TRANSNET

Transnet Projects
Project Lifecycle Process

Feasibility Study Phase Manual

Second Draft - Rev B

SECOND DRAFT

PROJECT LIFECYCLE PROCESS
FEASIBILITY STUDY PHASE MANUAL

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PROJECT LIFECYCLE PROCESS
FEASIBILITY STUDY PHASE MANUAL

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Chapter 1

1. OVERVIEW

1.1 Background

There is a need within Transnet to continuously and systematically strive towards improving the level of consistency in the approach to the preparation and management of Capital Investment Projects, and thereby, the reliability of the results achieved. To this end these Project Lifecycle Process Manuals have been developed to provide a standardised, generic Methodology, based on best practices as applied to progressive phases, separated and controlled by a series of Gate Reviews.

The purpose of the Manuals, therefore, is to provide a methodology for the effective management of Capital Investment Projects within Transnet and to ensure that all projects, throughout their Project Lifecycle Study and Execution Phases, are prepared with a consistent approach. This approach being based on agreed, defined scope level, evaluation techniques, and set of deliverables, all executed within the framework of Transnet's minimum requirements for the definition and execution of Capital Investment projects. The Manuals are therefore primarily intended to advise and guide all those directly involved in the development, evaluation and execution of capital intensive engineering projects.

The Project Lifecycle Process Manuals provide a methodology to this process. The manuals are supported by a comprehensive set of procedures, templates and tools, which can be accessed via the Transnet Document Management System.

These manuals are intended to be overview guides to the project team to make them each aware of the functions of all the disciplines that make up a project and their role in this context. These manuals are not references on specific areas of expertise as there are separate reference documents available.

The manuals address Transnet Projects as the engineering, procurement and construction management (EPCM) project organisation with the Transnet Operating Divisions as project Owners or clients. Transnet Projects may employ consulting organisations to assist in the execution of this role.

1.2 Structure

This sub-manual is part of a set of 6 manuals and a Gate Review Guideline, which collectively give an overview of the full Project Lifecycle Process (PLP) and then go on in more detail, through the sub-manuals, to describe the activities and requirements of each separate phase of this Project Lifecycle, as applicable and appropriate to capital projects within Transnet. The six manuals are:

- Overview
- Conceptual study (FEL-1)
- Pre feasibility study (FEL-2)
- Feasibility study (FEL-3)
- Execution (FEL-4)

- Close-out
- Gate Review Guidelines

The study or Front End Loading (FEL) phases are key to the successful implementation of the execution and finalisation phases. The "Front End Loading" terminology is fairly commonly used to illustrate the value and opportunity that may be realised by doing upfront work in the early study phases of the Project Lifecycle when there is still the potential to influence the successful outcome of the project.

While project management is obviously a key component of the overall Project Lifecycle Process and is the glue that pulls together the various activities that drive successful project outcomes, the PLP manuals do not intend to describe all the traditional Project Management functions and activities that are common to the various project phases. Rather, they sketch the requirements for project delivery within the Transnet environment in a manner that allows a Project Manager (whether experienced or new to this field) to gain an understanding of what is required when dealing with projects in Transnet. These manuals are therefore intended to supplement the project management skills of the Project Manager.

Each phase is broken down into key activities that are relevant to the purpose of the particular phase as depicted in Figure 1-1 below. These activities are complemented by activities relating to project set up, including project controls, and close out and can be broadly related to the Project Management Body of Knowledge (PMBOK) process groups of *initiate, plan, execute, measure and control, and close out*.

Each activity has a number of topics that specify a requirement, define this to the reader and describe the mechanics of how the requirement should be achieved. The manual is written in a way that clearly sets out the boundaries for the particular study phase and also describes the inputs to, and the deliverables from, this phase.

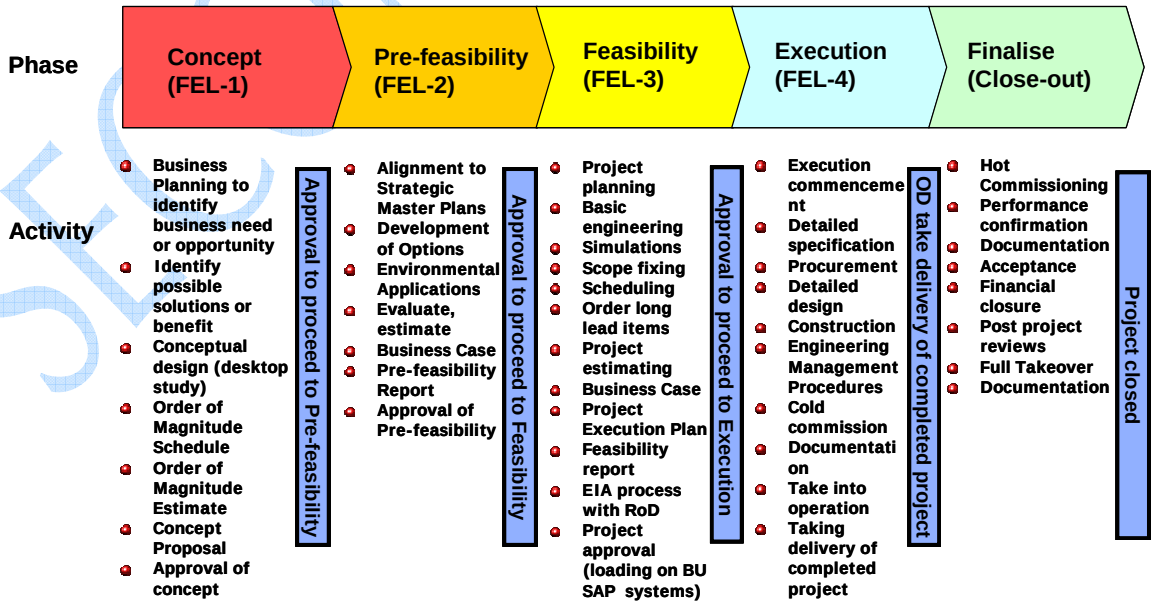

Figure 1-1: Project Lifecycle Process

1.3 Benefits

While being one of a set of six manuals, this particular Sub-Manual can be used independently when dealing with a Feasibility Study, however it would undoubtedly be more beneficial to the reader if read in conjunction with the Overview Manual in order to more fully understand the phase in the context of the entire Lifecycle.

1.4 Project Management Function

1.4.1 Projects

Projects are usually implemented as a means of achieving an organisation's strategic plan and business objectives. Projects differ from operations in that operations are ongoing and repetitive while projects are temporary and unique with a definite beginning and a definite end.

Organisations performing projects will usually divide each project into several *project phases* to improve management control and provide for links to the ongoing operations of the performing organisation. Collectively, the project phases are known as the *Project Lifecycle*.

1.4.2 Project Management Role

Project Management is the application of knowledge, skills, tools, and techniques or procedures to project activities to meet project requirements and includes:

- **Initiating processes** - authorising the project or phase
- **Planning processes** - defining and refining objectives and selecting the best of the alternative courses of action to attain the objectives that the project was undertaken to address
- **Executing processes** - coordinating people and other resources to carry out the plan
- **Controlling or Evaluating processes** - ensuring that project objectives are met
- **Closing processes** - formalising acceptance of the project or phase

Typically Project Management also involves the meticulous management of the following interface environments:

- Competing demands for: **scope, time, cost, resources, risk, and quality**
- Stakeholders with differing needs and expectations
- Specific identified requirements

The project manager is the single point of responsibility and accountability for project performance. The project manager will have the responsibility, upon receipt of project performance criteria or "User Requirements Specifications" from the Owner, to effectively translate these requirements into project development and implementation while providing periodic, accurate reports on safety, progress, budget, status and quality of the work back to the Owner.

In order to be a successful project manager, desirable traits include leadership, communication, decision-making and planning abilities. As projects become larger in scale or become programs (multiple projects associated with a certain Business or Operating Area), acumen for business, contract and commercial management is also desirable in order to take advantage of market opportunities with the potential to positively impact project performance.

In order to provide leadership and management of the PLP process, it is important for Project Managers to develop a working knowledge of each of the practices contributing to project execution. It is not a requirement to be competent or a subject matter expert in all of the practices although many project managers will have subject matter expertise in one or more of the practices. Many of the high performing project managers have during their career paths had significant exposure to various project practices and therefore have gained insight into practice working details. The accumulation of that knowledge combined with the ability to integrate the functionality of the individual practices allows project managers to plan and lead the work effort to a successful conclusion.

1.4.3 Project Organisation Development Responsibility

The Project Manager will communicate requirements and provide leadership to a professional project team that will source either from his own organisation or that of a third party organisation. The Project Manager will have the responsibility to develop and implement an organisational structure fully capable of managing and performing all necessary project activities leading to implementation and start-up. Project organisations may be integrated, composed of Owner and Transnet Projects personnel, or monolithic, where Transnet Projects provides a comprehensive project team. Project managers must be effective managers for either of these project organisation structures. Organisationally, the project manager is responsible for assuring roles and responsibilities are fully defined for each of the project participants regardless of origin and for setting the mode and detail of communication and document distribution. An effective project organisation embedded with necessary capabilities, clear authority and reporting lines and skill sets is one of the keys to successful project outcomes.

To this end the Project Manager will also be responsible for and have a leading role to play in the staffing process to select and mobilise suitable personnel to fill the defined organisation structure whilst being mindful of the schedules and budgets for the project. He will also be responsible for the process of training personnel as well as managing them through the project structures as well as monitoring and reporting on their performance. Finally he will be responsible for the process of demobilising the personnel from the project on closure.

The project organisation must be highly communicative and transparent to promote a degree of flexibility and capability to identify obstacles and challenges to project performance and develop and implement short and long-term plans and actions to methodically overcome any of these issues. The Project Manager must cognitively monitor organisational performance and develop and implement team-building events to extract the full measure of performance from the group and eliminate any dysfunctionality.

Project organisations will evolve over the course of the project. In the early stages of the project there is a greater bias towards technical development issues hence there is a preponderance of technical subject matter experts to conceptually develop the scope of the project and assure its compliance with the expected functionality. Later in the project development, the majority of project participants will tend to be experienced planners, engineers and construction personnel as the comprehensive scope of work is defined, fully planned and implemented in a manner that meets the expected quality of workmanship, materials, functionality and start-up criteria. Project managers are required to have the ability and skill sets to operate in all project phases.

1.4.4 *Project Lifecycle Process – The Project Manager's Best Friend*

The Project Lifecycle Process or PLP provides a structured, robust approach to project execution. Organisations such as Independent Project Analysis (IPA) and the Construction Industry Institute (CII) are international in their scope and provide benchmarking and research associated with project execution utilising the Project Lifecycle Process and fully support execution of projects in this manner. The PLP Methodology is the result of project experience gathered over time and distilled to a set of best practices supporting appropriate and successful project outcomes.

The methodology associated with the Project Lifecycle Process facilitates high functioning project teams providing a structured approach to development and execution of the projects. However, the Project Lifecycle Process is neither prescriptive nor rote and requires project management expertise to effectively implement the methodology within the project organisation. The Project Manager must ensure that the fullness of the methodology is implemented defining anticipated deliverables at each phase of the project, performing the required reviews and monitoring and expediting when required.

The most significant aids to a project manager are a valid project execution methodology and experience. The Project Lifecycle Process (PLP) is a robust project execution methodology that utilises an established practice of dividing the project into manageable phases aligned with developing a concept (FEL-1), investigating project options and determining the single, most optimal, option to carry forward to definition (FEL-2), comprehensive project definition and planning (FEL-3) and implementation (FEL-4) and Close-out. This is the subject matter of these documents, providing an Overview Manual describing the various practices associated with the PLP, Sub-Manuals for each of the project phases and Gate Review Guidelines defining the expected deliverables status at the end of each phase. The Project Lifecycle Process is a methodology that has been developed, refined and successfully deployed over a large period of time and applicable to projects of any scale.

All facets of project development and implementation must be considered during execution in order for the project to be successful. The inputs and outputs of each practice must be carefully monitored to ensure conformance with the project goals and objectives and to assure that the each practice facilitates the downstream users by delivering quality work in a timely and comprehensive fashion. For example, engineering deliverables must facilitate the procurement and construction activities in accordance with the project plan and schedule. The project manager must assure this transfer of information occurs as expected and monitors this process for any disruption or delay. To control the work process, each of the practices must be organised into tasks and sub-tasks associated with the way the work will be executed and then monitored on a regular basis to determine the quality, cost and schedule performance of each task. Trending and forecasting is necessary to demonstrate either conformance to the plan or early indication of deviation from the plan in order to proactively take corrective action.

The Overview Manual provides description of a number of key practices necessary during the development of a project. Each of these key practices must be integrated in order for the project to perform well. Each technical or project management and services related group or practice has a set of documents, reports, calculations, inspections, etc. that defines their work by each project phase. These items are termed deliverables. It is important to note that deliverables increase in accuracy from concept through implementations and the level of completion and accuracy of these deliverables is defined by phase to successfully achieve the intent of the phase. The PLP Gate Review Guidelines provide a comprehensive definition of deliverables status by phase.

Deliverables, for example general arrangements and layouts, are dynamic and have appropriate starting points and sequence in the Project Lifecycle Process. All documentation necessary to

implement a project or utilised for planning and decision making have appropriate start and finish dates within the sequence of project development and implementation. Failure to recognise the necessary deliverable requirements by phase or the sequence of production or accuracy or quality necessary at each phase will impart risk into the project that can result in cost overruns or delays. It is important for Project Managers to be completely familiar with the full set of requirements by project phase so that the activities required to produce the work are planned and assigned appropriately.

1.4.5 Project Set-up – First Step or Worst Step

Generally, the determination of whether a project will be successful or not is the quality of project set-up. Once projects are started poorly, it is generally very difficult to recover and place the project back on a solid foundation. It is important to have a clear definition of the scope of work, functionality, and anticipated outcomes at the initiation of the project. Project managers have this sole responsibility and this responsibility includes but is not limited to planning, organisational development, personnel recruiting and development, communication matrix, assessment of necessary skill sets, working knowledge of practices, typical timeframes for completion of the work, etc.

Generally, projects are initiated on a technical basis in accordance with a User Requirement Specification (URS) (refer to Section 5.4 below) determined by an Owner (Operating Division) describing the expected project outcome in terms of its functionality and operations. The URS also provides constraints detailed in a Business Case and will be updated as each of the early phases of the project are concluded and better definition becomes available.

Project managers must ensure the project team fully comprehends the starting point and inputs and the scope and accuracy of the project phase output. It is very important these issues are well documented and investigated thoroughly to remove any lack of clarity either to starting point or outcomes. It is also important to note that project teams may or may not proceed to the next phase of work due to any number of reasons. Therefore, it is incumbent upon the project team lead by the Project Manager, to fully document the concluded phase of work in such a manner as to allow a different team of personnel to initiate the next phase of work with clarity and on a firm basis.

Project set-up is required for each phase of the Project Lifecycle Process and becomes more involved and complex with each succeeding phase of the PLP. Obviously, the Feasibility Phase (FEL-3) becomes the most complex in terms of planning and definition and requires significant effort and skill from very diverse technical and managerial personnel.

It is important enough to reiterate that Project Set-up is a critical activity to the success of a project.

1.4.6 Planning – "Failure to Plan is a Plan to Fail"

The three legs of successful projects are Process, Personnel and Planning. The PLP methodology and quality of professional personnel are significant factors in the success of the project. However, without appropriate planning, the methodology and highly skilled personnel will fail to realise their full potential to achieve the expected outcome of a project or program.

Project Managers have the lead role in developing a project plan whether that plan is associated with the execution of each of the PLP phases or specific to the execution of the project once work at the site commences. Each facet of the work must be properly understood in detail, integrated with other activities and provided with appropriate duration of time to allow the work to be completed. Project activities are interdependent and have an appropriate sequence of completion. Planning projects of

significant scale is a complex interactive exercise that should produce doable but challenging completion dates.

Planning begins with the development of the Work Plan (early phases) or Project Execution Plan (for FEL-4), a document that sets forth the scope, schedule and budget of the project (whether an early phase or the project-specific implementation plan), determines how each practice will progress through their work activities and has a method of determining actual progress, trending and forecasting and expediting.

Key elements of this plan are discussed in the project management procedures including but not limited to safety, quality, project procedures, communication, reporting etc.

1.4.7 Change Management – Safeguard of Cost and Schedule

During the early stages of the project development, options are investigated and explored until the most viable of the options is selected for definition and implementation. During these periods the majority of the project development activities are time-based rather than production based. It is expected during FEL-1 and FEL-2 to explore a number of reasonable options and several changes to project scope may occur. When FEL-3 is being developed, only one option as determined during the work of FEL-2 is being fully defined and planned for implementation during FEL-4. If significant options or portions of the work remain partially undefined or under-defined it is appropriate to continue this investigative work until a clear option emerges.

During FEL-3 critical technical documents will be frozen or held firm generally only requiring certified supplier/vendor information for completion. Any significant change to any of these critical documents such as general arrangement, layouts, key process-defining documents, equipment lists etc. will likely introduce delay, cost overruns, reduced functionality or other detrimental issues. At this stage (controlling/ evaluation stage) all should understand the importance of avoiding or resisting change after plans for FEL-4 have been finalised and the work has commenced.

FEL-3 simply put is “Plan the Work”. FEL-4 simply put is “Work the Plan”.

1.4.8 Risk Management

All projects involve risks. Safety, labour, commodity pricing, contractor availability and skill sets, financial, political, environmental and time frames are a few of the many risks that will be encountered on the project.

In the complete set of Project Manager Skill sets will be the ability to lead Risk Assessment and Management exercises involving professionals specifically dedicated to this practice. Both Qualitative and Quantitative Risk Workshops will be conducted to identify all of the risk elements, establish mitigation plans and ensure sufficient cost and schedule allocation occurs to accommodate the risk element.

Project Managers will conduct risk reviews periodically throughout the project including during the early phases of project development. The early Risk Reviews will allow the project to sufficiently accommodate risk mitigation into the planning activities while Risk Reviews in the latter stages of the project will measure the effectiveness of the planning and take corrective action where and when necessary.

1.4.9 *Human Resources*

Projects are executed by teams of people led by the Project Manager through an organisational structure. In the setup phase, one of the key functions of the Project Manager is Resource planning for the project. This involves organisational design, and the timing and costs of the needed human resources to meet the schedule and budget. During project execution, the function switches to recruiting and training/developing the project team. This leads into managing the personnel through the project structures while monitoring and controlling the project. Finally the personnel need to be demobilised from the project in accordance with the Resourcing plan for the project.

1.4.10 *Communication*

A large number of projects fail because communication, whether to the Owner or the Project Team, was overlooked as a key element of success. Project managers must develop a plan for communication and reporting including clarity and transparency in report documents. Communication matrices are required to assure that the appropriate information is delivered in a timely manner and in a format that facilitates rapid access and cognisance of the information. As such, project managers should have significant written and verbal skills.

1.4.11 *Project Social Environment*

The Project Manager has a tremendous influence over the morale and environment of the project team. The Project Manager is primarily responsible for ensuring discipline, technical quality, safety enforcement, conformance to cost and schedule and, ultimately, project outcome. The ability of the Project Manager to achieve high functioning project teams is a critical aspect of successful projects. The project manager must always demonstrate leadership, maturity, fairness and discipline to all members of the team. In addition, the project atmosphere should be one where personnel have an opportunity to excel, stretch their abilities, and build their career paths. The majority of successful projects have a palpable positive energy where enthusiasm and desire to succeed are highlights. The project manager can create this atmosphere and social environment and, if so, has a significantly better chance of success.

1.5 Business Planning

In order to remain competitive and ensure long term sustainability, Transnet management has to invest in activities that have a positive shareholder return and are acceptable to most stakeholders.

A company's value is strongly determined by its ability to generate cash flow over the long term. Its cash flow generating capability is determined by its long term growth and its ability to generate returns on invested capital that exceeds its cost of capital. When management make major decisions it is therefore necessary to consider the economic impacts of those decisions.

Projects are essentially born out of a strategic imperative, the need or opportunity associated with improving the commercial or investment side of the business. This need or opportunity usually involves capital investment and therefore it is necessary to evaluate the viability of that investment prior to embarking on costly project expenditure. Those responsible for sponsoring the project will wish to test the viability through the study phases by issuing a list of User Requirement Specifications (the project scope or charter) which includes investment related goals, and these will need to be responded to through the Business Case. The Project Manager's role will be to conduct the study phase in a systematic and accurate manner in accordance with these Project Lifecycle guidelines, produce the most accurate results possible and report these back to the Investment Managers through

the Study Reports which will inform the Business Case. The evaluation of the financial results and establishment of viability will usually vest with those who sponsored the project in the first place.

Chapter 2

2. INTRODUCTION

2.1 Purpose

This phase further develops and defines the selected project option from the Pre-feasibility Study (FEL-2) and provides a control basis for implementation of the project. Typically, comprehensive basic engineering is required in order to produce a project definition package whereby a high level of confidence is attained regarding the implementation of the project in terms of safety, quality, cost and schedule. The scope of the Feasibility Phase includes full development of the project execution plan and critical project procedures from all aspects governing the project implementation.

2.2 Process

The Feasibility Phase is deliverable driven and initiated by Pre-feasibility Study Approval. The project will now enter the detailed project definition phase before receiving approval to proceed to the Execution phase FEL-4.

2.3 Terminology

For the purposes of these manuals, each of Transnet's Operating Divisions are referred to as either the "Operating Division" or the "Owner".

The organisation executing the study/project is referred to as Transnet Projects.

Chapter 3

3. KEY ACTIVITIES IN FEASIBILITY PHASE

The key activities for the Transnet Projects FEL-3 Feasibility Study phase are listed in Figure 3-1 below. There are similar diagrams for each project phase, each with their own set of activities, deliverables and actions. This document is largely structured in accordance with these sequences and contents.

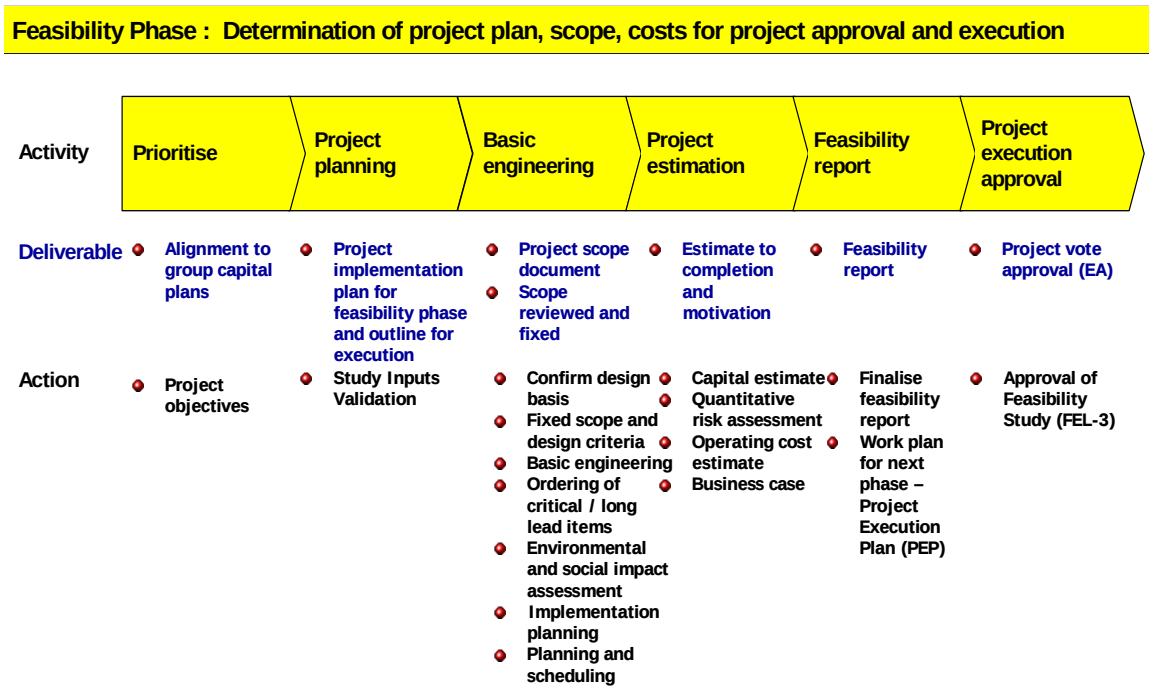

Figure 3-1: Key Activities Feasibility Phase

Chapter 4

4. STUDY LEADERSHIP

The study begins with the appointment of a person to act as the single point of responsibility to coordinate and manage the project. This appointment should be made at a time that allows the person to be involved in setting the study context and in the development of the execution strategy. Typically a senior manager in Transnet Projects and his counterpart in the Operating Division have already been identified when the specific study was being formulated. The logical sequence of personnel appointments is set out below.

The subsequent activities of "Establish Study Context" and "Study Set Up" will serve to define the wider study organisation and counterpart Owner's Team (if appropriate) requirements.

