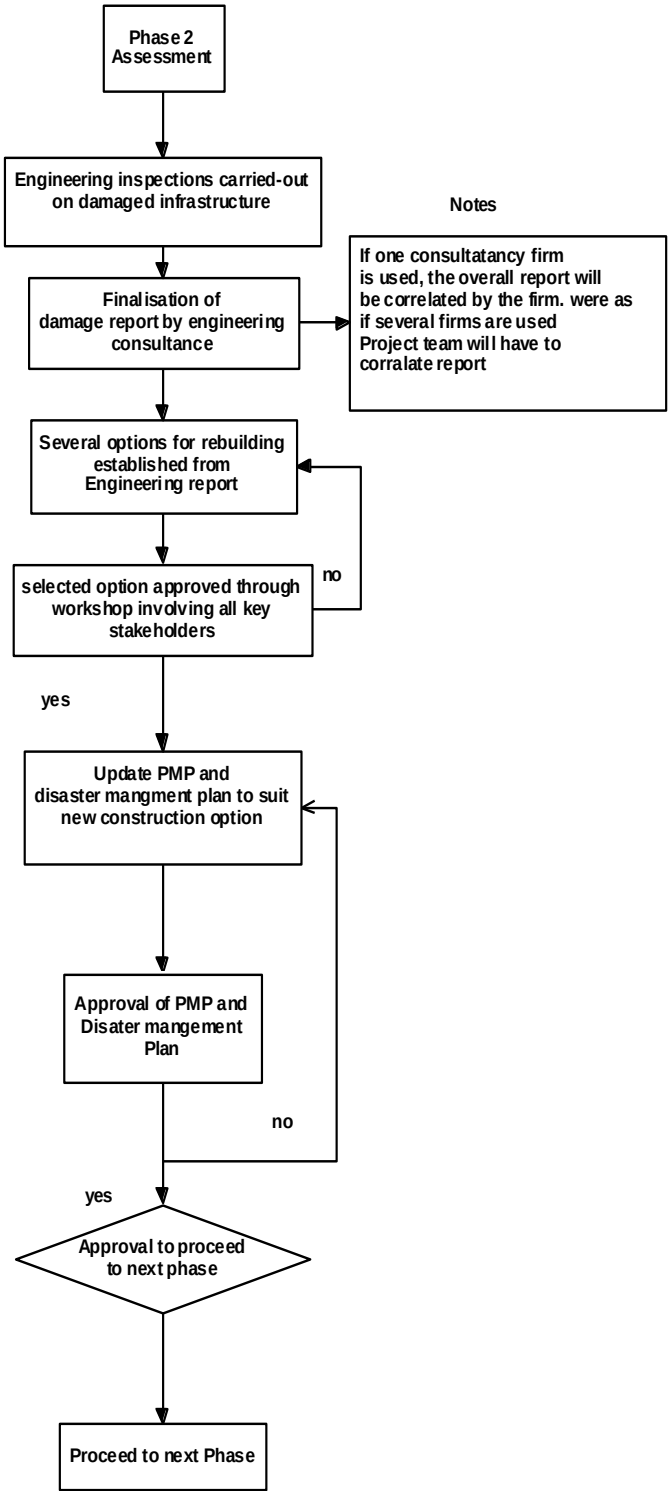
6.3.1. Phase 1

Table 6-2 Phase one reconstruction model



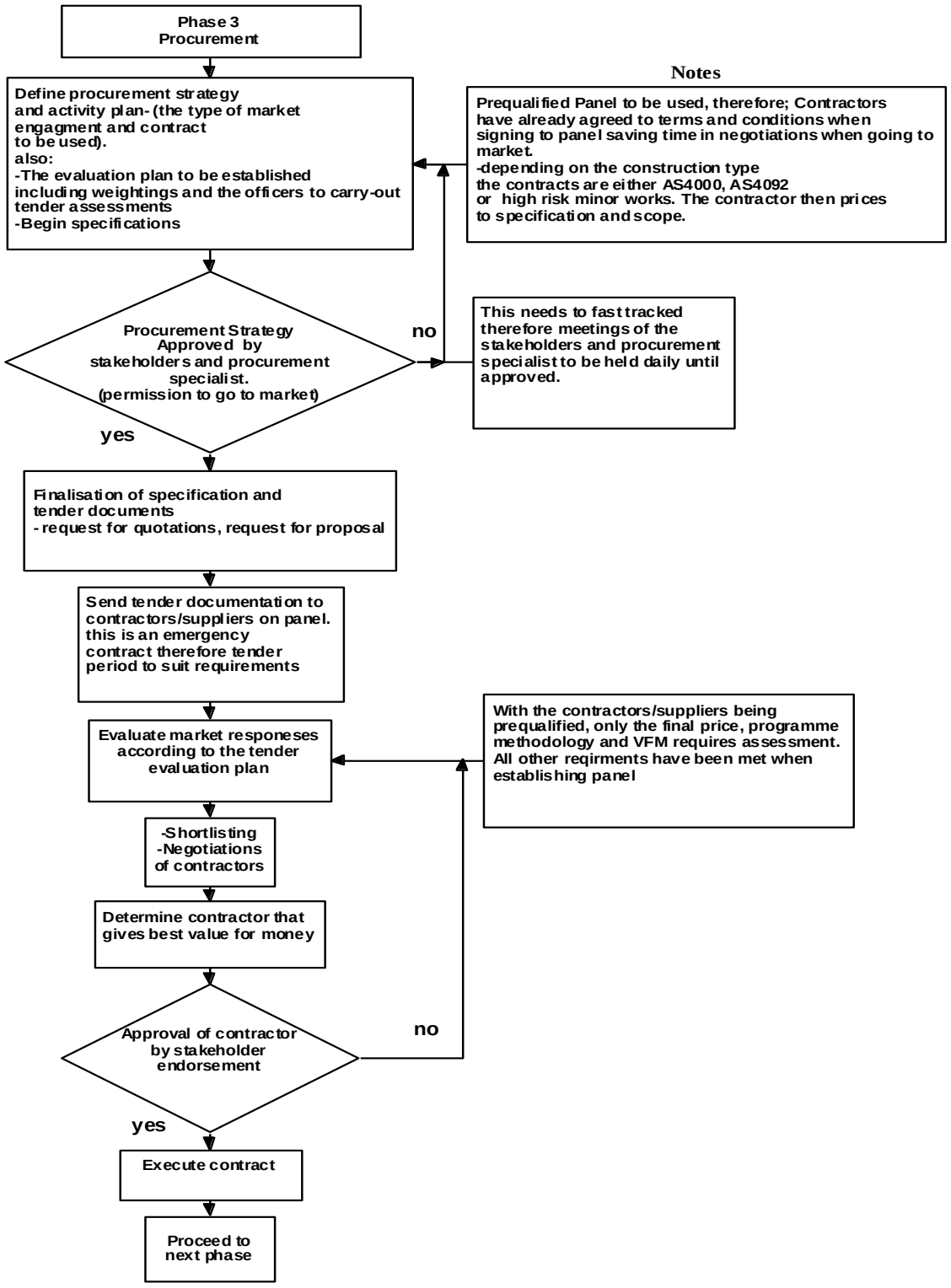
6.3.2. Phase 2

Table 6-3 Phase two re-construction model



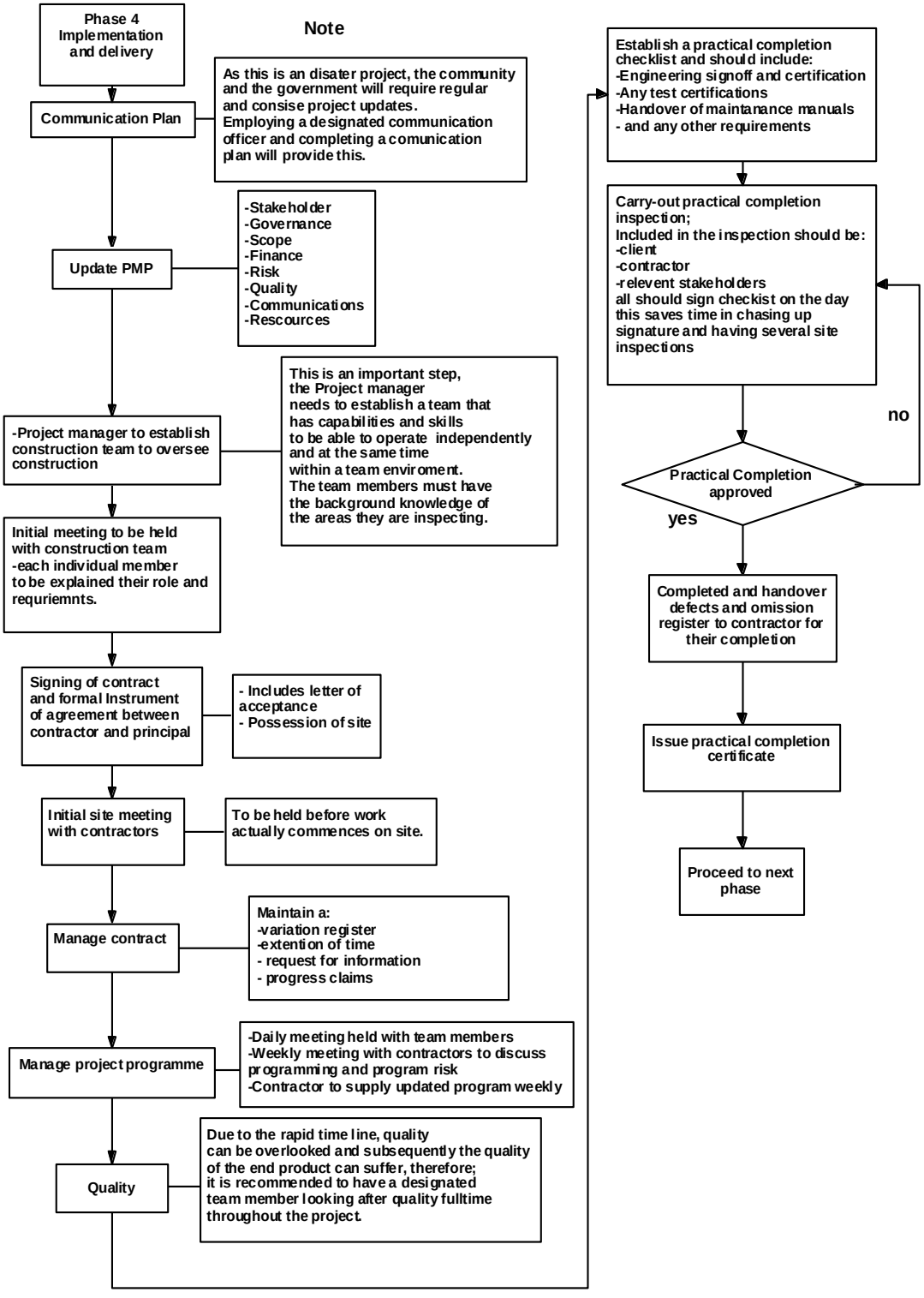
6.3.3. Phase 3

Table 6-4 Phase three re-construction model



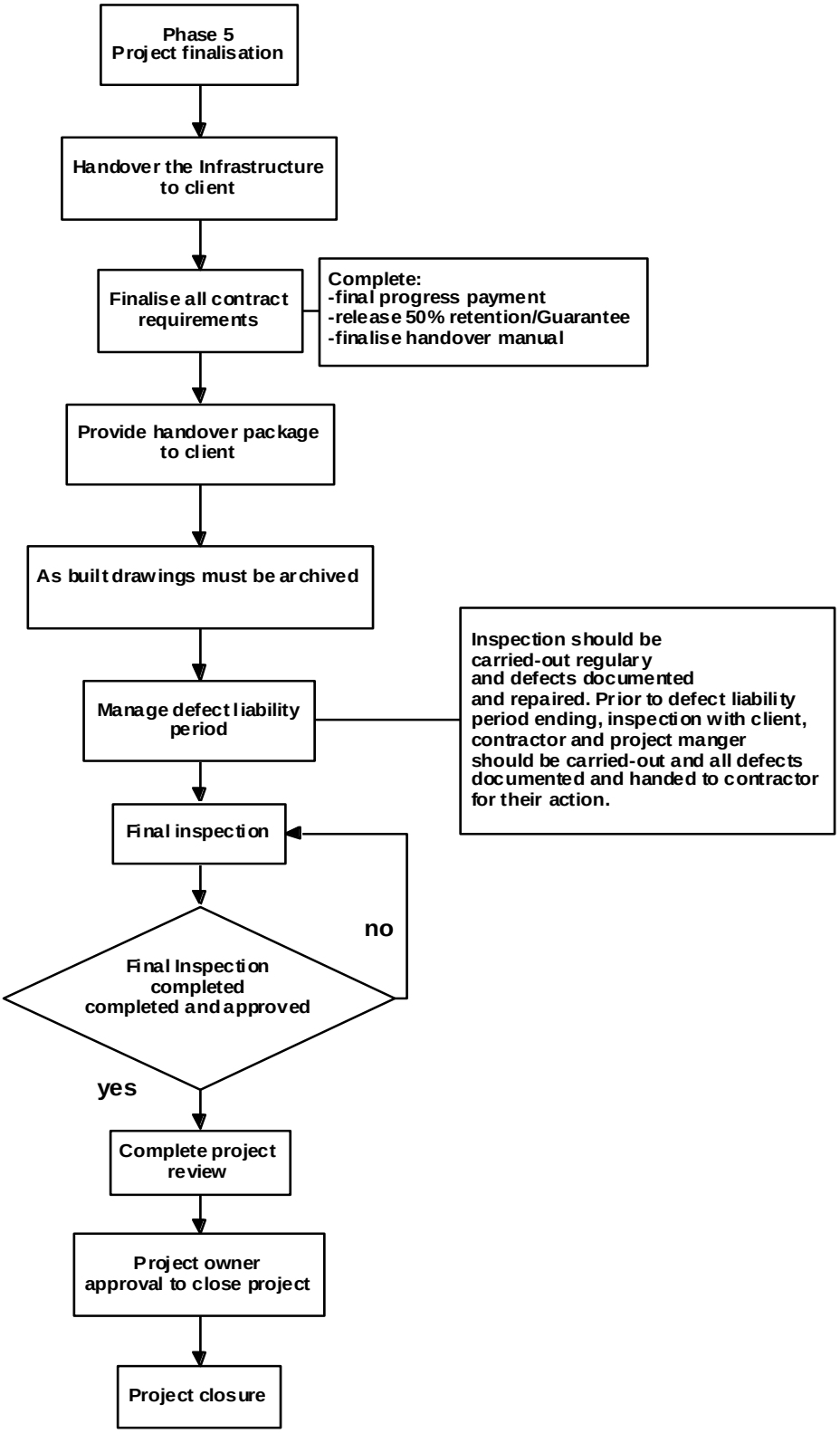
6.3.4. Phase 4

Table 6-5 Phase four re-construction model



6.3.5. Phase 5

Table 6-6 Phase five re-construction model



6.4. Conclusion

Two models were created based on two of Alexanders (2004) four phases of disaster management (mitigation and recovery) and the BCC Project Management methodology, using five of the six phases in the project life cycle.