The relationships between the key roles are illustrated in the generic study organisation chart below, Figure 4-1:

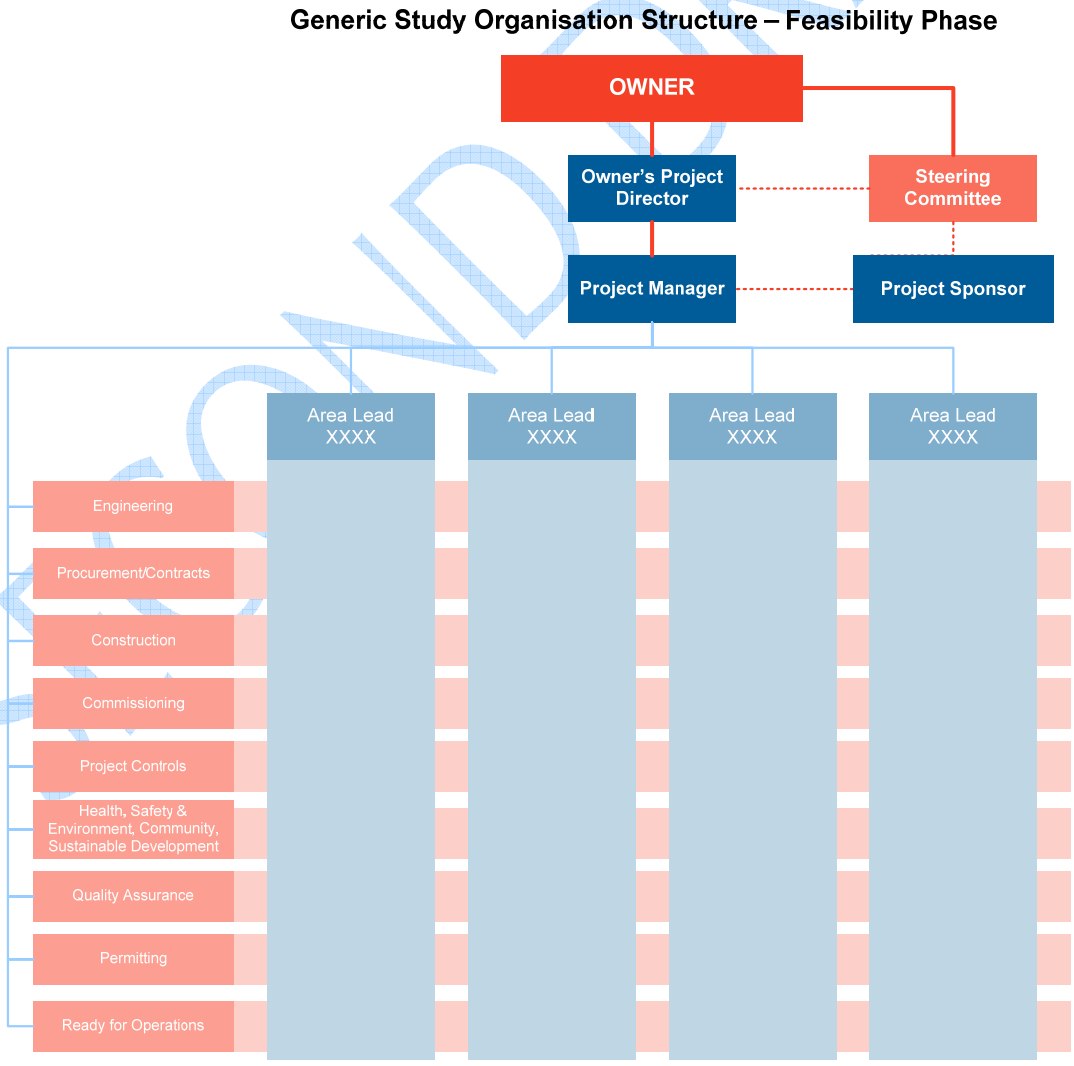

Figure 4-1: Generic Organisation Structure - Feasibility Phase

4.1 Project Sponsor

Senior representatives of Transnet Projects identify and appoint a suitable representative to the role of Project Sponsor.

The Project Sponsor provides senior support and direction to the Project/Study Manager and maintains senior management contact with the Owner. The Project Sponsor reports internally to Transnet Projects senior management and to the Owner's management team and participates in the Project Steering Committee.

The Sponsor meets regularly with the Project Manager and with the Owner's Project Director.

4.2 Project Director

Senior representatives of the Operating Division will appoint a Project Director to act as their responsible person for the execution of the study and to provide a single point of contact for the Project Manager to report to.

4.3 Project Manager

In conjunction with Transnet Projects Senior Leadership, the Project Sponsor identifies and appoints a suitably qualified individual to the position of Project/Study Manager.

The Project Manager is responsible for:

- Define the scope in conjunction with the Project Director
- Managing the study to meet the Owner's goals, objectives and expectations
- Resolves problems and coordinates the final turnover of the study to the Owner
- Managing, coordinating and administering the study
- Supervising the development of budgets and schedules
- Monitors progress and initiates action to assure schedules are met and work is performed within budget
- Manages Transnet Projects business interests, to include: the prime contract, revenues and receivables

Chapter 5

5. ESTABLISH STUDY CONTEXT

The Feasibility Study (FEL-3) phase of a project is to proceed only upon the project having received a Pre-feasibility Study Approval.

5.1 Confirm Pre-feasibility Study Phase Outputs

The outputs from the Pre-feasibility Study phase will provide the basis for proceeding into Feasibility, includes a preliminary Feasibility Study Work Plan and the Owner's original User Requirements Specification.

In the event that these documents are unavailable then the Feasibility phase is not to be initiated until they have been prepared and all FEL-2 activities – including approval to proceed to FEL-3 – are completed.

5.2 Confirm Required Commercial Outcomes

The business case objectives need to be clearly defined for the Project Team. This should be done by the Owner, in conjunction with the Transnet Corporate Finance function and captured in the User Requirements Specification.

The parameters that are to be defined include:

- Deliverable:
  - Business case objectives (contained within User Requirements Specification)
- Action:
  - Identify and define Business Case parameters

5.3 Operational Readiness

5.3.1 Purpose

The objective of the Operational Readiness process is to reduce overall Lifecycle costs whilst maximising start-up effectiveness and subsequent performance. By integrating the technical design and business development activities, the project and operational teams build the appropriate level of business, organisational, operational, sustainability and systems capability required to enable effective start-up and performance.

Various facets need to be considered during the technical development of a project including functions such as the Operating Division's business organisation, operations and maintenance structures, supporting infrastructure and systems, and sustainability criteria. All of these functional areas are interrelated and should ideally be developed throughout the project phases so as to ensure an optimal, integrated design for the operational phase and a resultant new facility that can ramp up quickly to meet and sustain its performance expectations.

The strategy for the operating division, typically defined by the Owner, must be supported by a documented set of future operational requirements (through the User Requirements Specification), functional designs and solutions (identified through the project development process). The project

team needs to actively engage with necessary company (and operational) role players throughout the project to ensure that the technical design of the final solution conforms to the future operational need.

All of these functional areas are interrelated and should ideally be developed throughout the project phases so as to ensure an optimal, integrated design for the operational phase and a resultant new facility that can ramp up quickly to meet and sustain its performance expectations as shown in Figure 5-1 below:

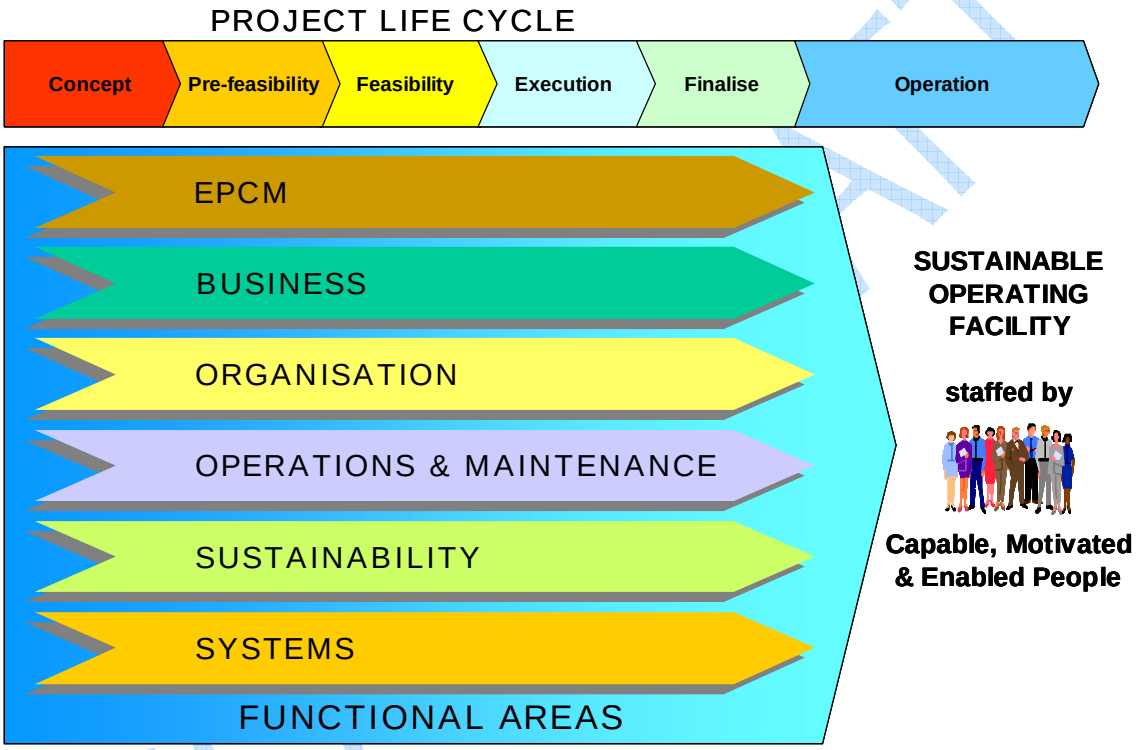

Figure 5-1: Operational Readiness Development

5.3.2 *Overview*

The FEL-3 phase is challenged to influence the technical design to ensure operational suitability.

The following deliverables are required:

- Validation of the project specific strategies
- Development of a Operational Readiness Plan (Level 1) at the early stages of the phase with further definition at the end of the phase Level 2

5.3.3 *Validation / Development of Project Specific Strategies*

The Owner is required to validate the project specific strategies as defined in the FEL-2 phase as listed below:

- Human Resource Strategy
- Supply Chain Strategy

- Maintenance Management Strategy
- Training Strategy
- Construction and Site Preparedness Strategy

Depending on the nature of the specific project, the above strategies will required tailoring and / or further inclusion of other key strategies such as Financial, Company specific, etc.

5.3.4 Development of the Operational Preparedness Plan (Level 2)

The scope of the operational readiness journey begins at project initiation (FEL-2), through to operational ramp-up to sustainable operations. Business systems need to be integrated into the project delivery stream. Various domains need to be incorporated into the operational readiness plan.

The FEL-2 phase starts off with defining for each domain, the high level tasks that need to be delivered thought-out the project until sustainable operations. The deliverable of this exercise being a resourced and structured plan.

Below are a set of domain topics that need to be considered when defining the operational readiness plan. (Understanding and integration across disciplines is important.)

- Organisational
- Safety, Health and Environment
- Technical Design and Influence
- Human Resources
- Operations
- Technical Support Domain
- Supply Chain (and Logistic Support)
- Financial
- Commissioning and Ramp Up
- Project Management

5.4 User Requirements Specification (URS)

5.4.1 Purpose

The User Requirements Specification is the vehicle for the Operating Division to provide the project team with information relevant to the execution of the project that only the Operating Division, due to an intimate knowledge of the operating plant, may be aware.

The User Requirements Specification is a complete, clear, unambiguous statement of the Operating Division's requirements in measurable terms, and a key source document in setting the study context and the required commercial outcomes.

A User Requirements Specification nominates the performance targets for the project team to achieve. If these performance targets are not clearly defined and quantified, it is possible that the project team may make incorrect assumptions. As such, the end result may be unsatisfactory to the

Operating Division, or may be far in excess of actual requirements and be wasteful of resources. A well-prepared User Requirements Specification will eliminate these possibilities.

5.4.2 Contents

The User Requirements Specification includes:

- The development context
- Description of the opportunity or challenge
- Demonstration of fit with Strategic and Master Plans
- Business case objectives and benefits (e.g. increased availability, increased service quality, reduction in operating costs, lowering of maintenance costs, improvement in yield, reduction of lost time, etc. – in measurable terms)
- Success factors/evaluation criteria
  - Health, Safety, Environment, Community and Social criteria
  - Financial criteria
  - Physical performance criteria (material types/properties; throughput; operational capacity; operating parameters – hours per day/week/annum; other) – current and future
- Operational Readiness considerations
- Constraints (geographical; physical; technical; existing facilities; operational; community; time; other)
- Limitations (e.g. Owner-mandated constraints : "capacity not to exceed"; "maximum height restriction"
- Assumptions
- Identified potential solution options and outline scopes of work
- Risks (technological, operational security, OHS, industrial, market, environment, community, consumable, statutory, other)
- Sustainable development objectives and benchmarks (governance, economic, social, ecological, environmental)
- Applicable standards (owner and / or other)
- Order of Magnitude investment expectations (capital and operating)
- Time frame for project execution
- Time frame for Conceptual Study completion
- Study deliverables and formats

5.4.3 *Deliverables*

- Confirmed User Requirement Specifications

5.4.4 *Action*

- Owner to develop and issue the User Requirement Specification document to Transnet Projects as a formally approved document

5.5 Commercial Engagement

For the purposes of this manual it is assumed that:

- An invitation to bid for Feasibility Study services has been received from the Owner, accompanied by a User Requirements Specification
- A commercial proposal has been submitted to the Owner, based on a preliminary Feasibility Study Work Plan prepared during the Pre-feasibility phase. The plan briefly scopes out the proposed work to be covered by the proposal and describes how the work will be executed should the tender be successful
- The Owner has engaged the Project Manager (via a purchase order or equivalent commercially binding document)

Chapter 6

6. STUDY SET UP

At the outset of the study, an appropriate governance structure must be set up for the execution of the works. Set up begins with the identification of the key personnel who will provide leadership to the study; followed by the planning process to develop the study Work Plan; within a framework of supporting work processes (risk management, project controls, quality and document management). It is critical that key appointments are made early and are in place to fully participate in the finalisation of the Study Work Plan. All the roles for the project team as well as the timing for their mobilisation and demobilisation and associated costs and project employment conditions are defined in the project Resourcing plan.

Key leadership positions will be assigned at the very start of the project (refer Section 4), prior to establishing the study context. These leads will then drive the execution of subsequent steps in the study process.

In identifying the team for the feasibility study, the intent will be to identify individuals who are capable of carrying the project into execution.

6.1 Study Organisation

6.1.1 Project Steering Committee

Senior representatives of the Owner and Transnet Projects identify and appoint suitable representatives from both organisations to the Project Steering Committee and nominate one as Chair. Typically there are 4 members on the Steering committee (although this can vary with project size and criticality): two from the Owner (one of whom is likely to be the eventual "owner" of the operating facility) and two from Transnet Projects (one being the Project Sponsor).

It is the responsibility of this committee to provide high level oversight to the project and provide a mechanism for problem resolution when the project manager and the person to whom he reports on the Owner's side cannot resolve issues.

Meetings are organised on a regular basis in order to oversee the overall execution of the project.

6.1.2 Owner's Team

The Project Director, in conjunction with the Operating Division Senior Leadership, identifies an Owner's Team organisation structure suitable to the nature of the project and appoints suitably qualified personnel to those roles.

6.1.3 Study Team

The Project Manager, in conjunction with the Project Sponsor and the Discipline Leads identifies a study team organisation structure suitable to the nature of the project/study and appoints suitably qualified personnel to those roles. Initially the lead positions will be filled. As the Work Plan is prepared the full organisation chart will be defined and the balance of the study team assigned.

6.1.4 *Review Team*

The Project Sponsor in conjunction with the Steering Committee and Transnet's Director – Project Reviews, identifies an appropriate review team to reflect the nature of the project (size, criticality, technical focus, etc.) and ensures that the review process is captured in the study planning.

The review team leader and the Project Manager agree on the review process, timing and the relevant gate criteria, as inputs to the study planning step (below).

The process of developing and agreeing the Gate Review criteria is a collaborative process between the Project Manager and the review team leader, intended to build a relationship of continued engagement. The review team leader's role is more one of coach and mentor than judge and jury.

6.2 Gate Review Guidelines

6.2.1 *Intent*

The Transnet Project Lifecycle Gate Review Guidelines set out the expected standards for deliverables (quality, level of development) at the completion of each Front End Loading phase. The Gate Review Guidelines are found in the Transnet document management system.

The Gate Review Guidelines are aligned with Transnet's Quality of Estimate Classes (see Estimating Functional Guide to be found in the Transnet document management system) and set out the level of work expected to have been done during a given FEL phase to be confident that the work group have delivered a capital cost estimate of the appropriate quality standard for that FEL phase.

Extracts from the Gate Review Guidelines are presented in Appendix A. Please refer to the Transnet document management system to ensure you are using the current version.

6.2.2 *Structure*

The Project Lifecycle Gate Review Guidelines have been assembled in two formats within the one document:

- Functional Work Sheets (see example in Appendix A)

  Each functional group (from Health and Safety, Environment and Community, Sustainable Development Design, Process Engineering, Mechanical Engineering, etc through to Construction, Commissioning and Value Improvement Practices) has its own dedicated worksheet setting out the deliverables standard to be achieved by that practice/function, and the status by FEL phase. These worksheets typically define the required project phase deliverable status with a single word (e.g. "preliminary", "draft", etc) plus provide a brief description. This one word deliverable status is rolled forward into the FEL Summary Sheets (see below). These functional worksheets provide a mechanism for understanding how each discipline progresses its deliverables from FEL phase to FEL phase.

- FEL Summary Sheets (see example in Appendix A)

  For each FEL phase, the status of the relevant deliverables contributed by each practice/function are extracted from these worksheets and presented in a Summary Table for the specific FEL phase. Each of these Summary Tables may be extracted from the workbook and used as a stand-alone checklist for Gate Reviews.

6.2.3 *Use of Guidelines to define Work Plan and Gate Criteria*

The Gate Review Guidelines are used to define the detailed scope of work and defining the Gate 3 requirements. The process is as follows:

- Use a copy of the Gate Review Guidelines for FEL-3 as the working template (see separate Manual)
- The Project Manager and Owner's representative jointly review the deliverables list and deliverables status definitions for FEL-3 and agree which are relevant and necessary to meet the criteria defined in the User Requirements Specification
- Mark up the template to reflect these decisions and sign off
- Submit the agreed Gate Review Guidelines to the Review team leader for his oversight

These agreed Guidelines provide the basis for:

- The detailed Scope of Work
- The Deliverable List for the study phase
- Defining the required engineering activities, level of effort, cost and duration (schedule) required to complete the study – that is, the Gate Review Criteria
- Developing the Work Plan

This process can be iterative to arrive at a match between time, cost, level of effort and expected estimate confidence (accuracy). However, it must be agreed at kick off between the Project Director, Project Manager and the Gate Review Team so that the study team's performance and the quality of the result can be measured against an agreed basis.

6.3 Gate Review

6.3.1 *Purpose*

The Project Lifecycle Management Process is a means of effectively controlling a project by breaking it into manageable stages or phases.

The Gate Review process provides a mechanism for management reviews of critical project outputs (engineering definition, capital estimate, schedule, EPCM fees estimate, execution plan, risk management), at the completion of each phase of a project's development to ensure project performance (development and execution) is as per plan. That is, towards the end of the relevant project development phase (FEL-1, FEL-2, FEL-3 or during the Execution phase).

The purpose of the Gate Review is to ensure the quality of deliverables and completeness of the study.

The Gate Review provides an input to the assessment of the viability of the project.

6.3.2 *Gate Description* - Gate 3 (FEL-3)

The focus of FEL-3 is on development of a comprehensive scope of work and Project Execution Plan for the chosen option to allow a decision to be made on proceeding to the Execution Phase.

6.3.3 *Gate Review Process Overview*

The Gate Review process broadly comprises the following steps:

- Preparation of documentation prior to the review
- Selection and briefing of the Gate Review team
- Project team internal preparation
- Gate Review workshop
- Quantitative risk workshops and determination of capital cost contingency (may be done as part of the Gate Review process (see agenda) but should preferably be done by the project team prior to a Gate Review
- Operations Division and Transnet Projects Senior Executive(s) review and approval to release documentation
- Gate Review report

The core of the Gate Review is the review workshop, which will use the PLP Gate Review Guidelines as the basis of the review and the review agenda.

No critical final stage documents (capital estimate, EPCM estimate, schedule, execution plan) and reports are to be formally issued to the Owner prior to the Gate Review.

6.3.4 *Gate Review Criteria*

Definition of the Gate 3 requirements will take place during the study planning and Work Plan development steps following the process in Section 6.2.3 above.

The intent is to clearly define and agree at the start of the work the criteria to be applied during the Gate Review to assess whether the study has met its objectives.

These criteria must be resolved at the study planning phase to ensure both the Project Manager and the Owner are aligned on the work that is required to meet the Owner's expectations.

6.3.5 *Gate Review Outcomes*

The Gate Review team will consolidate their observations and findings regarding the work done during the phase and arrive at an assessment that the work done has achieved one of the following statuses:

6.3.5.1 *Approved*

- All key deliverables meet the required project phase quality standard
- No further action is required before proceeding to Business Case assessment

6.3.5.2 *Hold - Further Minor Verification Required*

- Not all key deliverables meet the required project phase quality standard
- Proceed to Business Case assessment but complete certain requirements identified during the review process

6.3.5.3 *Fail - Further Major Verification Required*

- Insufficient deliverables meet the required project phase quality standard
- Do not proceed to Business Case assessment
- Complete specific requirements identified during the review process, updating previous data and / or reports and re-submitting these for another Gate Review

Note: "Key deliverables" are those that - if not met - pose an impediment to the next project phase. The judgement of the Review Team in determining the overall assessment must be discussed with the Project Team at the time of drawing the conclusion.

Typically the guidelines are not used to "pass" or "fail" a body of work but more to a) focus on what work is lacking and needs to be addressed up before completion, and more particularly to b) understand where the soft parts of the work are and how that needs to be recognised in the estimate and risk assessment/contingency analysis activities.

6.3.6 *Plan Gate Reviews*

Gate Reviews are to be planned at several stages during the study, depending on the scale and complexity of the study.

As a minimum, there shall be two reviews:

- Interim Gate Review, held mid-way through the study, to confirm that the team is on track to achieve the level of deliverables development agreed at the start of the study. Timing is set to allow sufficient recovery time should this review find serious flaws or obstacles to achieving the targeted standards
- FEL-3 Gate Review. Conducted at study completion, to ensure the work has been completed in accordance with the Work Plan, meets the requirements of an FEL-3 study and provides the targeted level of confidence in the outcomes (capital estimate)

6.4 Conduct Planning Session/Kick-off Meeting

Once appointed the Project Manager is to hold a planning session to launch the study.

The purpose of the planning session is to ensure that all relevant personnel are aware of the scope of services, liabilities and proposed project plan.

The agenda for this meeting should include the following:

- General Information
- Operating Division's revised User Requirements Specification
- Feasibility Study Work Plan
- Initiate the development of the final Work Plan from the FS Work Plan developed in the Pre-feasibility phase
- Planning session participants:
  - All relevant functional and discipline leads and key nominated persons
  - Operating Division representation as appropriate
  - Other key stakeholders

All key documents are to be available for this meeting, e.g. URS, plot plan, flow diagrams, etc.

The Project Manager will chair this session and ensure that the outcomes are adequately documented.

6.5 Confirm Work Plan for Feasibility Study

The Work Plan developed during the Pre-feasibility study phase will be reviewed to determine that it is compatible with the agreed scope of work, and provides a clear baseline of proceeding with the Feasibility study. Any changes will be incorporated into the final plan.

6.5.1 Purpose

A Work Plan is required to guide the study team in terms of focus areas and actions. The term Work Plan is synonymous with Project Execution Plan and other designations used in the engineering and construction industry to describe how the Project is going to be executed. As the full execution plan is not developed until FEL-3, the term "work plan" is applied to the 3 study phases prior to execution.

The Work Plan should include a specific scope of work for the study. It needs to be detailed enough that the team knows what they need to do and can identify where they are doing more or less work than envisaged in order to be able to drive the change management process.

The development of the Work Plan should be initiated in the Planning session and responsibilities and "due dates" assigned in that initial session.

6.5.2 Input Documents

The critical documents required to develop a Feasibility Study Work Plan are:

- The preliminary Feasibility Study Work Plan and the Operating Division's User Requirements Specification, revised as necessary. These are developed during the Pre-feasibility study phase. It is possible that at the onset of the Feasibility project phase that not all these documents are available. It is then recommended to conduct a project planning exercise at the beginning of the project to complete the list of input documents prior to starting any Feasibility level activities
- The agreed, signed-off Gate Review Guidelines

6.5.2.1 Deliverable:

- Confirmation of Feasibility Study (FEL-3) inputs from Pre-feasibility Phase

6.5.2.2 Action:

- Confirm input documents available
- Validate Pre-feasibility Study (FEL-2) deliverables against status specified in FEL-2 Guidelines

6.5.3 Work Plan Contents

The Work Plan at Feasibility Study phase should include the following minimum requirements:

- Introduction and Objectives of Study
- User Requirements Specification
- Description of Existing Facilities/ Current Environment

- Scope of Work - Facilities Description - for the recommended option from the Pre-feasibility study
- Scope of Work to be undertaken by Transnet Projects, by others
  - Extent of Basic Engineering to be undertaken
  - Expected study outcomes in terms of estimate accuracy
  - Extent of procurement activities to be undertaken
  - Assignment of responsibilities
- Feasibility Study deliverables, developed from the Gate Review Guidelines
- A copy of the signed off Gate Review Guidelines
- Resourcing Plan: define study team, responsibilities, locations and mobilisation/demobilisation timing
- Schedule for performing the work scope
- Estimate of costs, workhours and other resources required to complete the work
- Approach
  - Methodology for developing and assessing options (including annotation of the Gate Review Guidelines to define deliverables to be developed for each option)
  - Basic engineering approach (packages, inputs, methodologies, outputs) defined
  - Risk management
  - Project controls and reporting
  - Quality management/ reviews
  - Health and safety
  - Environmental management
  - Communications
  - Document/data management
  - Close-out
- Table of Contents of Feasibility Study report

6.6 Approval by Owner

Where the engagement of Transnet Projects to undertake this study has not been the subject of a formal, commercially-based bid or proposal cycle - then the completed Project Execution Plan should be submitted for Owner's approval and formal advice to proceed (including approval to commit funds on the Owner's behalf) prior to the study proceeding.