This chapter outlines the proposed model that following the review of the case study and the lessons learnt outcomes, is recommended as an alternative project management model for local government council for the rapid reconstruction of minor capital works.

The model has tried to duplicate the processes that worked during the rebuild of the passenger terminals such as minimising the length of the procurement process by having a prequalified panel of contractors and one point for all procurement approvals, this being the CEO or a specified Emergency Officer who can act on behalf of the CEO. The mitigation model has tried to emphasise the importance of planning ahead and ensuring all critical minor civil infrastructure is maintained adequately and has all the relevant documentation in the chance that it has to undergo a rapid rebuild.

Overall the models are a starting point; they provide alternative path ways that address key elements that arise when planning a rapid rebuild.

Chapter 7 Conclusions

7.1. Achievement of Project Objectives

The project addressed all primary objectives throughout the different chapters. There is considerable background provided on the event, BCC processes, and the literature review that provide valuable information to understanding the case study and proposed reconstruction model presented. A reasonable level of conformance with the objectives (with the addition of further material) as outlined in the project specifications has been achieved. Limitations within the project have been outlined, the major issue being the restriction of the lessons learnt activity to BCC staff. Chapter six contains the initial proposed reconstruction model, this being a specific aim of the project, however due to time lines this has not undergone peer review**.**

7.2. Further work

There are a number of areas where further work could be done to increase the worth of the model developed during this project.