6.7 Controls

This section describes the Project Controls to be put in place for the FEL-3 phase of the project. This is a discrete requirement to the preparation of the Project Controls Plan for FEL-4 which is one of the FEL-3 deliverables.

Prior to commencement of work on the study a framework for controlling the study cost and schedule must be established. This framework should relate directly to the scope of work for the study included in the Work Plan. This framework should be updated on a regular basis as discussed below and a trend/change management program implemented to track, and where appropriate approve, all changes from the baseline including not just scope changes but also adjustments to estimates and assumptions.

A typical Project Controls Baseline Structure will look as follows:

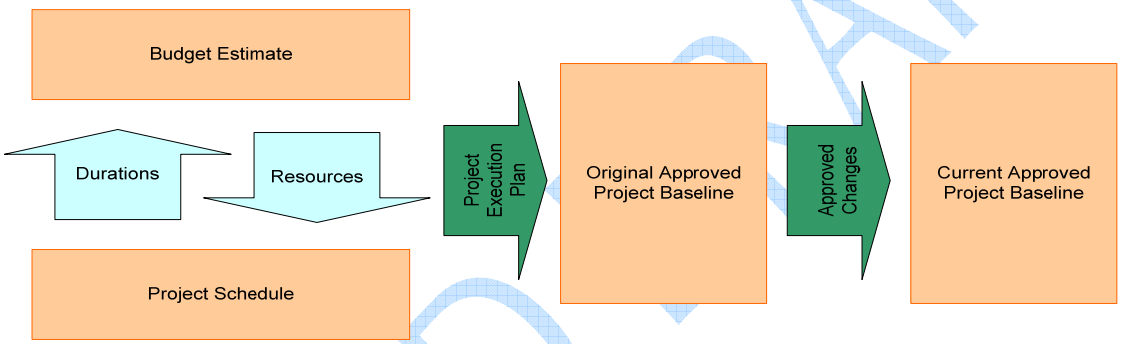

Figure 6-1: Project Controls Baseline Structure

6.7.1 Update Facilities Description and Facility Breakdown Structure (FBS)

The Facilities Description will be updated by the engineering team and will describe the project scope of work. It should address process requirements and equipment in addition to geographic locations and major layout issues.

The FBS will be finalised and provides the framework for scope definition and project controls and should be aligned with the facility description. Where the scope of work relates to an existing facility the FBS will typically be tied to the FBS for the existing facility.

6.7.2 Schedule Management and Progress Measurement

A schedule should be prepared for the study. This schedule is to manage the scope of the study and is a different schedule to that prepared as part of the study and described in Section 6.5.3. For a feasibility study the schedule will normally be prepared in MS Project or Primavera. The intent is to ensure that the study is completed within the committed time frame and that any slippages are identified as early as possible in order to allow for a proactive response to correct the slippage or early advice to stakeholders of a delay.

To this end the schedule should be statused either weekly or fortnightly dependant upon the overall study duration and the criticality of the activities. Any activity not completed on schedule must be reviewed to assess the impact on both the study completion and key intermediate dates. It would be

expected that the duration of the majority of activities in the schedule should not exceed two times the update frequency.

For a feasibility study overall study progress will be largely based on the status of the agreed study deliverables. This status may be calculated on individual deliverables however it is more commonly calculated based on groups of related deliverables. The relative contribution of each deliverable, or group or deliverables, is based on the estimated workhours for that deliverable. Planned progress is calculated based on the deliverable list and the project schedule. The rate of progress compared to the planned rate of progress, in concert with the status of planned schedule activities, provides the basis on which to forecast the study completion date and manage the study towards achieving the baseline completion date.

In particular the schedule should identify the due dates for key inputs to, and outputs from, the conceptual study including both internal and external stakeholders. The schedule should allow adequate time for reviews (including Gate Reviews) and consequent update of the study prior to formal issue of the report.

6.7.3 Cost and Workhour Management

At the time the Work Plan is prepared an estimate of the workhours required to deliver the study together with associated costs including expenses and third party costs (consultants, test and survey work) will have been prepared. This estimate provides the baseline against which the cost performance of the study is measured.

A cost report will be prepared at least monthly which records actual incurred workhours and costs against this baseline. Each month the estimate will be updated to provide a current forecast of the cost at completion. This forecast will reflect all trends and committed changes to the study including the impact of changes to the schedule.

Workhours will be a major driver (if not the sole driver) of the overall study cost and thus the cost control effort needs to focus on actual versus budget hours. It is also necessary to track and controls the average hourly rate against budget to ensure that changes resulting in differing labour mix (senior vs. junior) or hourly cost are properly captured.

6.7.4 Change Management

The scope of the study is defined in the Work Plan. A change approval process needs to be operated to ensure that work continues in accordance with this scope and execution methodology. For the feasibility study this scope is more defined in terms of project deliverables. Changes to the extent of the deliverables, or the expected quality of them, represent changes to the scope of the study and hence potential impacts on both the study cost and schedule.

In general the intent of the change management process is to prevent change however it change is demonstrated as beneficial the intent is to ensure that the change is implemented in a managed fashion with minimum unnecessary impact on the overall study objectives.

6.7.5 Reporting of Trends

Trend management is the assessment and reporting of changes to the study estimate and schedule due to the inevitable refinement of the initial baselines as actuals are incurred. The objective is to identify issues pro-actively together with their full impact on the overall study. Typical issues which would give rise to a trend in a feasibility study include average hourly costs different to those estimated, greater or lesser effort (in terms of workhours) required to perform tasks and delays (or

accelerations) in receipt of data from external stakeholders with consequent impact on both schedule and the cost of staff waiting for that data. A process of regular reviews of all actual and potential trends should be established. This may be weekly, fortnightly or monthly dependant upon the nature and scale of the study.

A typical Project Controls Trending Programme will look as follows:

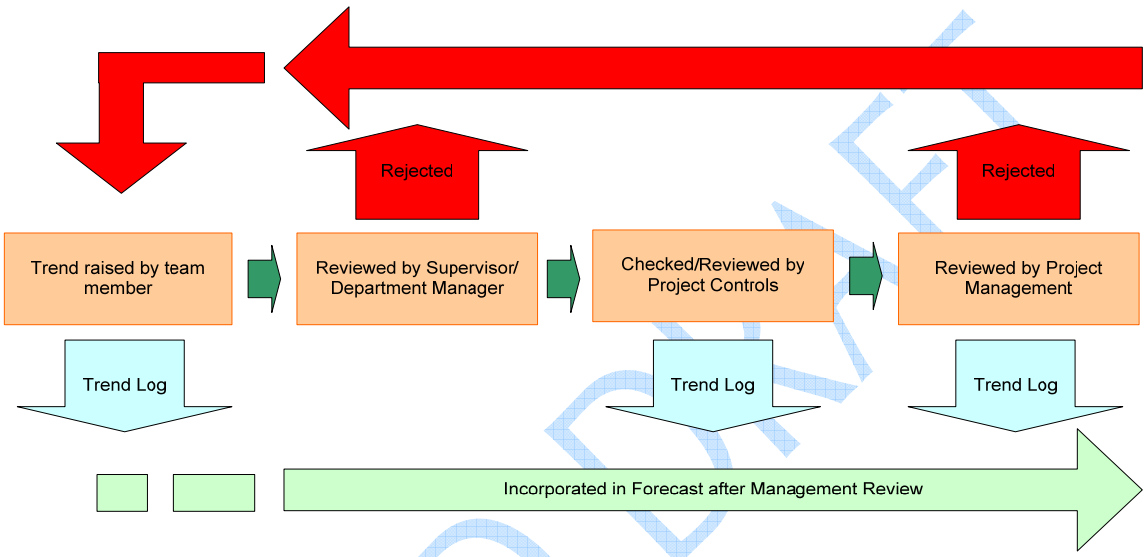

Figure 6-2: Project Controls Trending Programme

6.7.6 Document Management

6.7.6.1 Purpose

The primary objective of Documentation Management and document control throughout the Lifecycle of a project is that all documentation / information generated or obtained by or on behalf of the project will be identified and stored (electronically or hardcopy) to ensure:

- Access to all parties involved in the phase
- Traceability and transparency of all decisions taken
- Long term historical availability to Transnet, and
- Proper control

It is therefore of utmost importance that all documentation, formal or informal, published or just prepared for personal use be made available on the system to establish a complete database for the specific phase of the project.

6.7.6.2 Process

- Ensure that the project has actually been registered and a project number allocated as this number acts as the main part of the identifier to link all the documentation / information generated throughout the Lifecycle of the project

- Through the National Manager Document Control or the Regional Lead Document Controller obtain access to the database of documentation / information generated during the previous phases of the project in order to familiarise yourself with what has been done during the previous phases, specifically the Concept Study Report and the Pre-feasibility Report
- As a project moves through the various phases of it's Lifecycle the documentation generated during the phase will increase exponentially and the possibility to loose control therefore increases exponentially as well
- Identify through the National Manager Doc Control a Document Controller for the project. This person will form an integral part of the team and will ensure that proper control and management will take place throughout the specific phase of the project
- With the document controller, set-up the Document Management Environment on the relevant computer network for the control, management and storage of all project related documentation. This will include the following:
  - File structure for "Native" files where all documents will be stored while being worked on
  - File structure for "Published" files which can only be accessed through the Document Management System
  - File structure for the filing of all communication type documentation i.e. letters, e-mail, faxes etc.
- With the introduction of electronic communication such as e-mail, it has become very easy to loose control of the flow of information and the tracking of decisions. Adding to this the fact that major decisions are discussed and taken via e-mail the management of this media is of utmost importance. It should be emphasised to the team members that all e-mail must be stored in the system identified for it and that all e-mail must be clearly identified by completing the necessary meta-data
- With the document controller establish the documentation identification methodology for this phase of the project based on the information in Procedures SYS-P-001 and a continuation of the identification system used in the previous phase. The methodology must make provision to differentiate between the different studies to be undertaken. The main reason for clear identification is to ensure structure in both the electronic and hard copy filing system as well as retrieving of information through searching the identifier
- The document controller will prepare a Project Document Work Instruction for the phase and distribute it to all participants on the phase. This will typically include the Identification of documentation, the flow of information, the approval and the filing thereof (electronic and hardcopy). This will also include any outside parties i.e. consultants, contractors etc. to be involved in the feasibility studies
- The document controller will provide training were necessary on the utilisation of the Document Management System (DMS) to all members of the Project Team as well as outside parties
- Prepare a detailed Document Requirement List based on the Gate Review checklist for the feasibility phase of all documents required to form part or support the Feasibility Study Report. The preparation of these will be monitored by the document controller but it is suggested that a line item be added in the planning schedule to monitor and plan the delivery of the package

6.7.6.3 *Close-out of the Feasibility Phase*

- Ensure, with the document controller that all documentation generated during this phase of the project has been properly captured and archived if the outcome of the phase is that the project will not move forward to the next phase
- If the project moves to the next phase the National Manager Doc Control will be responsible for ensuring handover of the relevant close-out documentation to the Project Manager of the next phase and establish access for the project team to the documentation generated during the concept and pre-feasibility phase

6.8 Quality Management

6.8.1 Introduction

Quality during the Feasibility Phase (FEL-3) is similar to the quality management aspects of the Pre-feasibility Phase (FEL-2) but is differentiated by the level of detail required in both the Quality Assurance and Control aspects.

6.8.2 Purpose

The purpose is to establish, develop, implement and maintain an effective Quality Execution Management Plan and system for the Feasibility Phase (FEL-3), which meets the requirements of all the Stakeholders and serves as preparation for the setup of the Quality Management System for the Project Execution Phase (FEL-4).

The key execution principles of the project quality function include:

- Providing a satisfactory interface and communications with Owner representatives
- Preparing the more detailed Project Quality Plan
- Providing advice, interface and support to other Project functions on quality related matters including applicability, plans, processes, procedures, and decision support
- Alignment with the resource requirements
- Supporting assessments and reviews
- Interface to the main overall project functions
- Reporting against agreed performances measures / indicators
- Providing feedback on potential improvements and quality incidents
- Establishing a more refined definition of the quality framework

6.8.3 Process

6.8.3.1 *Project Initiation*

- Establishing the Project Inputs

  The minimum Inputs should be:

  - The project objectives
  - Owner requirements from the project including deliverables and their desired formats, special requirements, records, reporting requirements, etc.

- The project refined scope, agreed capital Project baseline and business case criteria

- Typical Activities

  The typical activities carried out during the various stages of the Feasibility Phase (FEL-3) include:

  - Ensure that a project kick off meeting is held with the Owner
  - Ensure that a matrix of Communication Authorities is documented and agreed with the Owner. Refer to Appendix C
  - Ensure that an alignment of processes for project functions such as Controls, Finance, etc. is agreed with the Owner
  - Ensure that the systems, procedures, document formats, records, assessment tools etc. are documented and agreed with the Owner
  - Ensure that a complete list of deliverables and their handover requirements is documented and agreed with the Owner
  - Ensure that a change management process is documented and agreed with the Owner
  - Ensure the definition of the project resource requirements

  The items discussed and agreed with the Owner are typically used as inputs to the project planning stage

- Outputs

  The typical output is a statement of Quality Objectives and Owner requirements, as well as the details of the Project Management System agreed with the Owner described in the preceding section.

6.8.3.2 *Project Planning*

- Establishing the Project Inputs

  The minimum inputs should be:

  - Quality statement and agreed Project Management System detail
  - Owner interfacing requirements

- Typical Activities

  The typical activities carried out during the various stages of the Feasibility Phase (FEL-3) include:

  - Interfacing with the other disciplines in the project
  - Formulation of a project review programme
  - Formulation of a Quality Management Plan detailing the Objectives, Project Management System, compliance criteria and assessment methods, resource requirements, and Owner interfacing requirements

- Outputs

  The typical output is a Project Quality Plan which forms part of the Project Execution Plan.

6.8.3.3 *Project Implementation*

- Typical Activities
  - Act as an interface and liaison with the Owner nominated representatives
  - Assess the project for compliance to the agreed upon Project Management Systems, procedures, and tools
  - Conduct reviews as per the project review programme
  - Validation of the deliverables as they are produced
  - Identification and verification of quality incidents and opportunities for improvement their resolution
  - Project management reporting as per the agreed Project Management System
  - Monitoring of the change management process and reporting against the baseline
- Outputs

  Performance reports as agreed with the Owner and feedback from the project reviews including managed Key Performance Indicators (KPI's) and trends.

6.8.3.4 *Project Close-out*

- Typical Activities

  At project Close-out, the typical quality activities are:
  - The verification and handover of the deliverables in accordance with agreed Owner requirements
  - An assessment of the level of Owner engagement and satisfaction with the project outcomes
  - Verification that the overall project has been closed out with respect to all of the relevant disciplines such as Controls, Finance, Document Control, etc.
- Typical Output

  The typical quality outputs at project close-out include:
  - A statement of quality performance, review reports, and improvements for the project which is typically part of the Project Close-out report
  - Handover of registers, documentation and records as agreed upon during the project initiation phase
- A Project Close-out self assessment checklist

6.8.3.5 *Resource Requirements*

The quality activities for the Feasibility Phase (FEL-3) of a project are typically carried out by the project management team which includes a dedicated quality representative.

The quality discipline typically facilitates the project reviews and reports as required by the project management system being used for the project.

6.9 Human Resource Management

Management of the personnel project team is the responsibility of the Project Manager. He will execute this function through the defined project organisation structures in accordance with the Resourcing plan defined in the project setup. Key activities to be addressed include:

- Recruiting suitable personnel to fill the organisation structure in accordance with the timing and cost requirements to meet the project schedule and budget. Whilst the details of this activity will be carried by the Human Resources Department or other personnel, the Project Manager will of necessity need to be involved in the selection of key personnel. This activity also involves the administrative aspects of mobilising personnel onto the project. It is imperative that the identifying of human resource needs, the advising of those responsible for recruitment regarding the specific needs and job descriptions, and the selection of the appropriate candidates, takes place timeously in order to avoid the consequences of unwarranted delays in filling the positions and to the project
- Training, development and coaching of individuals and teams. Whilst mobilised personnel may have appropriate technical skills, they will probably have to be coached into the project requirements, given project specific and safety induction training as well as training on project specific procedures, norms and practices. This can be ongoing throughout the life of the project as new personnel come onto the project or retraining is needed for existing personnel
- Regular monitoring and reporting on personnel and team performance against project requirements and established norms. Control will need to be exercised over non conformances and even disciplinary action in necessary cases. This monitoring and control needs to be exercised under the auspices of applicable company policies and guidelines, national, regional and local legislation and most importantly, health and safety norms and requirements
- Demobilisation of personnel in accordance with the project schedule and Resourcing plan as well as in special circumstances when for example people leave the project early

6.10 Risk Management

Risk management will follow a structured approach. Risks will be identified, analysed, evaluated and treated. Risk communication strategies will be developed to ensure stakeholder alignment and buy-in. The focus of risk management in this phase is aligned to the following typical project or investment objectives for this phase:

- Optimisation of the selected option from the previous phase (FEL-2) including finalisation of any required trade-off studies
- A rigorous assessment of the investment potential and its associated risk profile suitable for board submission and funding approval
- Development of a plan for the Development phase

The associated risk management objectives for this phase typically include the following:

- A rigorous assessment of the risk profile to understand the risk drivers and key controls and risk treatments. Capital and schedule risk profiles to be fully developed
- For technical risk management, complete Hazard Studies 2 and 3, CHAZOP, Functional Safety Studies and any other key required technical quantitative risk assessments Classification

- Develop the financial risk profiles based on the financial model if appropriate

The Transnet ERM risk assessment process shall be followed and as a further aid the AS/NZS 4360:2004 risk management process as illustrated in Figure 6-3 can be used as the framework for detail risk management activity in this phase.

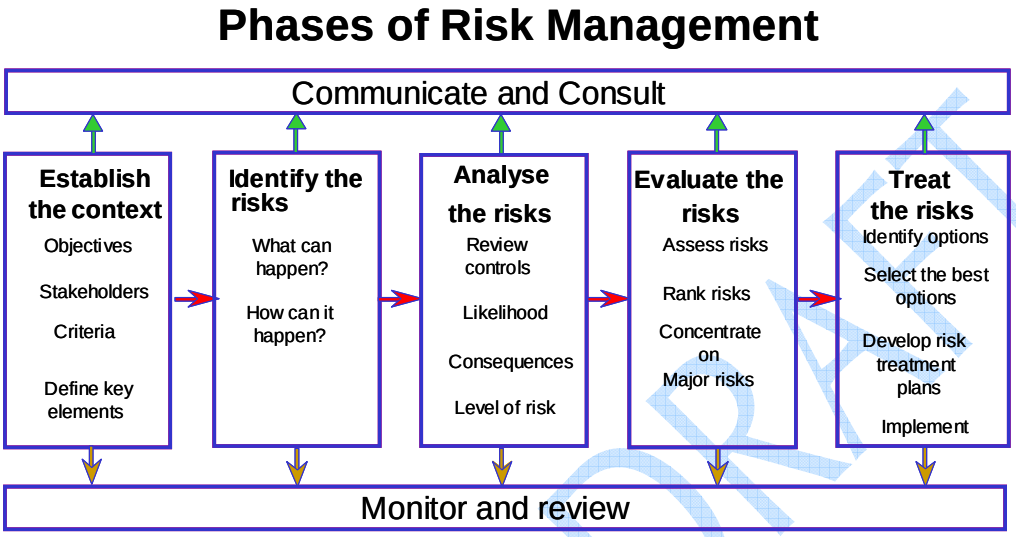

Figure 6-3: Phases of Risk Management (AS/NZS 4360:2004)

6.10.1 Establishing the Context

The context as documented in the previous stage should reviewed and updated as necessary to reflect any specific context issues for this phase especially:

- Risk breakdown structure (RBS) – Structure of risk sources used to facilitate the efficient identification of risk issues – the FEL-2 structure developed by the risk manager in consultation with the project manager may need to be upgraded for the selected option

Key outputs will include:

- Investment and project objectives
- Key or critical success factors and agreed risk criteria
- Stakeholder analysis
- Agreed risk management plan including scope, timing and deliverables - this will typically involve updating the current risk management plan

A typical RBS for this stage is shown in the following Figure 6-4 :

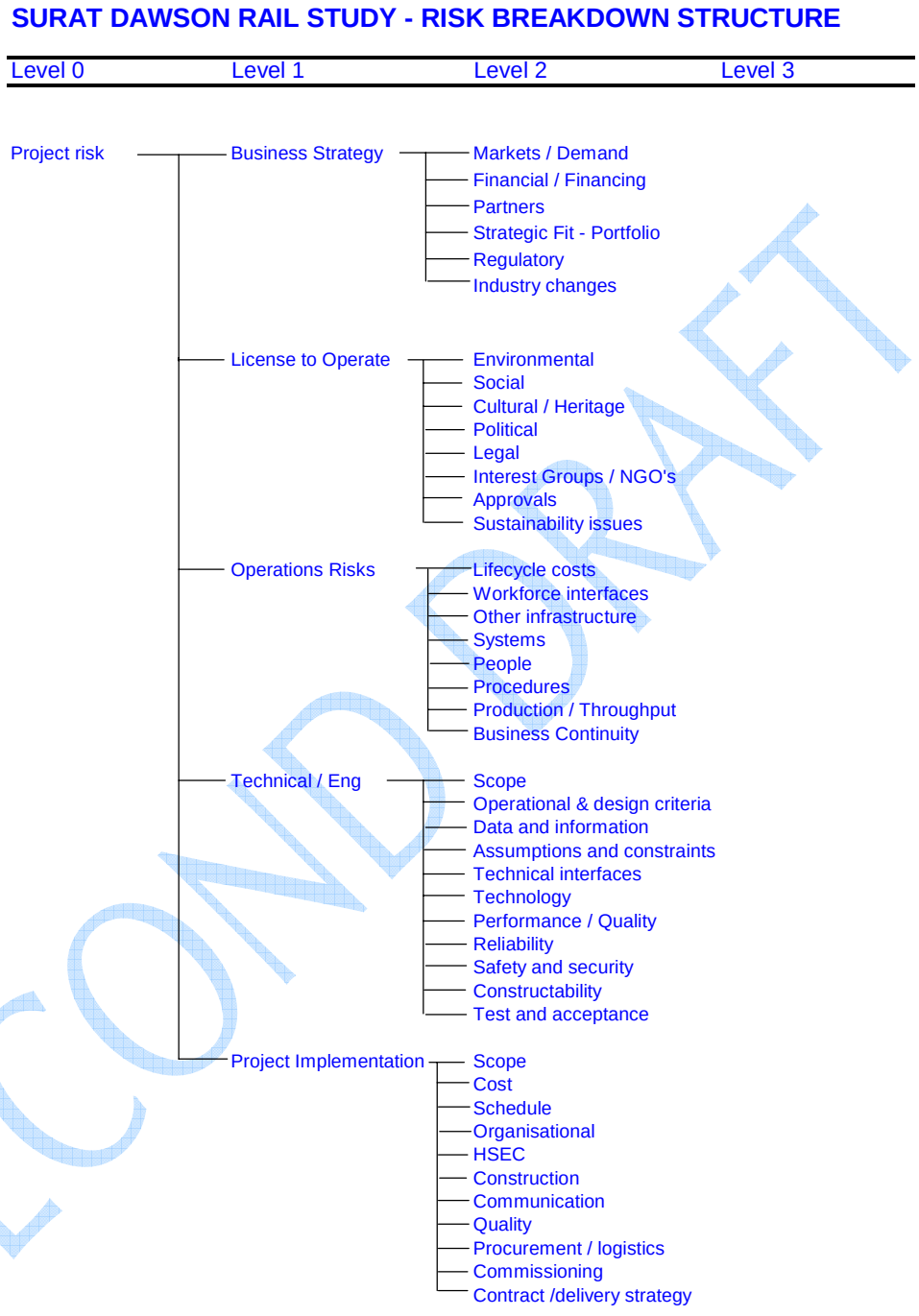

Figure 6-4: Surat Dawson Rail Study - Risk Breakdown Structure

6.11 Risk Identification, Analysis, Evaluation and Treatment

6.11.1 Qualitative Process

A series of facilitated risk and opportunity workshops shall be held based on the RBS to:

- Identify new risk issues and review existing risk issues
- Characterise, rate and re-rate the risk issues to develop updated risk profiles
- Evaluate risks against the agreed risk criteria and agree risks that require treatment to reduce the residual risk level
- Identify key risk treatments, develop detail plans and assign an accountable manager

Typical risk profiles that need to be developed are shown in the following figures, Figure 6-5, Figure 6-6 and Figure 6-7:

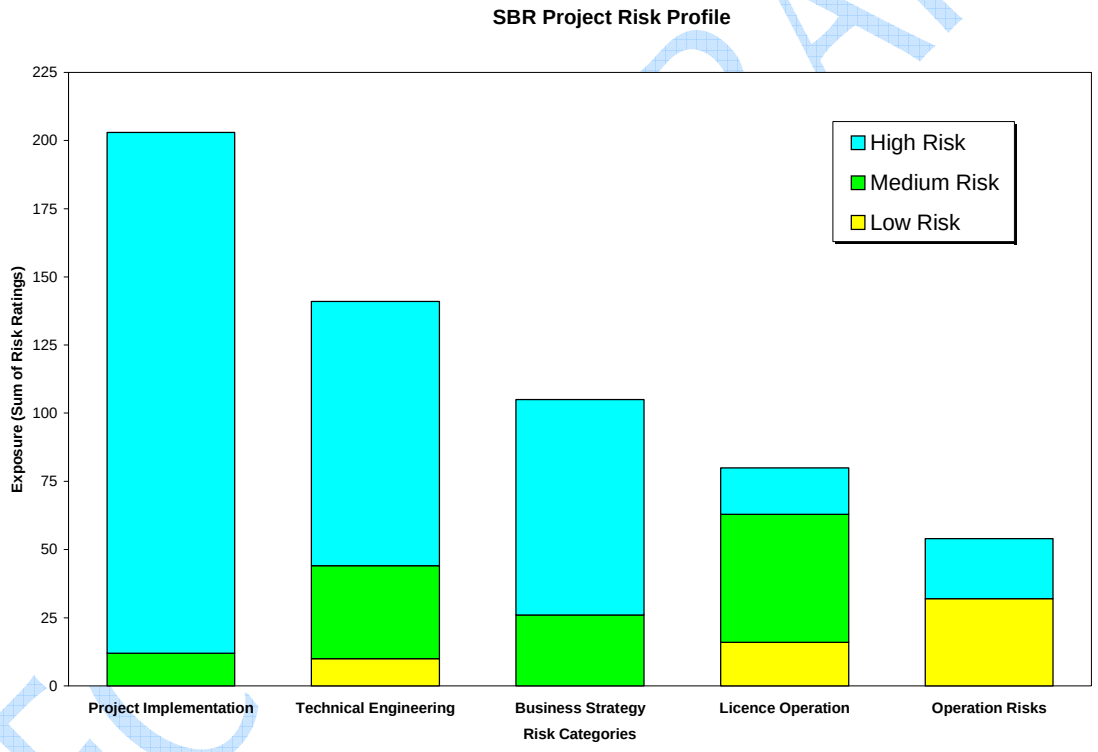

Figure 6-5: SBR Project Risk Profile

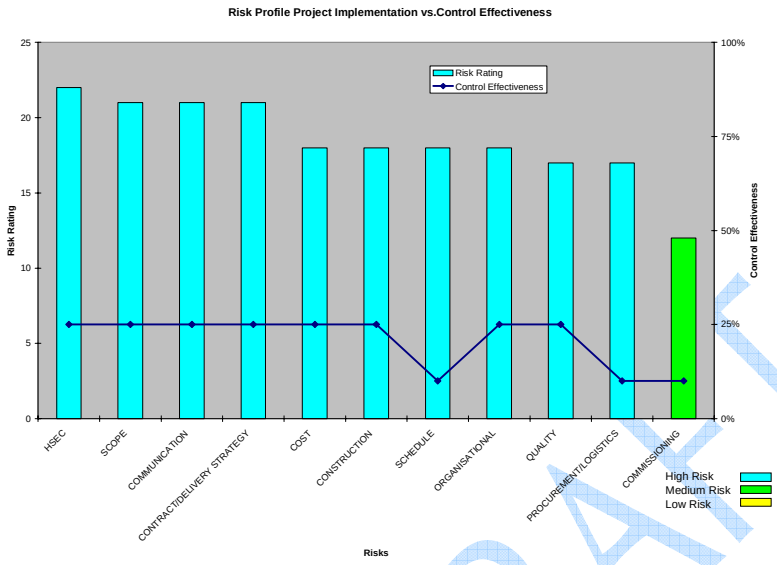

Figure 6-6: Risk Profile Project Implementation vs. Control Effectiveness

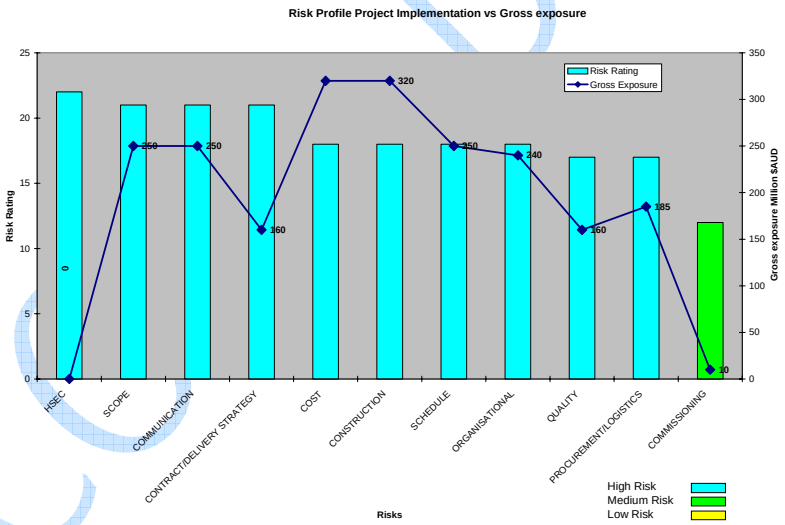

Figure 6-7: Risk Profile Project Implementation vs. Gross Exposure

As shown above the risk profiles can be "rolled-up" to the appropriate level for communication to different management levels. The profiles need to show both risk issues and rating against the assessed control effectiveness and gross exposure.

6.11.2 *Quantitative Analysis*

Quantitative analysis shall apply for:

- Overall project risk assessment of capital and schedule risk
- Technical risk assessments

Project quantitative risk analysis shall be applied to cost and schedule using probabilistic analysis techniques. This will assist in determining the quantification of the project contingencies (capital and schedule) and the associated reserves or risk amounts that are congruent with the risk appetite of Transnet. Quantitative Capital Cost Risk Analysis is addressed in more detail in Section 9.2.

6.11.3 *Monitoring, Review and Communication*

Risk management reports are to be provided for the key reporting milestones of this study phase to ensure that the project stakeholders are fully informed of the process and the results that will include reporting on the following:

- Risk management scope, objectives and process
- Risk register and risk profiles from which the most significant risks are noted and summarised
- Key risk treatments that are required and their status including the accountable manager
- Key controls that need to be monitored to manage the risk profile

During this stage risk management shall also be an agenda item for major project meetings and the project risk manager shall provide appropriate reporting on the status, key actions and key upcoming actions.

6.11.4 *Technical Risk Management*

Technical quantitative risk assessments are typically required for:

- Consequence and risk modeling of safety related risks as required
- Safety Integrity Level (SIL) assessments as part of the safety lifecycle process

Typical technical quantitative risk assessments are completed using fault and event tree analysis of unwanted events.

More detail of these types of analysis is provided in the technical risk guideline.

In accordance with the technical risk management process shown in the following figure, Figure 6-8, the following activities will be completed:

- Technical Risk Management Plan for the this phase
- Complete Hazard Study 2 if it was not done in the previous phase
- Complete Hazard Study 3 (HAZOP) and CHAZOP
- Complete Functional Safety Studies
- Complete the fire protection preliminary design
- Complete a preliminary Hazardous Area Classification
- Develop the technical risk register

Full details of the scope, requirements and deliverables of the above activities can be found in the technical risk management guidelines.

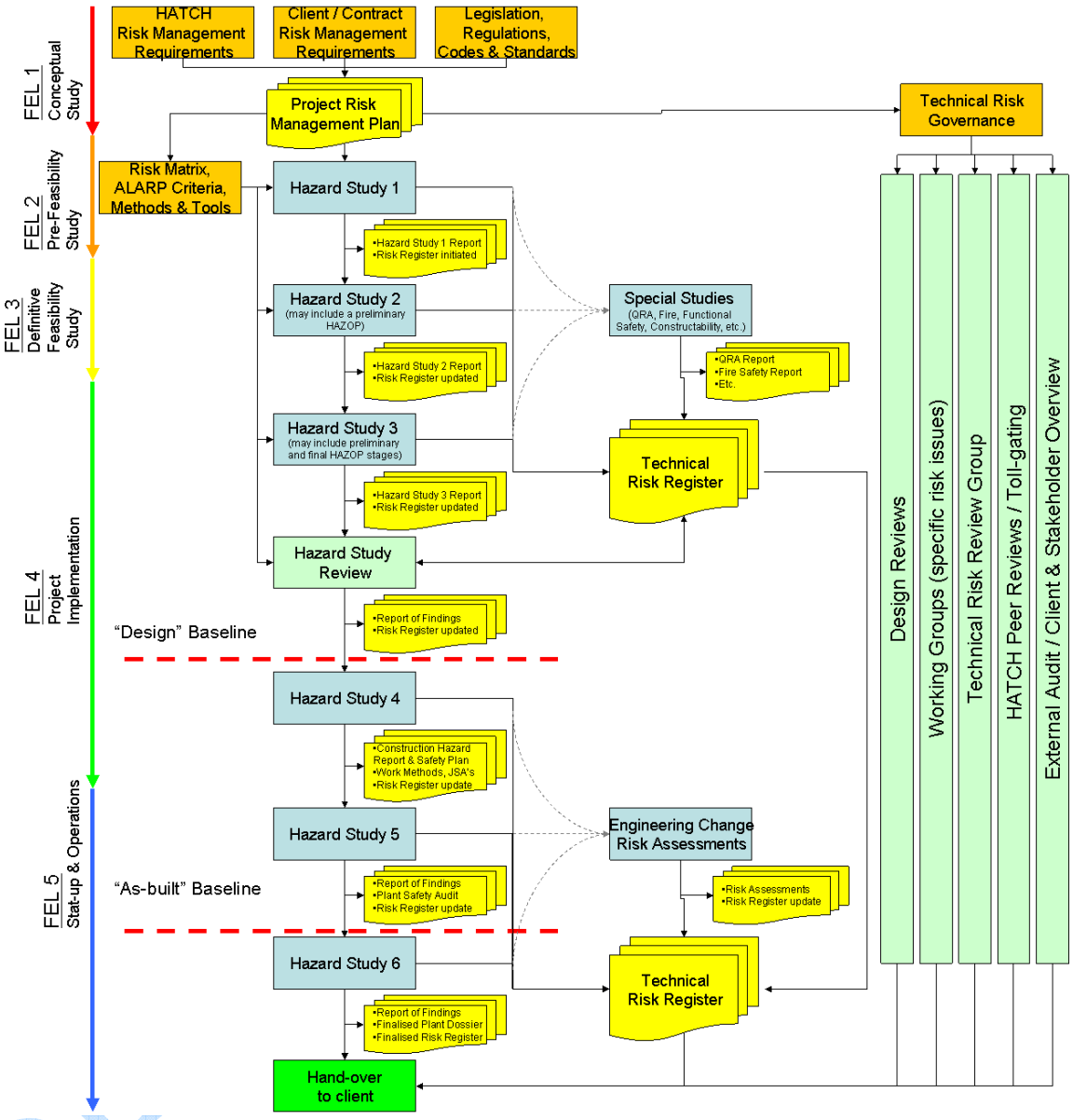

Figure 6-8: Risk Management Process

6.11.5 Risk Management Plan for FEL-4

A detail risk management plan shall be developed for the FEL-4 phase of the project. This plan is typically included as part of the Project Execution Plan (PEP) for the execution phase.

6.11.6 *Project Value Analysis*

The project value analysis (PVA) and risk management processes are closely integrated with the need to re-assess risk profiles associated with any identified scope opportunities. The PVA workshops are typically organised and facilitated by the risk facilitator.

6.11.7 *Lessons Learned*

A lessons learned workshop shall also be held to review the risk management process and its effectiveness during this phase. Any process gaps or opportunities for improvement are to be noted for application in the next phase and future studies.

6.11.8 *Risk Audits*

As part of the overall quality process, audits of the risk management process shall be organised by the risk manager in liaison with the project and quality managers. Corrective actions identified during the audit shall be implemented by the risk manager.

6.11.9 *Risk Management Activities and Deliverables*

- **Project Risk Management Plan including Technical Risk Management Plan -** The plan will outline the risk management system that will be used for the project, typically upgraded from PFS - includes both overall project risk and technical risk management for the project
- **FS Risk and Opportunity Register** - Upgrade PFS risk register using new information and detail, especially for the key risks
- **FS Risk Profiles – Qualitative** - Produce risk profile using the data in the risk register. Review and update on a regular basis throughout the FS
- **FS Risk Treatment Plans -** Develop treatment plans and critical procedures for unacceptably high risks and potential impacts. Complete cost-benefit analysis for treatments
- **Schedule Risk Profile -** SRA (Schedule Risk Analysis) completed using Pertmaster to assess schedule contingency and treatment plans to control schedule risk
- **Capital Cost Risk Profile** - Quantitative risk profile of Capex based on estimate uncertainty and potential discrete risk events to get Mean, P10, P50 and P90 as inputs to contingency and target budget where P90 implies 90% likelihood that specified capital cost will not be exceeded
- **FS Project Value Analysis (PVA)** - PVA completed and project basis upgraded. Decision analysis for key trade-off studies
- **Technical Risk Management Plan -** This plan will be included in the overall Project Risk Management Plan
- **Fire Protection Design** - same status as engineering deliverables, design criteria, specifications, hydraulic calculations, PI&D, layout for Fire Protection systems IFD
- **Hazard Study 2 -** Completed in the PFS or FS phase and also referred to as a Preliminary Hazard Analysis. The purpose of this study is to identify significant hazards and to provide an opportunity for elimination through re-design. This study builds on Hazard Study 1 by pinpointing critical risks and design strategies to mitigate risk as well as identifying those hazards that require further analysis. Where the project could create significant on-site or off-site risks, a Quantitative Risk Assessment must also be carried out by a qualified Hazard/Reliability Engineer. The Risk Register is updated following the study and a "Hazard Study 2 Report" is produced

according to standard procedures. The study will also produce most of the information and assessments needed to meet the requirements of the company and regulatory authorities on safety, health and environmental protection. At the end of Hazard Study 2 all information necessary for the production of an Environmental Impact Assessment will have been assembled

- **Preliminary CHAZOP** (Controls HAZOP) - If required, a Preliminary CHAZOP is performed as an extension of Hazard Study 2. This study identifies hazards and operability/maintainability problems related to the project scope, design requirements and the proposed approach to the process/equipment control part of the project. A CHAZOP Report is produced according to CHAZOP Procedure and the Risk Register is updated
- **Training and External Audits** - Training will occur to familiarise the project team with the selected project risk management system and the techniques to be employed to enable them to effectively achieve the objectives of the project and Project Risk Management Plan. External audits will be completed in accordance with the Project Quality Plan (PQP)
- **Monitoring, Review and Reporting -** Review of project risks and treatment plans as part of the Gate Review Process
- **SIL reports and any other technical quantitative risk assessments**
- **Audit and Review reports, Lessons Learned reports**
- **Risk Management activities for FEL-4**

6.11.10 HAZOP Study

Hazard and operability studies (HAZOPs) are a key element of overall quality assurance. HAZOP studies are carried out to:

- Identify potential hazards and impediments to operability in a design
- Anticipate whether the plant will operate as intended under all possible circumstances
- Learn about hazards through foresight, instead of after-the-fact review

Every part of the design for the whole plant (project) is examined.

6.11.10.1 HAZOPs in Feasibility Studies

HAZOPS are conducted during the Feasibility study to:

- Identify major hazards and make certain fundamental decisions:
  - Plant location within the site
  - Design aspects requiring special development to contain hazards
  - Further research required to obtain information needed to produce an effective design

During the Pre-feasibility study sufficient information exists to conduct a preliminary HAZOP study which reviews hazards and operability issues at the facility/process system level. For instance an entire thickening system will be reviewed as a singular unit, instead of individually reviewing each piece of equipment within the thickening system (thickener, flocculant system, overflow tank, overflow pumps, underflow pumps, etc.).

- Methodology

  The HAZOP process begins with selection of a facility or system to review. The facility system is highlighted on the process control diagram. A description of the intended operating function of the system is given. This is normally done by the process engineer.

  The team then systematically questions every part of the system to discover how deviations from the intention of the design can occur and decide whether these deviations give rise to hazards. The questions are formulated around guide words which ensure that the questions (posed to test integrity of each part of the design) explore every conceivable way that design could deviate from intention.

  Each deviation is considered to determine causes and consequences. Deviations with unrealistic causes or trivial consequences are rejected. For deviations with conceivable causes and consequences that are potentially hazardous, the hazards are noted. The team is then given an opportunity to identify preventative measures (safeguards), which if identified are noted and the issue closed off. When no preventative measures can be found, action the point to a person whom must investigate the issue.

  A template for use in HAZOP studies can be found in the Transnet Projects Procedures.

- Following the HAZOP study, the notes are issued to the project team in the form of a report. Outstanding issues must be investigated by the nominated personnel and a recommendation must be noted in the report. Once all outstanding issues have been dealt with, the HAZOP report can be closed out and issued to the Owner and all project team members concerned. The project manager and project engineer must ensure that all recommendations are implemented

6.12 Communications Management

Infrastructure projects, and particularly large ones, are likely to involve a large and diverse group of stakeholder interest groups in addition to the project team and owner. A communications plan is needed at all project phases from Concept (FEL-1) to Close-out as there are stakeholders and team members to consider in each project phase. At the early phases of a project, the numbers of stakeholders and team members are typically fewer and communications requirements understandably simpler. Issues are also likely to be more internal to the owner than at later phases. At early phases, external stakeholder interest groups may not need to be engaged on issues, which are still at a concept or pre-feasibility phase of consideration. In these early stages, much of the information may come from 'desk-top' reviews of published information, market research or previous reports, etc. As the project progresses through the phases, the number of stakeholders and team members will increase as will the complexity of communications. For the Concept (FEL-1) and Pre-feasibility (FEL-2) phases, a plan is still needed though it may not necessarily be formal. It should still be documented however. At the feasibility phase, a formal communications plan will need to be implemented, particularly if environmental and social issues are to be identified and resolved with external stakeholders before the project Execution phase (FEL-4). An effective and well-implemented communications plan is however an essential element of an Execution project (FEL-4).

The key elements of Communication Management include:

- Planning communications and incorporating these in a Communications Plan
- Distributing information to project stakeholders, when it is needed and in the form it is needed
- Collecting and reporting project performance information to the project team and stakeholders

- Engaging with and managing stakeholders to identify, address and resolve requirements and issues

For the Feasibility Study phase (FEL-3), the key aspects to address are:

- The project has passed the Pre-feasibility (FEL-2) phase. The project owner now needs to invest a substantial sum in the project as the next phase is Execution (FEL-4) where the large capital sums are to be invested. This is the last chance for the project to obtain the correct Go/No Go decision. As much uncertainty and risk as possible needs to be eliminated from the project. The reduction of risk and uncertainty involved significant investment into engineering and research. Additional specific physical research is essential as is broad based stakeholder engagement and environmental impact assessments. This if necessity involves communicating with the public at large and government
- The project is now focused on the chosen option and all the ramifications around its implementation in FEL-4 Execution. All sensitive issues must now be raised and resolved with external stakeholders. These issues to consider probably need to be raised in public stakeholder for and/or with government. Potential investors may also need to be approached either discretely or through public share offerings. This is a costly exercise, which needs to be handled professionally and well executed to ensure project success
- The project now needs to identify and engage all the internal stakeholders and their interests. These could be shareholders, customers, suppliers and employees. How should this be done? This too needs to be a professionally-executed and probably costly exercise
- Based on the above considerations, a comprehensive Communications Plan needs to be prepared and executed for the Feasibility FEL-3 phase. This will lead into and lay the ground work for the subsequent Execution phase FEL-4 Communications Plan
- At the FEL-3 Feasibility Phase, the project investment is major as this phase is to all intents and purposes the start of the Execution phase FEL-4. Project performance reporting on schedule, time, costs and quality needs to be addressed comprehensively. This must be documented in a separate communications plan. A typical communication plan basis is contained in Appendix C

6.13 Project Execution Systems Set Up

6.13.1 Approach

At the initiation of a project, regardless of phase, a range of systems, processes and documentation needs to be put in place to provide a framework to both guide and facilitate the execution of the project phase.

The extent to which these are each defined/ put in place increases in detail and complexity as the project progresses through successive Lifecycle Phases from FEL-1 to FEL-4.

A key principle in project set up is to remember that, for all project systems, the following applies:

"System = People + Practices/ Procedures + Tools"

Any system (engineering, control, financial, document management, etc) comprises 3 interdependent elements:

- Trained, capable people
- Documented practices and procedures

- The tools to support those procedures (e.g. Primavera, SAP, etc.) and the people using them

The greatest threat to successful project set up is the failure to adequately train the project team in the use of the project's tools and procedures.

The following table presents a generic set up checklist of those fundamental requirements that ought to be in place – at the appropriate level of development – at the start of the given phase.

The highlighted requirement of each project phase shown in Figure 6-9, indicates an option for the Project Team to assess and evaluate the need to change the designation of Generic or N/A to Yes or as deemed appropriate for the specific phase of the project.

Project Phase	FEL-1 Concept	FEL-2 Pre-feasibility	FEL-3 Feasibility	FEL-4 Execution
Project Structure				
Scope of Work	Yes	Yes	Yes	Yes
Scope of Services and Deliverables	Yes	Yes	Yes	Yes
Budget for current Phase	Yes	Yes	Yes	Yes
Schedule for current Phase	Yes	Yes	Yes	Yes
Project Execution Plan (PEP)/ Work Plan	Work plan	Work plan	PEP	Yes
• Organisation chart	Generic	Generic	Yes	Yes
• Position descriptions/ roles and responsibilities / RACI matrix/ staffing plan	Generic	Generic	Generic	Yes
• Health and Safety	Generic	Generic	Generic	Yes
• Environment and Community	Generic	Generic	Generic	Yes
• Sustainable Development	Generic	Generic	Generic	Yes
• Project controls (WBS/ FBS, PBS, estimate/ budget development, cost control, schedule, progress monitoring and reporting)	N/a	Yes	Yes	Yes
• Change management	Generic	Generic	Generic	Yes
• Engineering management	Generic	Generic	Yes	Yes
• Document management	Generic	Generic	Yes	Yes
• Procurement and contracting	N/a	N/a	Yes	Yes
• Materials management	N/a	N/a	Yes	Yes
• Construction (including IR/ ER)	N/a	N/a	Generic	Yes
• Commissioning	N/a	N/a	Generic	Yes
• Risk management	Generic	Generic	Yes	Yes
• Systems	N/a	N/a	Generic	Yes
• Communications	N/a	N/a	Generic	Yes
• Quality (including review)	Generic	Generic	Generic	Yes
• Training	Generic	Generic	Generic	Yes
• Project admin, accounting and financial control	Yes	Yes	Yes	Yes
• Project Procedures	Generic	Generic	Generic	Yes
• Execution Systems				
• Safety (e.g. SIMS)	Generic	Generic	Generic	Yes
• Accounting/ cost collection (e.g. SAP)	Generic	Generic	Generic	Yes
• Cost Control (e.g. iPAS)	N/a	N/a	Yes	Yes
• Schedule (e.g. Primavera, MS Project)	Yes	Yes	Yes	Yes
• Engineering execution (e.g. Bentley, Intergraph)	N/a	Generic	Generic	Yes
• Engineering management (e.g. HEMS)	Generic	Generic	Generic	Yes
• Document management (e.g. WorkSHARE)	Generic	Generic	Generic	Yes
• Procurement (e.g. iPAS)	N/a	N/a	Yes	Yes
• Contract administration (e.g. iPAS)	N/a	N/a	N/a	Yes
• Construction	N/a	N/a	N/a	Yes
• Commissioning	N/a	N/a	N/a	Yes
• Information and Communications Technologies (servers, networks, etc.)	N/a	N/a	Yes	Yes

Figure 6-9: Project Execution Systems Set-up

6.14 Legal Accountability

6.14.1 Introduction

It is important to establish as early as possible in the project phase, the chain of authority for Reporting and Legal Accountability on the project and who in the various organisations will be involved. This section is intended to serve as a guide to the typical chain of authority but will need to be confirmed at the time of the project.

6.14.2 Responsibility and Accountability

6.14.2.1 Driver

This phase is driven by the Project Director with involvement by the Operating Divisions through the Operating Division Representatives (ODR's).

6.14.2.2 Table of Responsibility and Accountability

Levels of accountability and involvement are depicted as follows:

R: Responsible for Development

A: Accountable

S: Supporting

C: Consulted before decision

I: Informed after decision

	Identify	Prioritise	Conceptual Design	Evaluate	Pre-feasibility Report	Concept Approval
CAPIC/ Board						**A**
Operations CEO	**A**	**A**	**A**	**A**	**A**	**R**
Operations Engineering	**R**	**R**	**R**	**R**	**R**	
Operations Project Management			**R**	**R**	**R**	
Operations Finance				**R**	**R**	
Project Director	**I**	**I**	**S**	**S**	**C**	**C**

Figure 6-10: Table of Accountability and Responsibility

6.14.3 *Reporting in Project Lifecycle*

The following Figure, Figure 6-11, shows the flow and shift in emphasis in the project's approval, accountability and reporting patterns within the time frame of the project lifecycle.