- Include the salvage and construction contractors in the lessons learnt workshop
- A peer review of the proposed model outlined in Chapter six
- Consultation with key stakeholders internal and external to the BCC regarding the model

7.3. Final Summary

The Case study presented outlines a significant infrastructure project that due to the adverse events preceding the project placed considerable social and political demands on an already complex project. The case study highlights that although successful in the delivery of the project within the timeframe specified, it was to some degree due to some favourable circumstances. These included:

- Contractor panel was already in place
- Previously fabricated gangway drawings had been archived by the contractor (were the BCC had failed to archive drawings)

The proposed reconstruction model developed and presented in this paper is designed to address these issues. The model puts in place contingencies related to pre-identified infrastructure risks and provides key personnel with timely access to documentation (i.e. project drawings) as well as a streamlined procurement and approval process. This is designed to meet the Governance requirements of the organisation, as well as balance the associated social/political and time line burden that arises from such natural disaster events.

In the wake of a turbulent and challenging year it is recommended that the BCC as it redirects its focus to a return to normal project management processes, takes the time to step back and consider the model proposed. Given that authors such as Marquina (2010) have predicted an increase in the likelihood of destruction of infrastructure is to increase due to the effects of climate change then it is something that needs to be addressed.

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Appendix A Project Specification

University of Southern Queensland
FACULTY OF ENGINEERING AND SURVEYING

ENG4111 Research Project
Project Specification

FOR: Danial John Fitzgerald

TOPIC: MANAGING THE RESTORATION OF TRANSPORT INFRASTRUCTURE SERVICES AFTER A NATURAL DISASTER

SUPERVISOR: Dr Vasantha Abeysekera

PROGRAMME: (version 3, April 2011)

Background

The largest natural disaster since the 1974 floods occurred in Brisbane on January 2011, resulting in wide spread flooding in 67 Brisbane suburbs that resulted in 14,972 homes and businesses being completely flooded with 18,025 only partially flooded. <http://www.brisbanetimes.com.au>. The flood also caused the closure of one of Brisbane's major forms of public transport, the cities CityCat and ferry services, which had over 23 terminals providing approximately 16,000 trips per day. <http://www.translink.com.au>.

According to the Lord Mayor of Brisbane, Campbell Newman, the closure of the Brisbane Cities' Ferry Terminals has had a major knock-on effect to road congestion, with travel times increasing by up to 30 minutes on some roads and significantly increased travel times by up to 35.8% on the Bus network <www.bordermail.com.au>.

To try minimising the public disruption due to the ferry terminal closures, a project team was established and given 52 days to have the effected ferry terminals up and running for public use. This was to include the construction of five new Aluminium Gangways, refurbishment or rebuilding of five new pontoons; refurbishment or rebuilding of balustrades, refurbished or new shade structures and other associated works such as electrical and water installations.

Justification

Completing the project in 52 days is a challenging task. In my capacity as a Contract/Welding Inspector and having briefly perused existing literature I have already realised that there might be better ways of managing such a challenging task. As such, I have set up the following objectives:

Objectives

The aim of the project will be to establish a set of Guidelines for rapid re-construction of minor capital works for local government organisations.

Methodology

Literature review: Initially a review of available literature will be carried out focusing on but not limited to the 'rebuilding after a natural disasters'. This will include reviewing conference papers, journal papers, technical reports and websites. As the project is to be completed within 52 days, in essence, this study will be conducting a post-audit and literature relating to post-audits will also be sourced.

It is expected that the literature search will provide information on areas to be investigated which will involve a critical evaluation of the processes used during the reconstruction of the ferry terminals by focussing on five major issues encountered before, during or after construction.

Case Study: This study will use the 'case-study methodology' (Yin, RK, 2003) various documents will be studied focusing on the reconstruction of the Brisbane Cities Ferry terminal. The case study will be broken up into three sections focusing on:

- Pre-construction
- During Construction
- After construction

Conclusions and Recommendations

The 'Guidelines' that is expected to be developed be in the form of a list of lessons learnt.

Agreed Student _____ Supervisor

Date 5/4/ 2011 Date_____/_____/2011

Examiner/Co-examiner_____

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