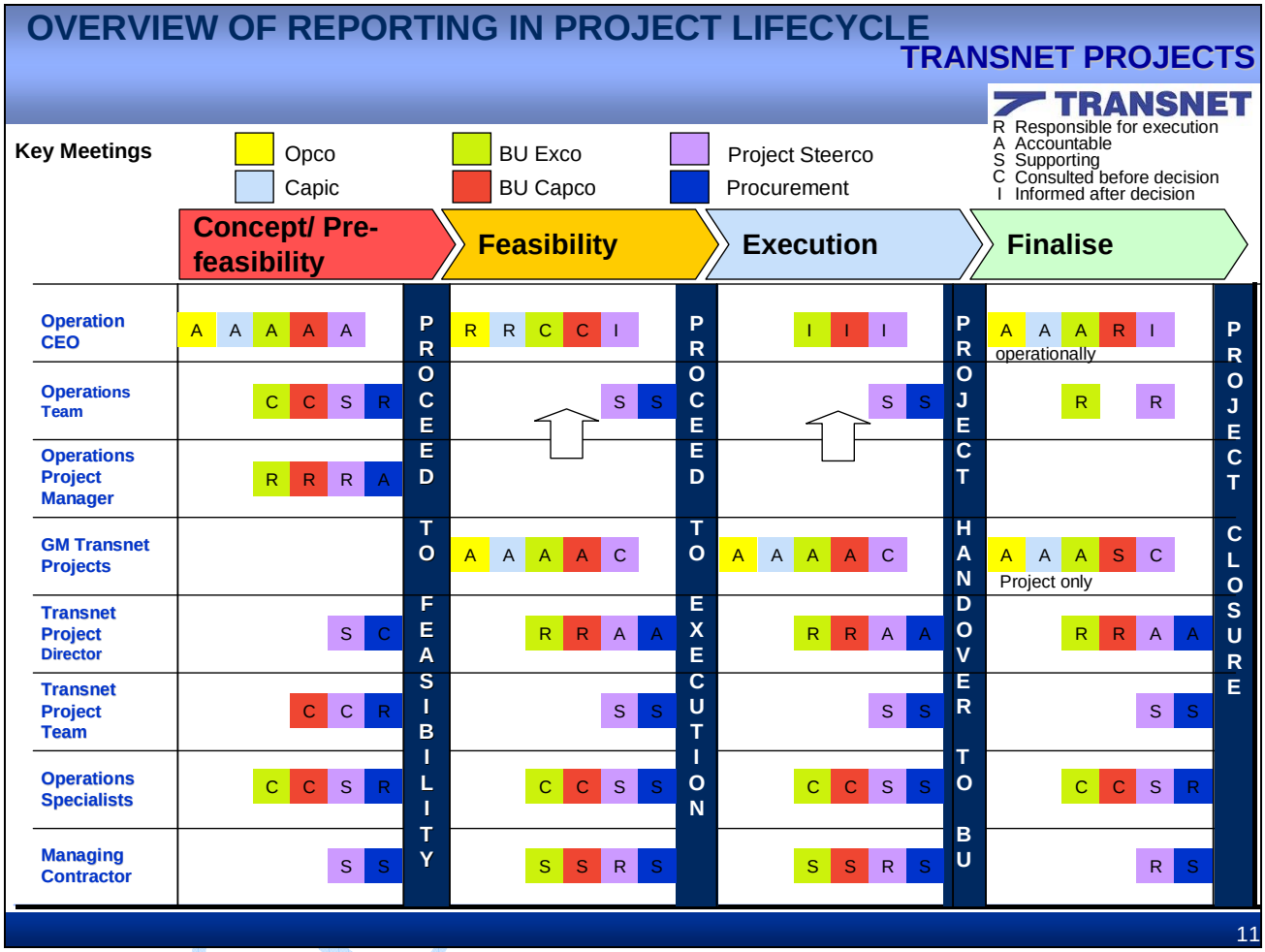

Figure 6-11: Overview of Reporting in Project Lifecycle

6.15 Project Implementation Review

Check team in place, systems in place and users trained, etc.

Confirm Gate Review checklist in place and embedded in study scope.

Use Project Implementation review checklist as guide (see Transnet Document Management system for checklist). Where gaps are identified by this review initiate an action plan to complete outstanding set up activities.

Chapter 7

7. EXECUTE STUDY

7.1 Health, Safety, Environment and Community

7.1.1 Health and Safety

It is the expectation of the Transnet Projects board and executive management team that Project Managers take ownership of project Health and Safety and ensure an environment is created and maintained where Health and Safety is a prime value that will not be compromised.

Project Managers must be familiar with the Health and Safety requirements as stipulated in Section 12 of the Transnet Projects Life Cycle Overview Manual.

Use the Project Health and Safety Setup and Execution Manual for guidance based on the Transnet Health and Safety System and Delivery Approach. It provides a combination of applicable Health and Safety Functional Guides, Standards, Safe Work Procedures and Safety Guidance Notes.

The manual provides generic project documentation required during the Health and Safety Feasibility Phase – FEL-3, in a logical sequence. For a brief summary also see table in 12.6 of the Transnet Projects Life Cycle Overview Manual.

Key focus areas:

- Develop and implement the Design for Safety Plan and Procedures (refer to applicable procedures and WTS Module 10)
- Conduct a full HAZAN
- Establish the full table of contents for the legal register
- Obtain copies of major Health and Safety codes of practice, standards and guidelines
- Conduct a comprehensive alignment meeting, in compliance with applicable procedure
- Complete comprehensive Health and Safety Management Plan using the information from the alignment session and initiate approval
- Agreement on Health and Safety manning levels, signed off, costed and implemented
- Review and develop the project required Standards, Functional Guides, Safe Work Procedures, and Safety Guidance Notes, (Refer to Transnet Projects Lifecycle Overview Manual). Approval process initiated
- Prepare Contractor Health and Safety Specification (refer to applicable procedure plus OHS Act Construction Regulations)
- Prepare the Work Method Statements procedure
- Prepare project procedures for Job Specific Risk Assessment and Daily Safe Task Instructions

- Prepare procedures for Health and Safety training and develop a roll out schedule. Training to include, but not limited to, Induction, Working Together Safely, Supervisors Safety - CSM/CST, Visible Felt Leadership and Values Driven Safety

7.1.2 Environment and Sustainable Development

Environment is broadly defined in South African environmental legislation. Environment includes the ecological, social and economic environment. These include cultural, aesthetic and heritage properties. As such, the project 'environment' we consider Environment in the broader 'Triple Bottom Line' (TBL) context of Sustainable Development (SD), comprising its Economic, Biophysical and Community/Social aspects. This is illustrated in the Figure 7-1 below:

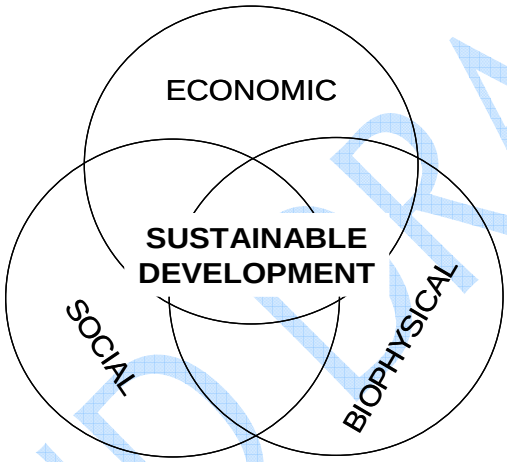

Figure 7-1: Three Aspects of Sustainable Development

Arising from this, a key issue for the project manager to bear in mind and address at all stages of the project is this: The project cannot only be considered from an economic and technical feasibility point of view. The positive and negative impacts of the project on the community and the environment need to be addressed. This includes aspects up to and including project construction and commissioning but also ongoing operations. The need for the project manager to address these aspects arises from three responsibilities:

- The legal requirement to comply with the law, notably the National Environmental Management Principles Act 107 of 1998 (NEMA)
- The possible/probable Owner's requirement to adhere to Triple Bottom Line principles. These need to be ascertained and adhered to. Many companies, especially listed and public companies, measure and report on their TBL performance
- Environmental and social impact considerations are amongst the highest risks to project success. These high risks are called 'fatal flaws'. They can delay the project start, add significantly to the costs or even stop it altogether

The costs of addressing environmental and social aspects of a project can be high but the potential risks to the project going ahead and delays in project approvals are higher. It is important for the project manager should start addressing these processes early and laying the groundwork for the all-important government's GO/NO GO decision to proceed. This is referred to as the Record of

Decision (RoD). Two types of environmental assessment processes are legislated, and each are triggered by different activities and requirements. These two are (1) a Basic Assessment, and (2) a full Environmental Impact Assessment (EIA). The full EIA requires a Scoping exercise which is to be followed by the EIA implementation. The EIA process takes considerably longer than the Basic Assessment because there are more steps involving the public and authorities.

These processes are time consuming and usually require considerable background information, research and stakeholder engagement. It is important to start these information gathering processes as early as possible so as to avoid excessive project execution delays. However, public engagement cannot be started too early for confidentiality reasons and for one other very important reason. Government considers a particular chosen project concept/option in handling down the RoD. As the project progresses the options are refined and evaluated and even the chosen option may be refined over time. If a decision is given at a point in time and the chosen option is subsequently amended beyond certain bounds, the environmental authorisation process may have to be revisited. Hence the project manager has a challenging timing balance to maintain between A) the project requirements to get the right environmental (technical, economic, biophysical and social) solution and B) the timing to get it approved on time so that it does not delay the execution.

It is at the feasibility stage of the project that the process (Basic Assessment or Full EIA) to obtain environmental authorisation should be started. However, the level of detail required for input into a Basic Assessment or EIA may not be available at the start of the Feasibility study. If this is the case, it may be useful to start with an environmental screening study prior to an EIA.

Environmental Screening determines whether or not a development proposal requires environmental authorisation and what process (Basic Assessment of Full EIA) is required.

Environmental Screening should be undertaken by an Environmental specialist. The study should include a fatal flaw analysis. This would involve identifying and describing biophysical and social (e.g. archaeological sites) assets at the site(s), and predicting the consequences of the project on these assets (will there be irreversible or irreplaceable impacts).

Before undertaking an EIA process the Environmental Manager should conduct a general environmental audit of the site(s). The purpose of the audit is to determine if there are already environmental problems associated with the site (e.g. unpermitted activities taking place, long term pollution has been taking place). On Brown Fields sites, the Environmental Manager should also determine what the status is of the existing environmental management at the site. If possible these issues should be addressed before an independent EIA consultant and specialists get onto the site because they will have to make public any serious environmental impacts.

Environmental Impact Assessment

The purpose of an EIA is to predict both the positive and negative environmental impacts of a proposed project and to find ways of reducing adverse impacts to acceptable levels. It serves to shape projects to suit the local environmental and to present the predictions and options to the environmental authorities for a decision.

Two types of environmental assessment processes are legislated, and each are triggered by different activities. These two are (1) a Basic Assessment, and (2) a full EIA requiring Scoping followed by the EIA. The latter process takes considerably longer because these are more steps involving the public and authorities.

An EIA for submission to the environmental authorities must be conducted and prepared by an independent Environmental Assessment Practitioner (EAP). Specialists involved in the EIA must also be independent.

You are strongly recommended to employ an Environmental Manager (with EIA experience) on your project team to appoint and manage the EAP.

In the EIA process the EAP will engage members of the public and relevant authorities. This tends to make the Owner very uncomfortable as traditionally only a CEO or their representative engages the public.

For large projects it would be useful to ask your Environmental Manager or EAP to present a short course on environmental legislation and the EIA process to the senior managers of the project and Owner team.

The scope of an EIA is set, initially, by the project scope, but later also by members of the public (referred to as interested and affected parties – IAP's). IAP's and the authorities can propose different locations, technologies and layouts, all or some of which may significantly affect the projects' plans. Each of these alternatives must be addressed. This may involve a short paragraph, for a clearly ridiculous suggestion, to detailed studies taking several months.

Because the scope of an EIA is largely not in the Project Managers control, the EAP cannot provide an accurate budget up front. This can be problematic if cost is used to evaluate tenders for the EIA. Focus the evaluation criteria on the EAPs technical ability, appropriate experience, and ability to manage a team of specialists.

If an EAP provides a fixed budget for any but the smallest EIA, drop them, they don't have a clue.

At the start of the process the EAP will complete and submit an environmental application to the Environmental Authority. Note that for parastatal organisations, such as Transnet, this will always be the National Department of Environmental Affairs and Tourism (DEAT).

The EAP will then submit a Plan of Study for Scoping (PoSS) to DEAT for approval. The PoSS describes the approach to be followed during the Scoping Phase, including the public participation process.

At the start of the Scoping Phase the EAP will advertise the project (local and regional newspapers for small projects, national papers for large projects or if a national asses, e.g. natural heritage site, may be affected). People and organisations who respond will be registered as IAP's on a database that the EAP will establish and maintain throughout the EIA process.

The Scoping Phase determines the range of issues and alternatives to be considered in the EIA. IAP's are provided with a description in the EIA and the project and are invited to raise issues and concerns to be addressed in the EIA. Some of these issues can be scoped out of the EIA in the Scoping Phase by the EAP. The remaining issues set the scope of the assessment phase of the EIA and usually need to be investigated by appropriate specialists.

It is important that the EAP maintains an effective paper-trail of all IAP correspondence (faxes, emails, advertisements and minutes) so that the level of public participation can be demonstration to DEAT.

Meetings with IAP's take place during the Scoping Phase. These are organised and run by the EAP. They are the EAP's meetings, not the project team's nor the Owner's, although the team and Owner should be represented and may be required to contribute.

If the IAPs have issues with Transnet activities elsewhere in the region, they will use the EIA as a vehicle to raise the issues, even if the issues have nothing to do with the project. There may, for example, be a history of poor environmental management practices at a Transnet site and this could spill over into your project's EIA. IAPs have long memories and are not always well informed about recent improvements. The result is that your EAP could walk into an already hostile environment and the EIA will be more complex than necessary. Your Environmental Manager should identify these conditions in the community prior to embarking on an EIA process. You will need to work together with the affected operating units to address the problems and improve communications with the community.

DEAT must approve the Scoping Report and Plan of Study for EIA.

Try to avoid large public meetings. They are the last of the blood sports! There are many other effective ways to engage IAP's (e.g. focus groups, open days etc) that your EAP will be able to use. If a public meeting is necessary, if the project is controversial, and if the affected community is clearly concerned, ensure that your EAP uses an experienced multilingual facilitator.

IAP's must be given an opportunity and sufficient time to review and comment on the reports produced by the EIA process. An important point to note here is that the period IAP's are given to review and provide comments on documents cannot include school holidays or public holidays. This can have a significant impact on the EIA schedule.

The process flow diagram in Figure 7-2 below summarises the process followed by a Basic Assessment, Scoping EIA, and the appeal process.

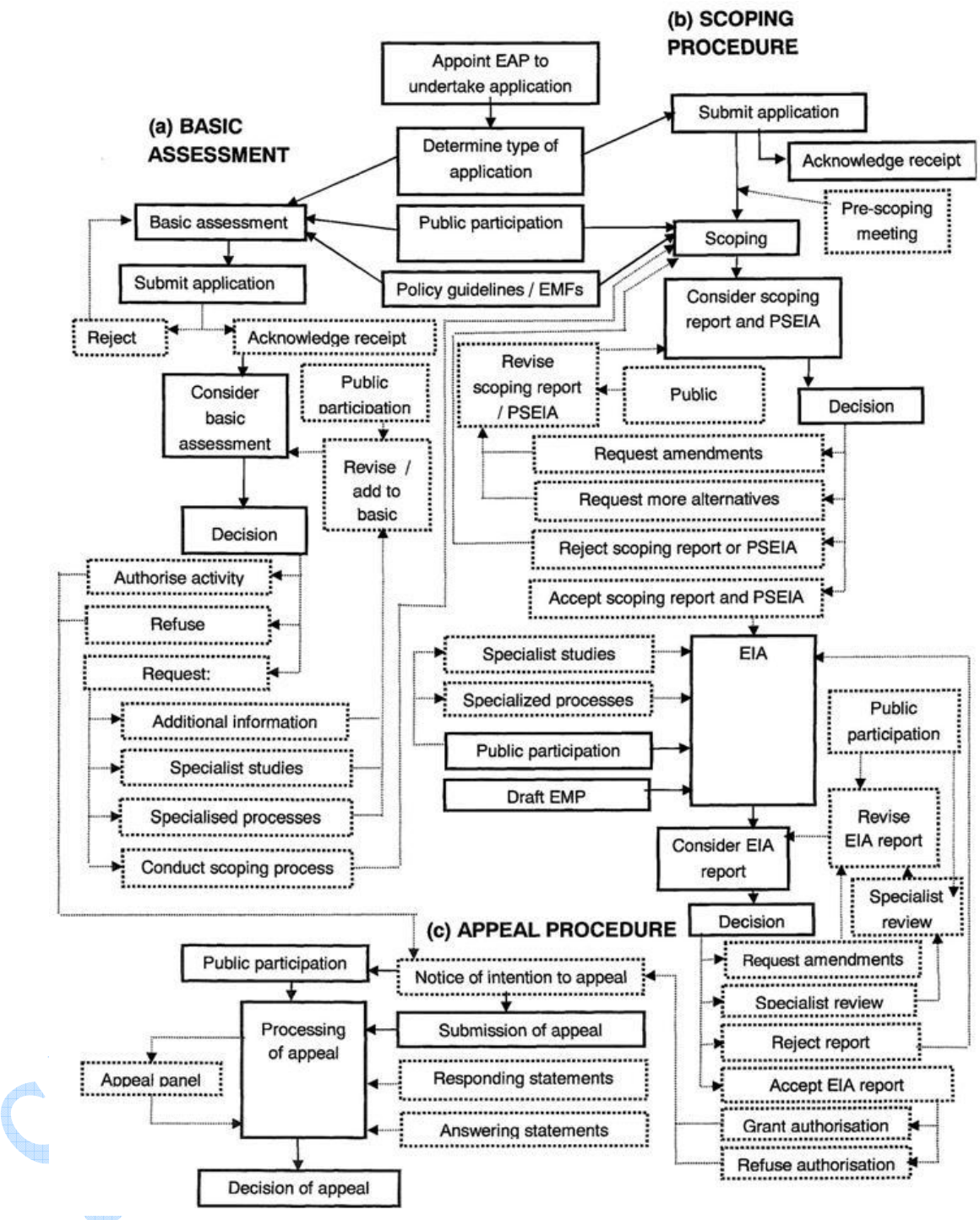

Figure 7-2: Detailed Process Flow

The EAP will make use of relevant specialists to conduct specialist studies as part of the EIA process. Sometimes, in order to speed up the EIA process, these studies are started during the Scoping Phase. This is especially if the specialist studies will take several months to complete. The risk to this approach is that the scope of one or more of the specialist studies may change due to impacts from issues raised by IAP's or requirements of DEAT provided during or at the end of scoping.

A key risk to an EIA is if the project scope changes significantly after the Scoping Phase has been completed. Significant changes in the project scope (and significance is related to the sensitivity of the environment) may result in part or all of the Scoping Phase having to be repeated.

Although the need for a formal EIA is triggered by the activities listed as part of the EIA Regulations, any activity associated with the listed activities must be included in the EIA. Therefore the scope of the EIA is far more extensive than just the listed activities.

The final EIA report (called an Environmental Impact Report or EIR) and the accompanying Specialist Reports can fill several volumes. If you, as the Project Manager, do not have sufficient time to read it all then as a minimum you should read the description of the project, the key findings, and the recommendations.

The description of the project should include everything that will be constructed, especially items that are listed activities, and volumes of product being handled. The detail required depends on whether or not it is in a sensitive environment. Ports are in a sensitive environment so a lot of detail is required where, for example, the marine environment is impacted. Anything that is left out (e.g. a small bridge, high mast lighting, anything within 100 m of the high water mark) will not be allowed and a further EIA process will need to be undertaken for these items.

In reviewing the key findings ensure that the environmental impacts are all predicted to be reduced to low levels after mitigation. Medium and high level impacts will probably not be accepted by the authorities and additional mitigation may be required.

The recommendations should be carefully scrutinised to ensure that they are practicable. Specialists are just that, and they sometimes have little insight about how a facility will actually operate and how problematic it may be to implement the recommendations.

DEAT issues its decision on a Basic Assessment or full EIA in a Record of Decision (RoD). This is a statutory document and its conditions must be complied with. The RoD can be amended by the authorities but remember that IAPs have an opportunity to appeal against any amendments should they not agree. It is likely that the EIA process extends significantly past the deadline for the Feasibility Study and this should be accommodated in the study plan.

7.2 Basic Engineering

7.2.1 Confirmation of Design Basis

- Deliverable:
  - Project Design Basis
- Action:
  - Definition of the Project Design Basis, to establish the information and data that engineering is to be based on. It consists of guidelines and requirements, corporate standards, codes, references to regulatory agreements, form of deliverables, and plant or production capacity
  - The design basis document provides all the base data required for preparation of material balances, heat balances, flow sheets and equipment sizing. The document is substantially completed during preliminary engineering but will continue to be updated during both basic and detail engineering

- The design basis includes: Design safety philosophy, environmental requirements and objectives, plant inputs (e.g., fuel, feedstock), plant license and permit requirements, plant operating requirements (capacity, availability), plant process requirements, plant product or output (type and capacity), site parameters (geographical, meteorological, soils, hydrological), plant design life/ equipment design factors, engineering quality, product and plant quality, product and raw material storage, technology, investment and project economics

7.2.2 Fixed Scope and Design Criteria

- Deliverable:
  - Signed off Scope/ Design Criteria Freeze
- Action:
  - Clarification and identification of project scope
  - Evaluation of user requirements and project scope
  - Identification of solutions
  - Presentation of understanding of scope and design criteria to stakeholders
  - Obtain agreement and alignment of all stakeholders

7.2.3 Basic Engineering

7.2.3.1 Purpose

Used to set up execution phase scope definition and as an input to obtaining Feasibility Study approval.

7.2.3.2 Description

The minimum content of the Basic Engineering phase should be as follows (modifications may be necessary depending on the scale and complexity and location of the project):

Detailed specifications of all major process equipment will be completed. Facility (port, rail, other) general arrangement drawings will be updated and mechanical flowsheets completed. Port/rail simulations undertaken. Fixed price bids for major equipment will be received, evaluated and vendors selected. To allow critical foundation design or modularisation development to take place equipment procurement contracts may be split into two phases. Phase one; the production of vendor information and drawings during the Basic Engineering Program. Phase two; the fabrication of the equipment should there be a positive decision to proceed with the project at the end of the Feasibility Study. In certain critical process areas preferred vendors may be selected outside the bid process. Orders for long-lead items will be placed with appropriate cancellation clauses. At this stage process plant general arrangements will be upgraded to include all minor equipment (using preliminary or typical vendor data,), ready for detailed design.

Based on the results of the work carried out during Pre-feasibility Study and the implementation plan trade off study, a decision on fabrication and construction criteria must be finalised. At this stage the block plan or layout will be modified accordingly and finalised. Detailed site grading and site preparation design and detailing will be carried out, quantity take-offs completed and prices solicited. This work will also include construction lay down areas and receiving facilities (modular

receiving), and site roads, etc. Local sources of structural fill materials and aggregates to meet the overall project requirements will be identified and prices solicited.

Detailed paving design will be in progress (and detailed foundation design for all major equipment , based on vendor information). Further geotechnical work will be carried out at major foundation locations or if a modular or skid mounted approach is adopted; foundations will be designed to meet these criteria. Building and minor equipment foundation design will remain at a preliminary level, but will be modified and enhanced to meet the advancing design knowledge. Unit price bids will be requested for foundation work.

Design of major structures will be advanced to the stage that detailed quantity take-offs can be completed and bids can be obtained.

Concrete design and quantity take-offs will be developed to the level that a discourse can be opened with major suppliers in the region and unit price bids requested. The information utilised to develop quantities and costs should be reviewed by an appropriately qualified third party at this stage.

To expedite the Electrical section of the Basic Engineering Program a clear scope of definition will be developed for power supply and distribution systems including main substation, site distribution single line diagrams, unit substations, updated motor list, major cable tray routing, etc. Detailed specifications for major substation equipment and distribution equipment will be produced. Firm price bids will be requested for major equipment, unit price rates for bulk materials and budget prices for minor equipment. Quantity take-offs and capital estimates will be validated against previous projects.

P&IDs and preliminary piping layouts will be developed for all major process streams. All major piping will be sized and specifications completed. A preliminary estimate of valves and piping spools will be made at this stage. Quantity take-offs and a capital estimate will be completed and validated against other projects.

Terminal operating systems, process control systems (software and hardware) and instrumentation estimates will be completed based on the P&IDs and a preliminary I/O count. Vendor prices will be requested for control systems and unit rates for instrumentation.

Layouts and estimates for all infrastructures, buildings and support facilities will be prepared.

The Engineering team will provide input and support to other functional groups (construction, planning, estimating) in the flowing activities:

- Development of a detailed construction schedule including the procurement and expediting program
- Outline construction contract packages definition
- Detailed facility based Control Estimate development
- Commissioning costs, operating costs, sustaining capital and closure costs update from FEL-2 based on current information
- A risk analysis on the estimated capital cost and contingency
- An assessment of the required cost growth allowances to be applied to each element of the capital estimate

- An assessment of the inflation allowance, foreign exchange gains and losses, early production costs and revenues that should be applied to the project

7.2.3.3 *Action*

- Complete all basic engineering and design tasks (refer to Gate Review Guidelines)
- Apply Engineering Management Procedures as per the Study Work Plan

7.2.3.4 *Deliverables*

- Basic engineering deliverables sufficient to support the development of a Capital cost estimate of target quality
- Approved Scope of work for all supply and construction contract packages for execution
- Approved Design Criteria for execution
- Approved facility layout drawings
- Technical evaluation report on long lead and early works packages
- Approved Standard specification and drawings
- Draft set of project specific specifications
- Definitive MTO sheets
- Updated Reliability, accessibility and maintainability review report including actions items issue for design

7.2.3.5 *Methodology*

- Approval of scope of work for all supply and construction contract packages
- Finalise contract packaging plan
- Finalise facility location including layout and routing
- Approval of all Design Criteria
- Collect definitive site-specific condition information from field investigation programs (survey, geotechnical program, environmental surveys, climatic data)
- Finalise impacts of regulatory framework and requirements
- Development of equipment lists, major equipment specifications
- Finalise sources for required services (power, water, waste disposal etc.)
- Finalise standard specification and drawings
- Prepare draft project specific specifications
- Perform Definitive material quantity take-off
- Prepare Engineering document for procurement and contracting for early works and long lead items
- Conduct final reliability, accessibility and maintainability reviews

- Utilisation of sustainable development framework and methodology to compare final design if competing processes are being decided at the basic engineering stage
- Application of value improving practices

7.2.3.5.1 Engineering Management

Engineering Organisation Structure, Responsibilities and Authorities

Engineering organisation structures vary depending on the size and format of the study. A typical structure is based on a facility/area delivery approach. Facilities/areas are managed by Area Leads reporting to the Project Manager. Other studies may be organised by engineering discipline. As studies scale up in dimension, area management is the preferred structure.

The study Work Plan will set out the overall organisation reporting responsibilities and authorities of senior project staff. Design resources are controlled by the Engineering Manager. Roles and responsibilities of design staff will be nominated and recorded by the Engineering Manager in conjunction with the Project Manager.

Via the matrix structure lead discipline engineers provide consistency in the engineering approach over the project facility/area.

Role and Responsibilities

- **Engineering Manager:** responsibility for managing the engineering team: controlling engineering budget and scope, planning, resourcing, scheduling; providing technical leadership for the integrity and quality of the engineering produced, for integrating the disciplines, for clear and open communications cross the team
- **Area Lead/Project Engineering:** have facility or systematic responsibility for specific areas of the plant. Each Area Lead is responsible for his designated area and utilises and co-ordinates the efforts of the support organisations, e.g. controls, procurement, construction and design engineering to accomplish the study objects in his specific area
- **Process Engineering:** develops the overall mass and energy balances, process calculations and design basis, process flow diagrams (PFDs), Process and Instrumentation Diagrams (P&IDs), line designation tables and input to equipment data sheets. Reviews selection of equipment and provides process support to) the Owner
- **Design Engineering:** provides engineering services to the study team. The design engineers prepare the physical design and provide technical assistance during the early procurement activities
- **Quality Control:** fully integrated with engineering, procurement and construction. Quality control inspectors act as an extension of engineering, procurement and construction groups
- **Engineering Technology/Systems:** support engineering activities to ensure that appropriate and optimum use is made of computer based engineering and design systems. Objectives are high productivity, effectiveness while facilitating safety and quality objectives and reducing the overall cost of the facility or project
- **Engineering Specialists:** incorporated into the engineering team on an as needed basis to provide subject matter expertise in e.g. finite element analysis, dynamic modelling etc.

- **Workflow Design Coordinator:** Multi-discipline functional implementation and coordination of the design review process, methodology/work instructions, progress measurement, master files and registers in accordance with the engineering procedures. Supports all disciplines, departments and downstream contractors in coordinating deliverable and scheduling interfaces

Engineering Schedule and Milestone Structure

Particular attention will be applied to integrating the engineering activities with the critical procurement inputs (for long lead equipment) and estimating data requirements.

7.2.3.5.2 Engineering Planning

A breakdown of the major design engineering scopes for each of the facilities will be described in the Work Plan and Gate Review Guidelines. Design activities will be undertaken by allocated groups to best suit the technology, skills and schedules required to satisfy project objectives.

A detailed breakdown of manhours, design activities, methodologies to be used, inputs required and deliverables within each of the facilities will be developed for use in controlling engineering work activities.

Activities are scheduled and aligned with the critical path of the study schedule, and incorporate into the engineering workflow logic.

7.2.3.5.3 Confirmation of Design Basis

- Deliverable:
  - Project Design Basis
- Action:
  - Definition of the Project Design Basis, to establish the information and data that engineering is to be based on. It consists of guidelines and requirements, corporate standards, codes, references to regulatory agreements, form of deliverables, and plant or production capacity
  - The design basis document provides all the base data required for preparation of material balances, heat balances, flow sheets and equipment sizing. The document is substantially completed during preliminary engineering but will continue to be updated during both basic and detail engineering
  - The design basis includes: Design safety philosophy, environmental and sustainability requirements and objectives, license and permit requirements, site parameters (geographical, meteorological, soils, hydrological, cargo demands (types, throughputs, frequencies), facility operating requirements (e.g. availability), cargo/product/ raw material storage, utilities inputs (e.g. fuel, feedstock), facility design life/ equipment design factors, engineering quality

7.2.3.5.4 Fixed Scope and Design Criteria

- Deliverable:
  - Signed off Scope/ Design Criteria Freeze
- Action:
  - Clarification and identification of project scope
  - Evaluation of user requirements and project scope

- Identification of solutions
- Presentation of understanding of scope and design criteria to stakeholders
- Obtain agreement and alignment of all stakeholders

7.2.3.5.5 Discipline Standards

Generic discipline standards will be applied during FEL-3. Project-specific versions may be developed for the Execution phase.

7.2.3.5.6 Engineering Progress Measurement

The primary objective of engineering progress measurement is to 'objectively' report actual physical progress of the engineering effort. To achieve this, base line elements are clearly defined. This process includes:

- Defining all deliverables (drawings and documents) by area, discipline, type, quantity, information content, data integrity requirements and format for downstream interfaces
- Defining activities directly contributing to deliverables
- Defining 'level of effort' activities for functional coordination
- Estimating hours (with cost categories) against the deliverable/activity list
- Assign weighted 'status' codes to each controlled deliverable type

The Engineering progress measurement and reporting system is then established with final WBS and discipline codes, document/activity details, milestone classes and weightings – key functions include:

- Reports by discipline, document type, responsible engineer and others
- Reports actual physical progress to facilitate earned hour/performance factor roll ups
- Reports S-curves

7.2.3.5.7 Change Management

General

Design changes may be necessary for work that has been previously released, is under review or verification prior to release. Design changes can also be driven by scope changes.

Should such changes be deemed necessary, early resolution and approval must be implemented.

The approval of design changes shall be in accordance with project procedures. A design change may be initiated from a deficiency such as:

- Safety or environmental hazard
- Inadequate function or operation
- Lack of provision for maintenance

Change Process

Design changes are initiated and processed through the use of a Scope Change or Design Change form. The following elements will be considered during the analysis and implementation of the change:

- The proposed change is reviewed with the Area Lead and design team members to assess the impact on a particular area of the study
- Approval of the change is undertaken according to the project Change Management Procedures
- A Scope Change Log or Design Development Log is maintained by the facility Area Lead

7.2.3.5.8 Design Reviews

Depending on the phase of a project life cycle the design review will have a different emphasis and will need to address different issues.

The guidelines below outline where the emphasis might be best placed in a feasibility study.

- When?

  Two to three design reviews should be scheduled in a feasibility study.

  Design review 1 should be held following the completion of design basis, design criteria, mass and energy balance, and process flow diagrams.

  Design review 2 should be held prior to the HAZOP Study, which requires completion of all above documents plus control philosophy, Piping and Instrument Diagrams.

  The final design review, design review 3, is optional and can be held once the remaining documentation is completed to ensure that consistency is achieved across all documents.

  Critical documents to be reviewed include all above documents plus equipment sizing and completed datasheets, basic equipment layouts, major equipment ready for purchase, control budget estimate, Project Execution plan and project schedule.

- Who?

  Design Review 1 should be attended by:

  - Owner and plant representatives, Project Manager, area leads, process and engineering managers, process specialists and consultants, technology suppliers

  Design review 2 should be attended by:

  - All of the above plus discipline engineering leads, equipment vendors

  Design review 3 should be attended by:

  - All of the above plus experienced project implementation personnel familiar with project type – planning, procurement, contracts, construction

- What?

  - Safety in construction, operations and maintenance
  - Review the design progress against Owner needs, schedule status, deliverables list, deliverables milestone

- Look for "Value Engineering" opportunities
- Thoroughness of designs
- Constructability (with P&CM input)
- Maintainability (with operators input)
- Operability (with operators input)
- Quality control of work
- Evaluate whether the project team has or is progressing towards having sufficient information to generate an estimate of the target accuracy

- Design Review Checklists

  A series of design review checklists with increasing detail are available in the Transnet Document Management system.

  Templates of these checklists can be found in the Transnet Project Procedures. The reviewer should review these guidelines when planning a design review and decide how to apply them.

  Templates of these checklists can be found in the Transnet Procedures. The reviewer should review these guidelines when planning a design review and decide how to apply them.

7.2.3.6 *Engineering Procedures*

7.2.3.6.1 Procedures

The work will be performed and managed in accordance with Transnet Projects' corporate engineering procedures. Engineering procedures may be specifically customised to suit the requirements of the project and will be applied by all engineering team members.

A base index of engineering corporate procedures is provided for reference in the Transnet Projects Document Management System.

7.2.3.6.2 Engineering Workflows

A cornerstone of the engineering and design execution process is the 3Di and 2Di Workflow and Statusing methodology. This methodology is based on the following principles:

- Once-through engineering and design via a combination of structured milestones, proven engineering principals and innovation
- Totally integrated design execution team. All participants – Engineering and Design Disciplines, Procurement, Detailing, Fabrication, Construction, Suppliers, Owner – will be actively involved in the engineering and design process
- Concurrent or semi-current design execution
- Effective design freeze and change control
- 'Fit for purpose deliverables'
- Maximise the value of technology automation for total project delivery benefit

Proven workflows will be customised through the Engineering definition phase as all aspects of the project specific strategies and interfaces are defined.

In addition to defining and controlling deliverables, interfaces and progress, engineering workflow defines the who/what/how/when methodology to encompass the system and people issues. The project procedures contain examples of workflow guidelines - as input/output diagrams, application interface diagrams, manuals/procedures and checklists, of which shall be tailored as work instructions for the project

7.2.3.6.3 Document Control and Review Processes

The control (i.e. registration, storage and issue) of technical documents and drawings for the *project* will be in accordance with the Feasibility Phase Document Control Procedures.

The definition of technical documents to be managed through these procedures is "revision controlled engineering deliverables" and includes but is not limited to the following examples:

- Specifications
- Technical Reports
- Design Criteria
- Calculations
- Datasheets
- Manuals
- Scopes of Work
- Basis of Design
- Mass Balance
- Equipment List
- Instrument List

Physical Traceability

In order to fulfil QA requirements all technical documents and drawings prepared as deliverables during the study will be issued through Document Control. To provide a comprehensive audit trail, Document Control will maintain on file both wet signature originals and electronic files for every revision. A revision is not formal unless the document/drawing has been signed off and issued to Document Control.

Specific Procedures

The following document control and review processes are governed by specific project procedures:

- Preparation of Documents and Drawings
- Document and Drawing Approval
- Document and Drawing Issue
- Document and Drawing Review
- Issue of Design Documents and Drawings to Contractors
- Network File Access

- Hard Copy Filing

Document Control Systems

Transnet Projects Document Management System will be used on the study. For a description of the system's functionality refer to Transnet Projects Document Management System Functional guide.

7.2.3.6.4 Calculation Review Processes

General

Design calculations will be prepared in accordance with the engineering procedures.

References to standards, source formulae and design parameters will be noted in the initial section of the calculations.

Software Packages

Software used in the compilation of calculations will be approved by the Engineering Manager.

7.2.3.7 Engineering Technologies

An Engineering Technology Plan will be developed to support the engineering delivery on the study. Standard Transnet Projects engineering and design application software and automation tools that have proven to enhance productivity and improve workflow process will be used as appropriate.

7.2.3.7.1 Computer Aided Engineering

Standard CAE software will be used for engineering analysis, calculations, and design, and for the production of specifications, reports, charts, operating manuals, indices and graphs. In some cases, vendor supplied software may also be used for equipment design, analysis, and selection.

7.2.3.7.2 Computer Aided Design

MicroStation will be the primary CAD tool used during the Engineering phase of this study, in conjunction with a three-dimensional (3D) computer model. The 3D CAD model will be the source of most of the engineering deliverables, and will provide the mechanism for tracking design progress, and the production of Material Take-Offs for estimation purposes.

7.2.3.7.3 Project CAD Standard

Drawing Requirements

All drawings prepared for the study will conform to the Project CAD Standard and all relevant South African Standards and will be created in MicroStation/J .**dgn** file format (tbc).

The Project CAD Standard will include the MicroStation seed files, level allocations tables, general cell libraries and border sheets.

External Suppliers

The Project CAD Standard will be issued to all vendors, consultants and other external suppliers who are required to produce and/or submit drawings for the study.

Data Transfer

Where appropriate data integration will be implemented between applications and systems to make the best and most effective use of project generated data, this will ensure a minimum of re-entry of

data into data centric systems, and provide the project with an integrated approach to data warehousing and sharing.

All electronic data generated for the project will be held on the project server and will not be transferred to any other party in its native format unless specifically approved by the Project Manager.

Where the electronic transfer of the content of engineering and design files is required for information and / or review by other parties it shall be done in the form of PDF files.

The transfer of any project data shall in all instances be via the project Document Controller.

7.2.3.7.4 Technology Support and Training

Support

The Engineering Technology Team will provide ongoing support to the project with both the initial implementation of the selected tools, and thereafter the ongoing support of these tools for the project team.

Training

Proficiency by the study personnel in the use of the selected applications is essential for the project to gain the full benefit from these integrated tools. Where new staff are unfamiliar with the nominated tools the Engineering Technology team will either provide, or facilitate, the necessary training to bring those staff up to the required level.

7.3 Procurement

7.3.1 Introduction

The purpose of Project Procurement Management is to develop strategic guidelines for managing and mitigating risks and issues on a project and standardising the approach to Procurement execution.

The Project Procurement and Contracts Manager is responsible for preparing, gaining approval of and issuing the overall Procurement Organisational Chart for the project to reflect a procurement organisation appropriate to the procurement tasks, duties and responsibilities in executing the contracts and purchase orders.

At the Feasibility Phase of the Project Lifecycle there would usually be very little major procurement activity other than the procurement of Professional Services for design, studies or field investigation but it may be necessary to place contracts and Purchase Orders for long-lead critical items or early contracts such as demolition works.

7.3.2 Procurement Functions

The term “Procurement” broadly encompasses the following functions:

- Purchasing of goods
- Contracting for services (construction, design, consulting, equipment hire or design supply and install services etc.)
- Co-ordination of Quality Assurance Inspection activities for equipment and materials supply
- Expediting of Purchase Orders

- Materials Control including Traffic and Logistics, Receiving, Warehousing and issuing materials to construction
- Administration of contracts

7.3.3 *Procurement Lifecycle*

The following flow chart, Figure 7-3, displays the Procurement Lifecycle through the various phases of the project development:

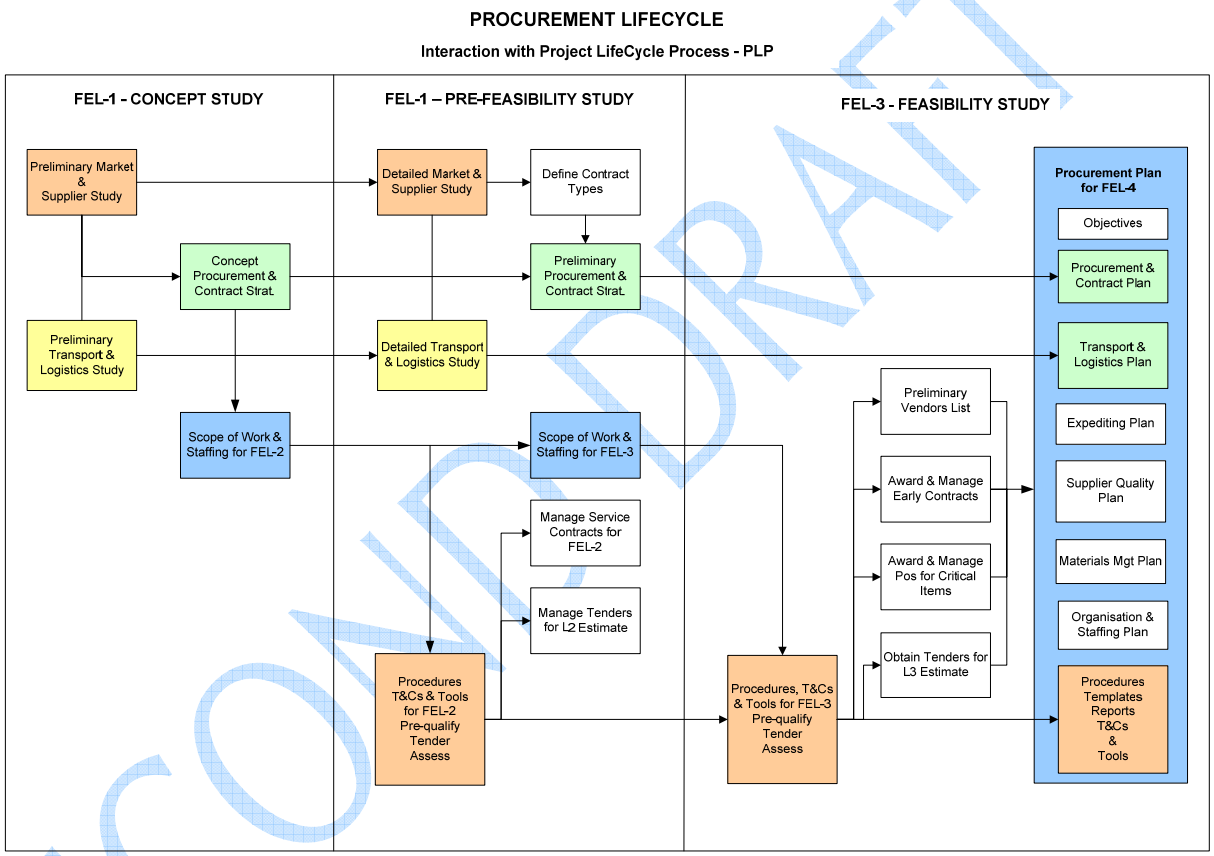

Figure 7-3: Procurement Lifecycle

7.3.4 *Feasibility Phase Procurement Activities*

Typical Procurement activities during the Feasibility Phase are as follows:

- Prepare Preliminary Vendor List
- Pre-qualify and select Tenderers
- Award and manage early service and other contracts
- Award and manage Purchase Orders for critical items
- Obtain tenders for Level 3 Estimate
- Produce Procurement Plan for Execution Phase (FEL-4)

- Define scope of work and staffing requirements for Feasibility Study Phase (FEL-3)

7.3.5 Procurement Categories

There are 6 distinct categories of procurement, not all of which are applicable during the Feasibility Phase:

- Routine buying (Minor Purchase Orders and Minor Services Contracts)
- Standard supply (Purchase Order)
- Major supply (Major Purchase Orders or Supply of goods Contracts)
- Minor site worker site services (NEC Engineering and Construction short form Contract)
- Major Site work (NEC Engineering and Construction Contract)
- Consulting Professional Services (Professional Services Contract)

Those most likely to be applicable to the FEL-3 Phase are as follows:

7.3.5.1 Routine Buying

This includes the minor purchases or acquisition of minor services required to support the project. The items are non-capital and have an extremely low risk of poor outcomes affecting the project and would generally have a value less than R50 000.

7.3.5.2 Standard Supply

This includes standard capital items; generally off-the-shelf type products with no special design or manufacture. The items would have a low level of complexity and little risk of poor outcomes affecting the project.

7.3.5.3 Consulting Services/ Professional Services

This includes agreements for design work and specialist services such as Site Survey Works or Geotechnical Work.

7.3.6 Process Flow

The Procurement Procedures that apply to each of the six main procurement categories are outlined in the flow chart, Figure 7-4, below:

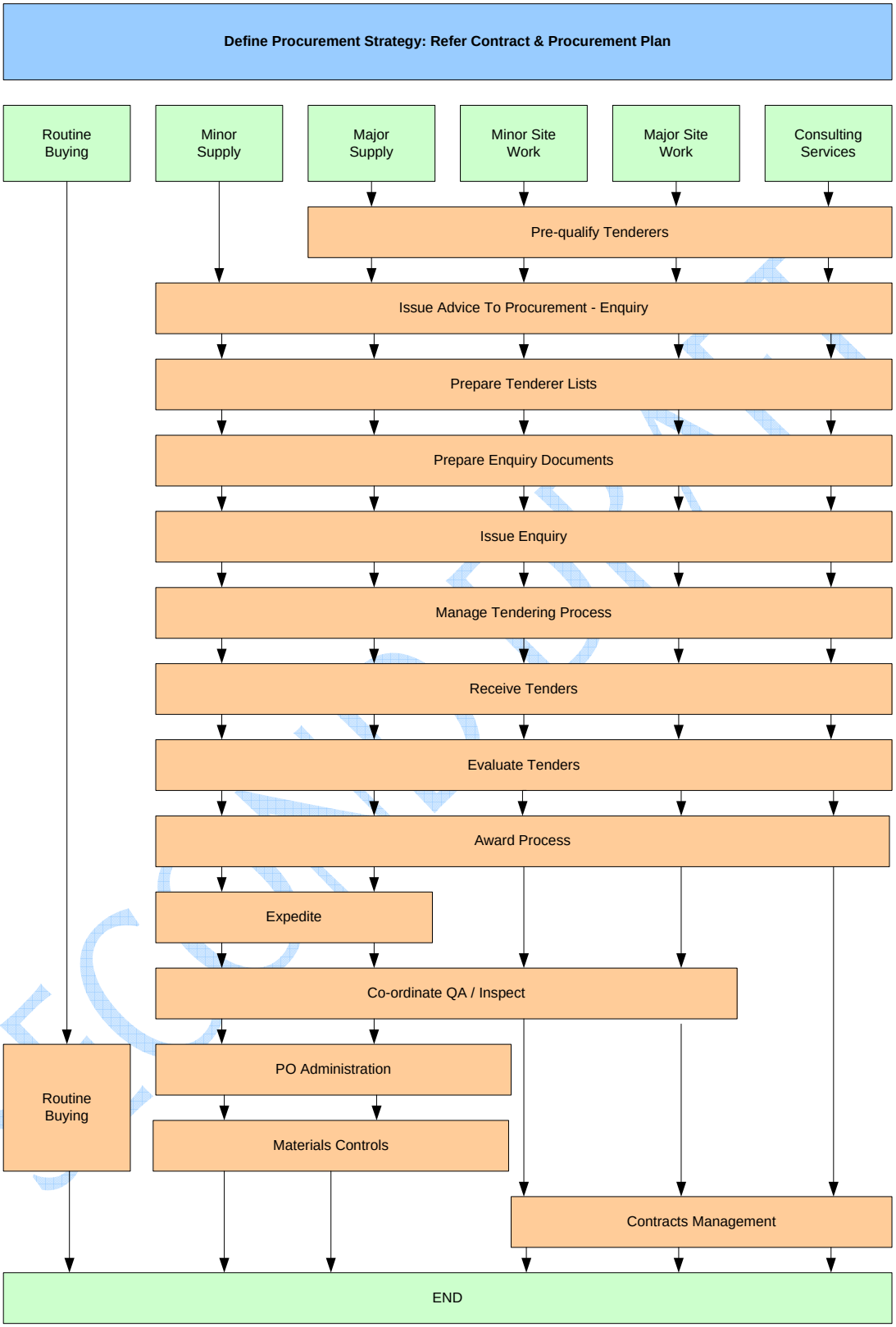

Figure 7-4: Process Flow

7.3.7 *Project Procurement Execution Plan*

For each Project an individual Project Procurement Execution Plan is required. This will address the following issues:

- Objectives
- Procurement and Contract Plan
- Transport and Logistics Plan
- Expediting Plan
- Supplier Quality Plan
- Materials Management Plan
- Organisation and Staffing Plan
- Package list
- Cash flow

7.3.8 *Roles and Responsibilities*

7.3.8.1 *Project Procurement Manager*

Each individual Project Procurement Manager is responsible for managing and coordinating the procurement team for the delivery of the Procurement and Contracts work on that Project to achieve required cost, schedule and quality outcomes. He reports to:

- Contracts Manager on functional issues – i.e. for applying project-wide Procurement and Contracts practices, tools and procedures
- The Project Manager for operational issues i.e. carrying out Procurement and Contracts activities to time and cost parameters set by the Project Manager

The Project Procurement Manager's responsibilities include:

- Prepare the Project Contracts and Procurement Execution Plan and lead a team of Contracts Specialists to issue and administer the Contracts for major construction and other services required for the project and appropriate Purchasing Expediting and Logistics teams to place orders for and expedite the delivery of equipment and materials to site or other delivery locations in accordance with project budgets and schedules
- Liaise with the Project Contracts and Procurement Manager and Project Manager to determine team Organisation and ensure required personnel are assigned to the project in accordance with the scheduling and workload requirements
- Assign personnel to various tasks
- Ensure Contract/Procurement documents are signed within allocated signing levels as per Project Authority Approval Matrix
- Prepare man-hour budgets and review and updating as required
- Prepare Procurement Status Reports, Exception Reports, etc.
- Set up a Project Procurement filing system

- Ensure that all procurement activities are carried out in accordance with the Project Procurement Procedures, sound business practices and in an ethical manner
- Interact with the Owner to ensure objectives are achieved, potential problems identified and corrective or preventative actions taken
- Audit Procurement activities against the Project Contracts and Procurement Execution Plan and Procedures

7.3.8.2 Contract Administrator

Although the primary function of the Contract Administrator at the FEL-3 Phase will be related to the procurement of Professional Services there may be a need in some cases for all or at least a few of the following duties:

- Review Scopes of Work and solicit Expressions of Interest and/or select and obtain approval of a Tenderers list in consultation with other Project disciplines and Owner
- Prepare and issue enquiry documentation by preparing commercial content and coordinating technical content of Invitation to Tender documents and obtaining appropriate approval prior to issue to approved Tenderers
- All activities required in the selection of bidders co-ordinating preparation and issuing of enquiry documents. Review of bids received and preparing and issuing Contract documentation
- Co-ordinate commercial aspects of all Contracts and determine Tender process document requirements
- Review Contract Terms and Conditions and select as appropriate and consider any project requirement for Special Conditions
- Supervise and maintain security of the tender process. Log tender queries and answers and issue Addenda as required
- Co-ordinate technical evaluations and conduct commercial evaluations, co-ordinate negotiations and the recommendation for Award
- Prepare contract documentation
- Attend negotiations regarding proposed changes to the contract documentation
- Liaise with legal services regarding proposed changes to contract documentation
- Where appropriate, liaising with quantity surveyors to ensure bills of quantities are properly prepared, priced and negotiated
- Ensuring contract documentation is properly signed
- Ensuring contract documentation, once signed, is properly filed

7.3.9 Public Sector Regulatory Requirements

The key Public Sector regulatory requirements that must be complied with in all Transnet Procurement activities are:

- PFMA Public Finance Administration Act
- CIDB Construction Industries Development Board

- NIPP National Industrial Participation Program
- Regional requirements/ political variations
- BBBEE Broad Based Black Economic Empowerment

Transnet internal requirement is for 50% of Capital Expansion Project spend to qualify as BBBEE spend in accordance with the balanced BBBEE scorecard, and utilisation of local labour in construction amounting to at least 60%.

7.3.10 References

- ISO 9001
- NEC 3rd edition family of Contracts published June 2005
- Transnet Projects Procedures covering the following applicable subjects:
  - Procurement Definition
  - Code of Conduct
  - Filing (electronic and hard copy)
  - Major Procurement Process Schematics
  - Minor Procurement Process Schematics

7.3.11 New Engineering Contract (NEC)

The NEC suite of contracts has been chosen by Transnet for utilisation on all construction and service type contracts. The NEC contracts are working documents which define processes and associated terminology for project execution. The primary applicable NEC contracts are:

- The Professional Services Contract (PSC) typically between Transnet Projects and the Operating Divisions for the provision of EPCM project management services
- The Engineering and Construction Contract (ECC) typically between the operating division, Transnet Projects and an equipment/material supply or construction company

Project personnel need to be aware of and use the applicable procedures and terminology in executing projects under NEC. Some of the specific contract terms applicable to roles on the projects are:

NEC CONTRACT	ROLE	NEC TERM	TRANSNET or OTHER ENTITY
PSC	**Owner (client)**	**Employer**	**Operating Division**
PSC	**Project Manager (organisation)**	**Consultant**	**Transnet Projects**
ECC	**Owner**	**Employer**	**Operating Division**
ECC	**Project Manager (organisation)**	**Project Manager**	**Transnet Projects**
ECC	**Supply or construction contractor**	**Contractor**	**Construction companies**

Figure 7-5: Specific Contract Terms

Use of these contracts will require:

- Development and use of Master Templates
  - Engineering and Construction Contract template
  - Professional Service Contract template
  - Works Information and Site Information standard templates to ensure NEC contract compatibility and consistency for all technical packages from Engineering
  - CIBD and government regulatory compliance
  - Minimise Z clauses
  - NEC Payment requirements to be compatible with Transnet payment process
  - Other Contract templates (services, Minor works etc.)
  - Purchase Order templates for supply only purchasing – not covered by NEC suite: to be separately developed
- Internal NEC Training for anyone involved in preparing the Works Information or Site Information of an NEC contract or enquiry for an NEC Contract e.g. scope, specifications, programme, etc as well as for those involved in the pricing and commercial terms. Also necessary for anyone involved in the technical or commercial review of bids or involved in post award Contract administration or supervision of an NEC Contract including not only those nominated as a Project Manager or Supervisor within the terms of an NEC Contract but also anyone involved in the review of:
  - Compensation Events (Claims etc), including use of the Schedule of Cost Components
  - Early Warnings (potential claims and risk review)
  - Acceptance or Review of Programme or setting of Key Dates
  - Review of Payment Certificates or imposing Disallowed Costs
  - Managing Defects Liability period, and
  - In the event of disputes, involvement in inputs to the Adjudication process

- Contract Administration: templates and procedures to be NEC focused
- NEC Adjudicators-appointment; back-to-back with signing of contracts and consider same adjudicators as Owner agreement requirements

A set of project master documents to be developed to be used for all procurement and contractual requirements.

7.3.12 Records

All records generated in terms of this procedure will be classed as records and retained for the life of the project or longer if required by legal or statutory requirements.

7.4 Project Execution Schedule

- Deliverable:
  - A Level 3 Project Schedule to completion of execution
  - Updated level 1 and 2 Project Schedules reflecting the Level 3 schedule
- Action:
  - It may also be referred to as the Project Master Schedule and is built as a critical path network. It reflects both the Project Execution Plan (PEP) and the project estimates and initially built around the project Facilities Breakdown Structure (FBS). Activities are coded in order to be sorted in accordance with the project work packages
  - This is the level at which the project will be managed and includes the activities and logic necessary to manage and control the project
  - The activities, logic and durations are based on input from the project team and reviewed and approved by the Project Manager
  - Identification of all significant work activities including major engineering, procurement and construction work packages
  - Identification of activity durations, critical milestones and key resources
  - Identifies all external interfaces
  - The level 3 schedule activity durations should exclude contingency however they should includes provision for the impact of design and quantity growth allowances consistent with how those allowances are calculated and presented in the estimate
  - A schedule contingency should be included in the schedule based on the results of the schedule risk analysis. This contingency is carried as a single activity placed between the project completion milestone and the Owner handover milestone. The duration of this activity will be the responsibility of the Project Manager and will be calculated in accordance with the schedule range analysis profile to a consistent level of confidence with the project estimate
  - The project team will be managed against the early start/finish schedule whilst Owner reporting will normally be against the late start/finish schedule
  - The level 3 schedule identifies

- The interfaces between project departments and external influences are managed
- Overall resource requirements
- Provides the framework for timing for detailed level 4 planning and scheduling

7.5 Construction Management

- Deliverables:
  - Preliminary Construction Management Plan for FEL-4
  - Constructability inputs to basic engineering development, contracting strategy development
- Actions:
  - Construction Management representative joins the FEL-3 study team early enough in FEL-3 to undertake the works outlined below

7.5.1 Summary

The Construction Management team is responsible for ensuring that a project is built without any harm to any participants and in accordance with project objectives and requirements namely quality, schedule and budget.

The Construction Management approach treats the project design and construction phases as integrated tasks. As such, the Construction Management team will provide leadership on all matters relating to construction, keeping the Project Management team informed and making recommendations on health and safety, design improvements, constructability, schedules, contracting strategies and labour relations.

Ensuring cooperative efforts of designers and builders at the initial stage of design will reduce problems encountered during the construction phase. Most of the early involvement of these individuals will be to share their in-depth knowledge and understanding of the way projects are being built. A smooth and efficient construction phase is fundamentally important in securing a successful project.

7.5.2 Constructability

Throughout the industry, constructability is recognised as an essential planning methodology that can significantly increase the probability of project success both in meeting project cost objectives and especially in meeting project schedule objectives when applied in a formal comprehensive program. A basic constructability tenet is that the potential benefit of constructability is high during the early project phase and decreases with project duration while the cost of constructability implementation is low in the early phase and increases with time. Constructability requires that companies (Owners, Project Managers and Contractors) go beyond their conventional approaches to project execution by expanding front-end planning and investing additional effort in order to anticipate potential construction problems. Constructability is implemented through a team effort involving Owner representatives, Project Management project leadership, engineering, procurement, and construction working together toward a common goal; producing a quality facility while optimising cost and schedule. Figure 7-6 presents the generic Project Constructability Road Map and indicates where the emphasis should be placed in addressing constructability issues during the current FEL phase. Refer also to the Construction Industry Institute (CII) manual.

PROJECT CONSTRUCTABILITY ROADMAP

HATCH™

Constructability must be made an integral part of the project plan.

Constructability is enhanced when the project team gains an understanding of the clients' corporate & project objectives.

External factors can effect the cost &/or program of the project.

Match the skills and resources available to the Technology of the design solution.
The experience, skills & composition of the project team must be appropriate for the project.

Project design must consider construction methodology.

Constructability will be enhanced if construction accessibility is considered in the design & construction stages of the project.

Project constructability is enhanced when construction efficiency is considered in specification development.

Project planning must actively involve construction knowledge & experience.

The use of innovative techniques during construction will enhance constructability.

Constructability can be enhanced on similar future projects if a post construction analysis is undertaken by the project team.

FEL 2 PRE-FEASIBILITY	FEL 3 BASIC DESIGN	FEL 4 DETAILED DESIGN CONSTRUCTION	POST CONSTRUCTION
Integration	Integration	Integration	Integration
Corporate Objectives	Corporate Objectives	Corporate Objectives	Corporate Objectives
External Factors	External Factors	External Factors	External Factors
Available Resources	Available Resources	Available Resources	Available Resources
Team Skills	Team Skills	Team Skills	Team Skills
Construction Methodology	Construction Methodology	Construction Methodology	Construction Methodology
Accessibility	Accessibility	Accessibility	Accessibility
Specifications	Specifications	Specifications	Specifications
Construction Knowledge	Construction Knowledge	Construction Knowledge	Construction Knowledge
Construction Innovation	Construction Innovation	Construction Inovation	Construction Innovation
Feedback	Feedback	Feedback	Feedback

The overall program for the project must be realistic, construction sensitive & have the commitment of the project team.

LEVEL OF IMPORTANCE & ACTIVITY OF CONSTRUCTABILITY PRINCIPLE DURING PROJECT STAGE

HIGH ACTIVITY ~ 1 2 3 4 ~ LOW ACTIVITY

Figure 7-6: Constructability Roadmap

The effectiveness of the constructability process depends on several factors:

- Integration of constructability methodology into all project work process to maximise benefits and to minimise disruption to those processes. The focus must be on timely input of construction knowledge. Reviews are held only to verify that the input has already been incorporated into project deliverables
- Understanding of the process by all project personnel and recognition of their individual responsibilities with regard to constructability
- Support and guidance from project team leadership
- Simple but effective interfaces between all project participants
- Continuous evaluation and improvement of the constructability process

7.5.2.1 *Objectives*

Specific objectives for each project include:

- Cost reduction – Using the constructability process to identify potential cost minimising opportunities is a fundamental part of the process and supports the overall project CIP/Value Creation Program
- Schedule optimisation – Integrating engineering, procurement, and construction schedules for overall project duration optimisation is a key factor in the success of the project. Some areas requiring special attention are:
  - Critical equipment and long delivery items and development of construction contingency plans
  - Early focus on critical path activities
  - Simultaneously developing a systems completion based EP (Engineering and Procurement) schedule and developing and prioritising construction work packages to correspond with the construction sequencing plan. This will support construction activities both during the geographic and system-based construction phases
  - Safety – The constructability program will address both the safety of construction workers and the safety of operations and maintenance personnel. Construction safety will be addressed in formal project reviews during the FEL-3 phase that identify potential construction hazards and evaluate suggestions to minimise the impact of those hazards. Operations and maintenance safety will be addressed in reviews of specific design deliverables to ensure that safety requirements from applicable codes, standards, and specifications as well as specific owner concerns are satisfied in those deliverables

7.5.2.2 *Implementation*

Constructability input is especially beneficial during the critical early phases of the Project when cost sensitivity is at a maximum. Opportunities for cost savings are the highest during the Conceptual, Preliminary and Basic Engineering Phases and diminish as project schedule progresses through Detail Design to completion.

Constructability will be integrated into the Study Work Plan. The FEL schedule will define the timing and incorporation of the key constructability activities into all phases of the Project.

During FEL-3 a structured Constructability Program is to be implemented in conjunction with Engineering. However, the Constructability Program includes more than a review of drawings and specifications, and requires the inclusion of Construction personnel in the engineering, design, and planning processes to ensure the input of their expertise and field construction knowledge.

7.5.2.3 *Pre-construction*

Construction management's input to project outcomes begins in the pre-construction phase with involvement in a number of activities which will have an impact on construction activities.

Some of these tasks include; constructability reviews; preparation of the Construction Management Plan; input into the Project Schedule; liaison with statutory authorities and the like.

7.5.3 *Construction Schedule*

A detailed construction schedule for the project will be established thus setting up milestone dates, work packages, manpower requirements and critical path. Identification of potential early work activities could be resulting from the aforesaid schedule development and this, in order to adequately prepare the start of the major construction effort.

- A Construction Management representative (preferably the Construction Manager) is required to start working on the project while the Master Schedule is being developed
- Using the Master Schedule established in the preliminary phase of the project, a preliminary work plan is developed. This plan will include the detailed recommended approach to the project including:
  - Overall approach including contracting strategy
  - Field and home-office services split
  - Preliminary list of proposed work packages
  - Preliminary list of proposed Contractors to be used or for further screening
  - Preliminary design, procurement and construction schedule
  - Complete construction management organisation with staffing plan
  - Detailed estimate of construction management costs

7.5.4 *Contracting Strategy*

Bearing in mind the capabilities of the potential Contractors/Bidders, the project team will conduct an in-depth review of the total project scope thus assembling and sequencing the work packages into sound and compatible construction packages. Construction packages will be sized to maximise the use of the most efficient workforce (local or imported depending on trade).

Constructability review during the engineering phase should enable the construction management team to investigate various options relating to modularisation, pre-casting, pre-assembling, skid mounting, etc. The outcome of such investigations will lead to the development of the contracting strategy to be used throughout the execution of the project.

The project team will adapt the existing overall schedule incorporating any new milestones, depending on date of award. This schedule will be the basis of the contracting plan, and individual contract schedules that will be prepared and issued with each tender package, ensuring all contractors are aware of the project milestones.

7.5.5 *Construction Management Plan*

A preliminary Construction Management Plan will be developed by the FEL-3 study team. This plan will define the overall construction execution strategies and construction management approach appropriate to the project environment. The Construction Management Plan will address:

- Owners objectives/priorities/philosophy
- Construction strategy (contracting strategy, labour issues, etc.)
- Construction philosophy (e.g. fabrication philosophy)
- Construction organisation

- Constructability
- Engineering and procurement
- Construction methodology (e.g. pre-assembly, pre-fabrication, modularisation, heavy lifts, transportation, construction facilities)
- Industrial relations/Labour studies
- Infrastructure and temporary services
- Site project controls and reporting
- Communications and IT
- HSEC management
- Materials management
- Quality management
- Site administration
- Commissioning management
- Systems testing, cold commissioning and handover
- Construction Close-out

7.6 Industrial Relations

Increasingly, a properly managed and stable labour environment has become a critical success factor in the implementation of large and mega-projects and the so-called "soft issues" are very often the determining factor between success and failure, in terms of meeting project time, cost and quality expectations.

In addition, there is generally a requirement that local labour and resources be utilised to the fullest possible extent during the construction phase of projects. This will in turn require that strong relationships with communities and other local stakeholders are developed and maintained in order to ensure that there is ongoing support for the projects and that local labour and business opportunities are maximised. Positive community relations are therefore integral to managing the project labour environment successfully.

Currently, one can distinguish between two schools of thought as to how the labour environment in projects should be established and managed.

On the one hand, we have the so-called "all comers" or "hybrid" approach, which essentially places the responsibility for the management of labour exclusively on the Contractor, as the employer of such labour. The Contractor must then ensure that terms and conditions of employment are consistent with all legal requirements and that all the necessary hygiene factors are in place. There is no specific framework within which the Contractor is required to operate, other than the law.

Conversely, the "managed" approach focuses on ensuring that the risk factors associated with labour and the labour environment around projects are identified and properly managed. Essentially, the Owner takes the lead role by undertaking a risk assessment process and then establishing an Industrial Relations Policy or Framework, setting out Owner policy, philosophy and requirements relative to the management of industrial relations on a Project. A component of this Policy requires

the development and negotiation of a Project Labour Agreement ("PLA") that establishes Standard Wage Rates per job category and all the necessary employment conditions and benefits that will apply on the Project, taking into account the circumstances and peculiarities of the region or area. In addition, standard industrial relations procedures, practices and mechanisms are also developed and included in the PLA.

A key upfront project decision is therefore whether to use the "all comers" or "managed" approach. There are pros and cons to each, but the preference is to use the "managed" approach on a large project to ensure consistency and an optimal balance between industrial relations management and project risk. If the "all comers" approach is adopted, the guidelines can be referred to, but the project team will need to be flexible to adapt the project industrial relations plan to the many plans of the various contractors on the project. The following principles and guidelines assume the use of the "managed" approach.

Key industrial relations implementation principles to be applied include:

- Effective management of the labour environment on projects is a critical success factor in successful Project implementation
- Effective management of labour by Contractors will be a key contributor to success
- Industrial Relations risks will be prevented or reduced and social and economic benefits will be optimised, particularly for local labour
- Uniform Industrial Relations practices will be applied on projects as far as practicable, including standard conditions of employment and standard wage rates per job category
- Contractors will be monitored and audited for compliance to the required Industrial Relations standards which are contractually binding
- Industrial Relations related risks will be identified and managed at the regional and project level;
- Efficient and effective dispute resolution processes will enable speedy solutions to potential disputes, industrial action or conflicts arising, and
- There will be proactive and effective communication on Industrial Relations throughout the project life cycle

Project personnel involved in project industrial relations are:

- Project Manager

  The responsibility for ensuring Industrial Relations management on a Project will rest with the Project Manager.

- Project Site Industrial Relations Manager

  The Project Site Industrial Relations Manager reports to the Project Manager and the Programme Industrial Relations Manager.

- Construction Manager

  The Construction Manager has overall responsibility for Industrial Relations management on site.

- Industrial Relations Officer

  This person supports and assists the Project Site Industrial Relations Manager.

- Procedure

  The Programme Industrial Relations Functional Execution Plan is managed as follows:

  - Identify the appropriate strategic approach, standards, processes and procedures required for the project
  - Determine the sequence and interaction of these processes
  - Determine criteria and methods needed to ensure that the implementation of these processes are effective
  - Ensure the availability of resources and information necessary to support the implementation and monitoring of these processes
  - Monitor, measure and analyse these processes, and
  - Implement actions necessary to achieve planned results and continual improvement of these processes

The table below, Figure 7-7, summarises some IR activities to be addressed in the various project phases.

Activity	FEL-1 Concept	FEL-2 Pre-feasibility	FEL-3 Feasibility	FEL-4 Execution	FEL-5 Close-out
IR Risk Assessment Workshop	Yes	Yes	Yes	Yes	Yes
Identification of key stakeholders	No	Yes	Yes	Yes	Yes
Interaction with key stakeholders	No	No	Yes	Yes	Yes
IR Policy/Framework	Prelim	Prelim	Prelim	Yes	Yes
Project Labour Agreement (PLA)	No	No	Prelim	Yes	No
Labour Management Documentation	No	No	Prelim	Yes	No
IR Reporting Requirements	No	No	Prelim	Yes	No
Contractors IR "Kick-Off" Pack	No	No	Prelim	Yes	No
Local Work-seeker and Business Registration	No	No	Prelim	Yes	Yes
Skills Assessment, Skills Training and Employment	No	No	Prelim	Yes	Yes
Pre and Post-Employment Medical Examinations	No	No	Prelim	Yes	Yes
Project Induction Programme	No	No	Prelim	Yes	No
Induction Booklet	No	No	Prelim	Yes	No
Access Control and Access Permits	No	No	Prelim	Yes	No
Identification, Employment and Training of Implementation Resources	No	No	Prelim	Yes	No
Site IR Structures	No	No	Prelim	Yes	No
Ongoing Monitoring of IR	No	No	Prelim	Yes	Yes
Management Information System	No	No	Yes	Yes	Yes
Post-Mortem Workshop with all stakeholders	No	No	No	No	Yes

Figure 7-7: Industrial Relations Activities

Depending on the phase of the project, additional social/community interventions to be considered include HIV/Aids programmes, creation of entrepreneurial opportunities , establishing site clean-up teams or a janitorial services business, safety performance awards and milestone commemorative gifts, issue of T-Shirts with slogans expressing support for the Project, themed arts and crafts contests at local schools using a project theme, bi-annual project concerts featuring local musicians, family days, sports sponsorship, clinics and competitions, monthly project newsletters featuring local success stories, project golf day, project team relay, etc. This investment in local community initiatives will go a long way to ensuring a stable and supportive project environment.

In the context of the table above, specific activities for the Feasibility (FEL-3) phase include:

- Review proposed alternatives to ensure that the appropriate Industrial Relations model is applied
- Provide Industrial Relations inputs into Feasibility Studies as required, and
- Ensure that local labour opportunities are optimised
- Interact with the identified local and national stakeholders from an industrial relations perspective such as trade unions, employer organisations, community organisations and individuals that may have a vested interest in the project, in order to gain support for the philosophy that will be adopted and to obtain commitment to participate and support the processes that are required during the implementation phase

7.7 Commissioning Planning

When sufficient design has been progressed to enable a clear understanding of the facility, equipment and operational control, a preliminary commissioning plan should be prepared. Input from the Owner, designers, vendors, and Construction is recommended.

The preliminary commissioning plan is a high level overview of how the entire facility will be commissioned. Normally attention is focussed at the major facility component level/process step level and should not at this stage reference individual pieces of equipment. For instance, a materials handling system may be discussed, but not the individual drives, belts, chutes, gantries, etc.

The crux of the preliminary commissioning plan is the development of a commissionable systems definition. Individual components and equipment will be grouped together into logically defined systems for Cold Commissioning and Hot Commissioning planning and communications with respect to system boundaries and Turnover.

This process involves:

- Division of the facility into engineered systems i.e. designated groupings of components designed to perform a specific function within the configuration of the facility and satisfy the following criteria:
  - Reasonable turnover grouping or package
  - Defined testable unit or grouping
  - Satisfactory boundary for safety isolation
- It may also be logical to further divide the plant into sub-systems: divisions of an engineered system. The subsystem associates its function with the operation of the engineered system

- These systems/ sub-systems represent the basic building blocks for developing the commissioning, start-up and turn-over plan
- Ensuring that the basic design allows these sub-systems to be commissioned independently of adjacent sub-systems. That is that they can be safely connected to utility and power systems and energised without constraint. Where this is not possible it may be that the commissioning plan needs revision or additional facilities may have to be designed into the plant to support the commissioning of the major plant and equipment
- The commissioning plan will be integrated in to the Project Master Schedule. Trade-off assessments can then be made between the cost of additional facilities to support a commissioning plan and schedule impact
- The cost and schedule ramifications must be understood during FEL-3

7.8 Implementation Planning

- Deliverable:
  - Implementation strategies and base line plans for inclusion in the Project Execution Plan

    (see below) and to set the framework for the development of the Capital Cost Estimate and schedule
- Action:
  - Strategies and base line (final draft) plans developed for engineering, procurement,
  - Material management, contracting, modularisation, construction, commissioning and start up
  - Labour sourcing and logistics studies at final draft
  - Market and supplier studies at final draft

7.9 Apply Value Improving Practices

Value Improvement (VI) encompasses many aspects which are seen as core to the manner in which successful projects are delivered and as such is seen as an integral part of the Project Manager's capabilities.

7.9.1 Value Improving Practices

There are a wide range of Value Improving practices available for application at the appropriate stages of a project's development. The Transnet Gate Review Guidelines contains an extensive list under "Value Improving Processes".

The VIP's most commonly applied during the Feasibility study phase include:

7.9.1.1 Technology Selection

Aim: To ensure that the technology chosen is the most competitive available technology; focuses on evaluation and selection of technology that is appropriate for the project and is a viable solution for the business need.

7.9.1.2 *Process Simplification*

Aim: To reduce capital and/or operating costs by reduction of process steps/process complexity; a disciplined analytical facilitated session to examine the project's overall manufacturing process and facilities to identify non-revenue producing and non-value adding processes or process steps.

7.9.1.3 *Waste Minimisation*

Aim: An analysis of process streams on a stream-by-stream basis to reduce or eliminate each non-useful stream. Focus will be on prevention, recycle/reuse, reduction and treatment. End-of-pipe treatment of waste stream is to be avoided.

7.9.1.4 *Energy Optimisation*

Aim: To identify the facility, process and equipment options that achieve the most economical use of energy; employ technologies or materials of construction to optimise energy usage; make use of thermal or fuel waste streams to generate energy or reduce thermal or fuel requirement via recycling.

7.9.1.5 *Project Value Analysis (PVA)*

Aim: To achieve the business investment at lowest total cost, consistent with required levels of quality and performance (i.e. value for money). Aimed at eliminating plant/equipment/systems that do not add value to meeting business objectives; a structured and team-based analysis process used to generate and evaluate concepts and design alternatives which satisfy the required functionality at the lowest life cycle cost.

7.9.1.6 *Sustainable Development*

Aim: To address sustainability during the FEL phases in order to meet the Owner's corporate sustainability objectives.

7.9.1.7 *Designing for Safety*

This is critical to ensuring that any plant designed will not only be productive, but will ensure that the safety of both the construction and operations personnel is in no way compromised.

7.9.1.8 *Constructability Review*

Aim: Constructability Reviews by competent and experienced construction professionals during several phases of project development. Constructability reviews can take place at the outset of each project stage in preparation for/anticipation of constructability issues. These reviews can and should also take place at the end of each stage to contribute to the lessons learned process in preparation for the next stage or next project. Refer to the Construction Industry Institute (CII) manual for checklists of items to address.

7.9.1.9 *Risk Management*

Aim: To address Risk Management - both qualitatively and quantitatively - during the FEL phases in order to meet the Owner's Objectives. For more detail refer to the Transnet PLP Gate Review Guidelines.

7.9.2 Application

Depending on the nature of the process it may be applied either as a key early step in project development (e.g. technology selection, process simplification), or progressively through the study phase (e.g. energy optimisation, waste minimisation, risk management, safety in design), or towards

the end when sufficient work has been done to provide some focus for the activity (e.g. PVA, constructability).

The study schedule is to define when these processes are to be applied and reviewed.

Responsibility for ensuring that VIP's are applied timeously rests with the Project Manager.

Chapter 8

8. PROJECT EXECUTION PLAN (PEP)

8.1.1 Introduction

The Project Execution Plan (PEP) defines the strategy, procedures and project management elements that will be used to implement the project.

The PEP defines the organisation, work processes and systems necessary for the management of the project.

The information contained in the PEP document is used to help ensure that the project is completed in a timely and efficient manner and that the facilities designed and constructed will satisfy the project functional requirements.

The PEP is intended as the governing document for project implementation. Both the Owner and Transnet Projects are required to provide input and direction to the PEP. Once approved in writing, both the Owner Organisation and the Project Manager will be governed by the process, procedures and practices set forth in the document. All activities set forth in the document are required to be implemented.

The PEP is intended to be dynamic, periodically reviewed by both parties and modified as necessary throughout the project, particularly, if any material change to scope, schedule, budget or execution strategy occurs.

The structure of the Project Execution Plan is discussed below.

During FEL-3 the PEP and functional management plans are to be prepared, as final drafts, and reviewed with the Owner. Project Procedures (Manual), Discipline Plans, etc will be prepared in the early stages of the Execution Project.

8.1.2 PEP Structure

- Overview

  The Project Execution Plan (PEP) is the top level document in the project Quality Management System that defines the strategy for the project as well as defining the strategy from which all subordinate management plans are prepared. The Quality Plan, Engineering Plan and other functional management plans (e.g. Health and Safety, Environment and Community, Procurement and Contracting, Construction, Commissioning, Project Controls) will be subsets of the PEP.

  These execution plans fit together in a project documentation hierarchy as illustrated below in Figure 8-1:

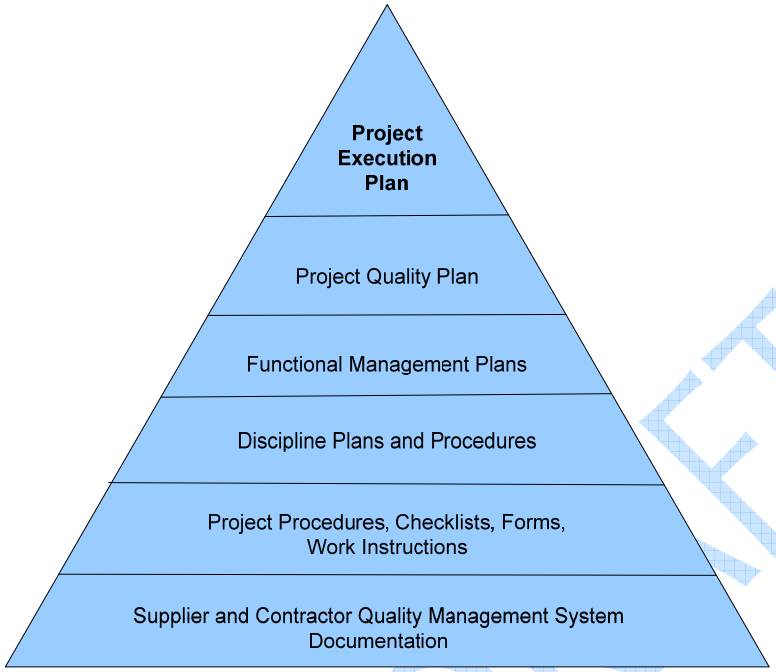

Figure 8-1: Hierarchy of Quality Management Systems (QMS) Documentation

- Functional Management Plans

  Functional management plans are written to support the PEP, to define how each given function will be executed on the project. Each of the functional management plans forms a significant part of the systems that will be used to manage the project. In large projects, functional management plans are typically stand-alone plans supporting the PEP. Functional management plans are prepared by the Functional Leads and describe the following for each key function:

  - Scope of work
  - Scope of functional/discipline services
  - Organisational structure and interface requirements
  - Outline of discipline work processes
  - How quality objectives will be achieved within the discipline or function
  - Value improvement processes applicable to the function
  - Tools and data bases to be used
  - Lists of procedures
  - KPI's

  Each plan is supported by detailed process documentation (as detailed in referenced procedures and related forms and templates).

- Project Procedures, Checklists and Standard Forms

  An extensive suite of procedures, checklists and standard forms controlling the execution of project activities supports the functional management plans, and will be progressively prepared by the Functional Managers using best appropriate practice from Transnet standard procedures.

- Discipline Plans and Procedures

  Discipline plans and procedures will be developed to supplement the Quality Plan and functional management plans. These will address any unique functional requirements deemed necessary to supplement the overall project procedures and plans.

- Supplier and Contractor Documentation

  All suppliers and contractors involved in the project will be required to comply with all specified requirements in order to ensure a positive outcome to the project.

  Suppliers and contractors will be required to produce their own compliant quality management documents as a condition of engagement on the project.

8.1.3 Project Execution Plan Contents

- Introduction
- Executive Summary
- User Requirements Specification
- Project Definition
  - Project Drivers
  - Objectives
  - Measures
  - Stakeholders
  - Owner's Expectations
  - Project FBS
  - Scope of Work
  - Scope of Project Manager's (EPCM) services
  - Budget
  - Schedule
- Execution Strategy
  - Overall Approach
  - Project Management
  - Engineering
  - Procurement
  - Construction

- Commissioning
- Project funding
- Owner's Role
- Project Deliverables

- Organisational Plan
  - Project Organisation
  - Roles and Responsibilities
  - Authorities and Signatories
  - Staff Acquisition
  - Team Development/Training
  - Skills Transfer
  - Time and Expense Recording
- Project Initiation Plan
  - Kick-off
  - Scope Validation
  - Cost Validation
  - Schedule Validation
- Health and Safety Management Plan
  - Health and Safety Management
  - Health and Safety System and Delivery Approach
  - Project Health and Safety Set-up and Execution
  - Health and Safety deliverables during Project Life Cycle Phases
  - Health and Safety Standards, Functional Guides, Safe Work Procedures and Safety Guidance Notes
  - Security
  - Emergency Response
- Environmental and Community/Social Impact Management Plan
  - Controls and Specifications
  - Environmentally Sensitive Areas
  - Risks
  - Licences, Permits and Approvals
- Permitting and Approvals Plan

- Quality Management Plan
  - Quality Organisation and Responsibilities
  - Quality Assurance
  - Quality Control and Expediting
- Project Review Plan
  - Review schedule
- Risk Management Plan
  - Roles and Responsibilities
  - Risk Assessment and Register
  - Review Schedule
- Communications Plan
  - Public Relations/External Affairs
  - Project Meetings and Reporting
  - Performance Reporting
  - Correspondence
  - Managing Stakeholders
- Engineering Management Plan
  - Engineering Organisation and Responsibilities
  - Engineering Management and Reporting
  - Basis of Design
  - Deliverables
  - Project-specific requirements
  - Detail Engineering and Design
  - Design Verification and Review
  - Data management
- Procurement and Contracts Plans
  - Procurement and Contracts Organisation and Responsibilities
  - Procurement Plan
    - Procurement Strategy
    - Packaging Plan
  - Contracting Plan
    - Contracting Strategy

        - Packaging Plan
        - Contract Documentation
    - Procurement System
- Materials Management and Logistics Plan
    - Materials Management Organisation and Responsibilities
    - Engineering
    - Expediting
    - Supplier Quality Control
    - Traffic and Logistics
    - Warehousing and Stores Control
- Construction Management Plan
    - Construction Organisation and Responsibilities
    - Construction Management
    - Constructability
    - Work Package Management
    - Site Administration
    - Industrial Relations
- Commissioning – Testing, Handover and Acceptance Plan
    - Commissioning Organisation and Responsibilities
    - General
    - Commissioning Management
    - Handover and Start Up
- Operations and Maintenance Plan
    - Operations Organisation and Responsibilities
    - Operational Readiness Program
    - Operability, Safety and Maintenance Reviews
- Project Controls Plan
    - Project Controls Organisation and Responsibilities
    - Baseline Establishment
    - Planning and Scheduling
    - Cost Management
    - Change Management

- Trending and Forecasting
- Management of Contingency
- Management of Foreign exchange and Escalation
- Progress and Performance Reporting
- Finance and Accounting
- Administration
- Authorised Signatures List

- Document Management and Control Plan
  - Document Control Organisation and Responsibilities
  - Overview of Document Control
  - Document Approvals
- Execution Systems Plan
  - EPCM Systems
  - Information Management
  - Information and Communications Technologies
  - IT Infrastructure
- Project Close-out Plan
  - Administrative Close-out
  - Records Management
  - Contractual Close-out
  - Project Retrospective
- Project Improvement Strategies
  - Alignment
  - Project Performance Measures
  - Knowledge Management
  - Continuous Improvement
  - Project Recognition Program

8.1.4 *Example PEP Contents List*

Doc ID	Doc No	Doc. Level	Document Title Description
PE	00001	1	Project Execution Plan
PL-01000		2	Management Plan
PL-02000		2	Environmental Management Plan
PL-03000		2	Safety and Health Management Plan
PL-04000		2	Risk Management Plan
PL-05000		2	Engineering Management Plan
PL-06000		2	Quality Management Plan
PL-07000		2	Procurement Plan
PL-08000		2	Contract Administration Management Plan
PL-09000		2	Construction Management Plan
PL-10000		2	Change Management Plan
PL-11000		2	Project Controls Management Plan
PL-12000		2	Administration Management Plan
PL-13000		2	Information Tech and System Mgt Plan
PL-14000			Commissioning and Handover Plan
PL-15000		2	Industrial Relations Mgt Plan
PL16000		2	Stakeholder Relations Mgt Plan
PL-17000		2	Work Authorisation
PL-18000		2	Security
	PR-18001	3	*Procedures (not included herein)*

Figure 8-2: Example PEP Contents List

Chapter 9

9. EVALUATE

Each Project Lifecycle Development or Front End Loading Phase has associated with it a specific "class" of estimates corresponding to the level of work done during that Phase. At the end of the Feasibility Study the following is expected:

9.1 Capital Cost Estimate

9.1.1 Type

Control or Feasibility Estimate.

9.1.2 End Use

Used primarily to verify viability, initiate Execution Phase financing and as a detailed control baseline for the project and project execution. It is required to obtain Feasibility Study Approval (see Section 11).

9.1.3 Process

The standard approach to the preparation of Feasibility Study capital cost estimates is summarised as follows:

- Prepare a draft Estimate Plan
- Define the scope of work
- Prepare a schedule for preparation of the estimate
- Hold Estimate Kick-off Meeting
- Issue Estimate Plan and Schedule
- Set up the estimate in the Estimating System Software according to the agreed estimating breakdown structure (EBS)
- Quantify the work in accordance with the standard commodities
- Determine direct labour rates from other similar projects
- Schedule the work on a time/logic basis
- Determine the purchase cost of the installed material
- Determine the purchase cost of installed equipment
- Determine the cost of installation and construction
- Establish, and allow for, the requirements for freight, duty and taxes
- Determine the cost for the Engineering, Procurement and Construction Management effort as a percentage of Total Installed Cost (TIC)
- Establish foreign currency costs and exchange rates, if applicable

- Establish appropriate base date and escalation criteria
- Carry out contingency/risk assessment
- Prepare estimate reports
- Undertake estimate reviews appropriate to the class of estimate being prepared
- Obtain approvals and issue completed estimate

9.1.4 Methodology

Requires a well detailed definition of the project, including but not limited to the following:

- Detailed Work Breakdown Structure
- Detailed work packages
- Detailed Material Take-offs (MTO's)
- Confirmation of resources required for the implementation of the project
- Probabilistic risk analysis and its impact on the estimate
- Project Estimate using established benchmarks and well maintained rates data banks
- Detailed analysis of the contingencies required
- Detailed analysis of the Forex contribution and pre- and post-execution escalation
- The preparation of an economic motivation
- Preparation for execution approval

Feasibility Study estimates are usually prepared based on preliminary plot plans, mechanical and electrical equipment lists, PFD's, P&ID's, SLD's, material specifications and equipment specifications. This information should reasonably represent the final scope of work and quantities required for the project.

The pricing basis of Level 3 estimate preparation is firm quotations or formal budget prices for major equipment supply and budget pricing or current market prices for all commodity materials. Construction direct labour rates and contractor overheads and margins should be based on current construction market costs.

When preparing Level 3 estimates it is important for the estimator to consider and address aspects such as:

- Status of engineering progress supporting MTO's
- Layouts, PFDs, P&ID's, SLD's, GA's
- Equipment Lists
- Material MTO's
- Quotation qualifications, terms and conditions
- Location, site conditions
- Labour productivity

- Labour agreements, hourly rates and work cycles
- Foreign currency exchange rates
- Overall scope of work
- Project schedule
- Project execution strategy
- Escalation from base date to completion
- Construction indirects including accommodation, FIFO and temporary construction facilities
- EPCM manning based on schedule, deliverables, PEP and office locations
- Constructability
- Contingency / Risk analysis

9.1.5 Level of Engineering Definition

Between 30% and 40% of total engineering should be complete at this stage.

(Level of Engineering Definition is expressed as a % of total engineering, where total engineering = all engineering services in phases FEL-1, 2, 3 and FEL-4 - except FEL-4 Procurement, Project and Construction Management functions. It is presented as a range to reflect that in the early FEL stages "total engineering" has not been fully quantified.)

9.1.6 Level of Contingency

Between 10% and 15%.

9.1.7 Indicative Probability Range

Not greater than 90%.

9.1.8 Indicative Accuracy Range

Between –10% and +10%.

9.2 Quantitative Capital Risk Analysis

Quantitative analysis applies to:

- Overall project risk assessment of capital and schedule risk
- Technical risk assessments

Project quantitative risk analysis is applied to cost and schedule using probabilistic analysis techniques. This will assist in determining the quantification of the project contingencies (capital and schedule) and the associated reserves or risk amounts that are congruent with the risk appetite of Transnet. Quantitative risk analysis (QRA) is a technique of risk analysis that uses numerical values (rather than the descriptive scales used in qualitative and semi-quantitative analysis) for both consequences and likelihood. The technique is used with capital cost estimates, schedules and project risks to develop a capital risk profile for the project. Although this section is focussing on capital risk assessment, the techniques apply in general to schedule risk analysis as well.

The methodology allows the following questions to be answered, which cannot be done using traditional approaches:

- What is the most likely project cost and what is the estimate accuracy?
- What is the probability that the estimate will be exceeded?
- What is the capital risk exposure and what risk allowance is required?
- What are the key risk drivers?

The following diagram, Figure 9-1, illustrates how capital risk profiling can answer these questions:

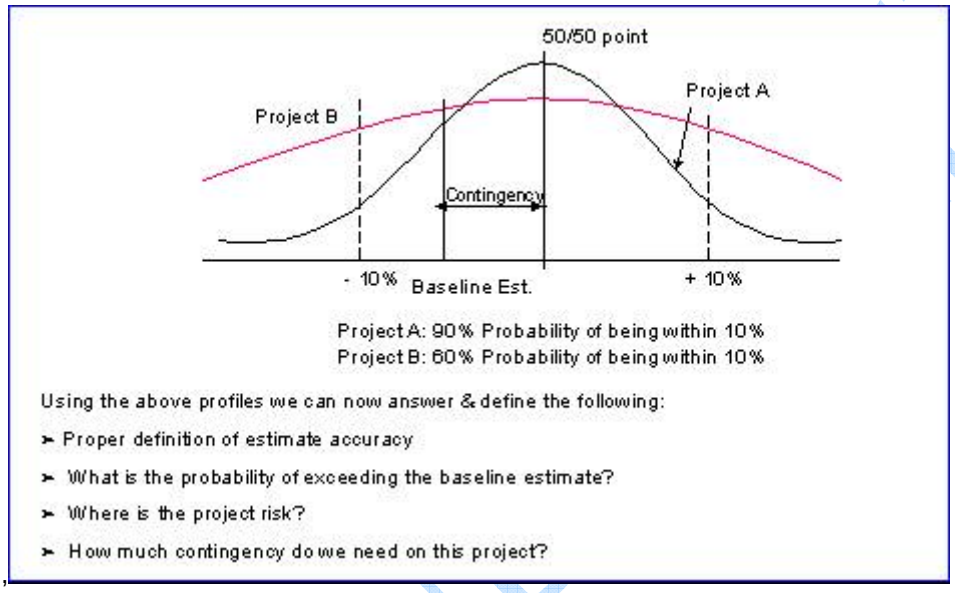

Figure 9-1: Capital Risk Profiling

9.2.1 How is it done?

The process is completed as shown in the following figure, Figure 9-2, and facilitated workshops are used to collect the required data. The process, workshops and the associated planning and analysis and reporting are managed by the project risk manager or his delegate.

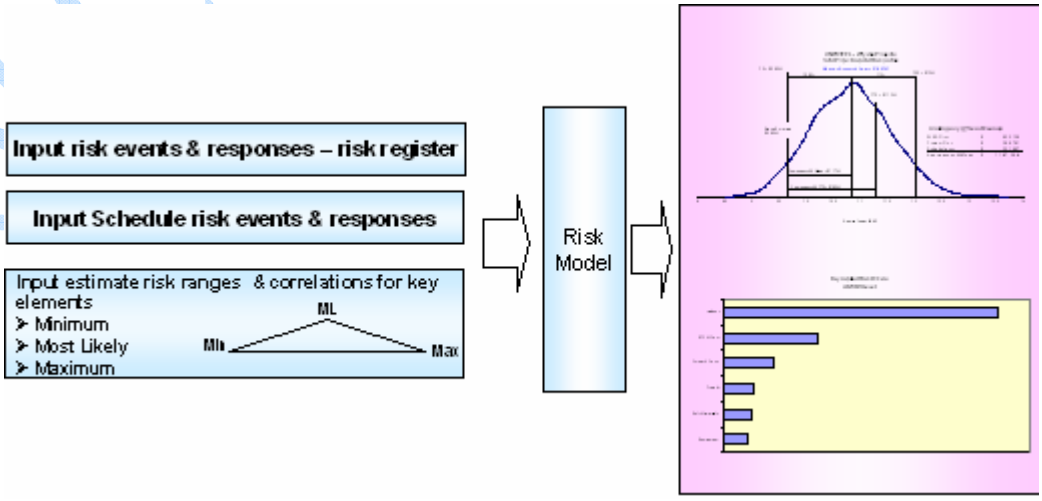

Figure 9-2: Risk Quantification Process

The necessary information and ranges to complete the risk model is collected in facilitated workshops that will generally be completed in 3 sessions:

- Ranging of the estimate values
- Schedule risk ranging – based usually on a summary risk schedule
- Project risk ranging

The timing of the required workshops and associated planning, analysis and reporting is scheduled by the project manager in co-ordination with the project risk manager.

Capital and schedule risk profiles are produced from the process and typical examples are shown in the following figures, Figure 9-3 and Figure 9-4:

A typical resultant capital risk profile is shown in the following figure, Figure 9-3:

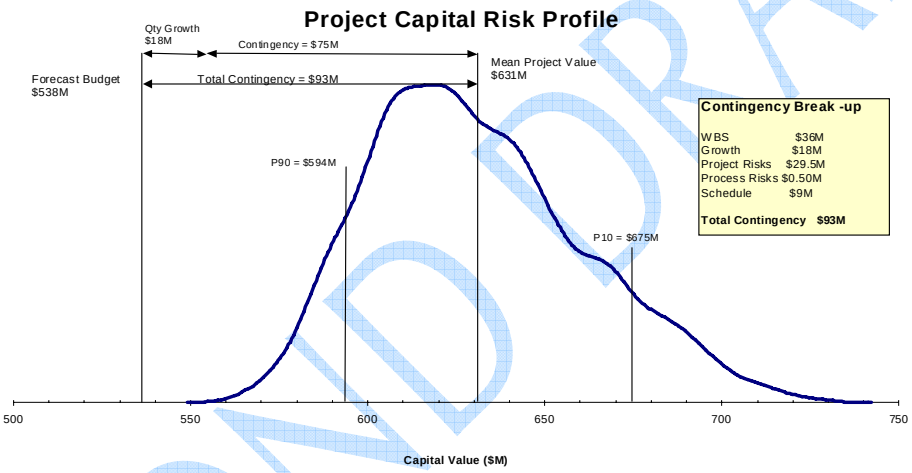

Figure 9-3: Project Capital Risk Profile

The capital risk profiles integrate the results of a schedule risk analysis that will provide the framework for assessing time variable risks. A typical schedule risk profile is shown in the following figure, Figure 9-4:

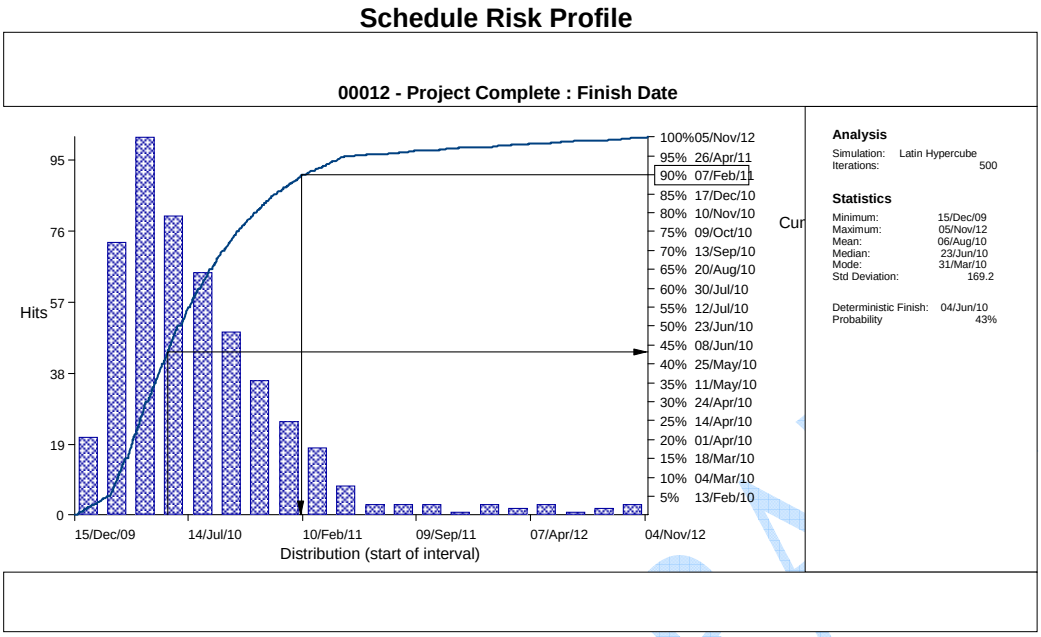

Figure 9-4: Schedule Risk Profile

9.2.2 *Applying the results*

The profile is used to set contingency, float and project targets as summarised in the previous and following figures, Figure 9-3, Figure 9-4 and Figure 9-5:

The same capital profile as Figure 9-3 can also be illustrated as a cumulative distribution profile as shown in the following figure, Figure 9-5:

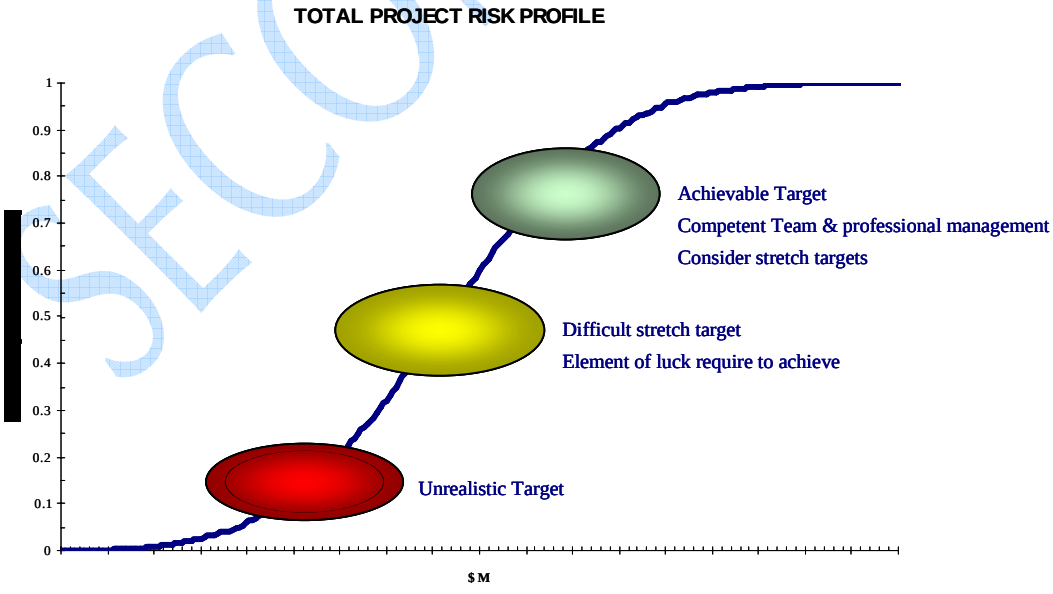

Figure 9-5: Total Project Risk Profile

9.3 Operating Cost Estimate

A Level 3 operating cost estimate should be developed for each option carried forward.

Typically operating cost estimates are developed jointly between the Project Manager and the Owner. While the technical data required will be available from the scope of facilities and equipment definition (via the Project Manager), the estimate can be largely based on cost data from similar operations (via the Owner). Useful information may also be extracted from the preliminary operating cost generated in the Pre-feasibility study phase. While operating costs are sometimes reported as unit costs, it is very seldom that these costs apply to all levels of production/throughput. It is therefore necessary to break operating costs down into their fixed and variable components. Variable costs change as throughput either increases or, while fixed costs do not. The operating cost estimate should address the following:

- Operating Labour
- Maintenance (routine, major and minor overhaul, labour, spares, consumables)
- Operating supplies (consumables)
- Utilities/ Services
- General and Administrative
- Rentals and Insurance
- Waste disposal or effluent treatment

Items to consider during the preparation of an operating cost estimate are as follows:

- *Basis of Estimate.* State the plant throughput basis for the operating cost estimate. Include the number of operating hours per day, the operating days per annum, base currency and applicable exchange rates. The base currency used for presenting the estimate should be agreed to with the Owner
- *Labour Costs.* Obtain labour rates from the Owner. If this is not possible, base labour rates on those of a facility local to the proposed development. Base manpower requirements on an evaluation of the organisation chart for the operating facility, considering the equipment required, proposed operating cycle and shift work requirements. Provide for management personnel, operations and maintenance supervision, and support personnel. Do not include maintenance labour, as these are usually included in maintenance costs (see below)
- *Maintenance Costs*
  - Either: estimate annual maintenance costs as a factor of the total new plant capital cost (typically in the range of 3 to 7 %, but confirm against the relevant Operating Division's operating experience) to include both maintenance supplies and labour
  - or: develop maintenance supplies and labour separately - develop maintenance requirements, obtain costs from suppliers (or estimate), base manpower requirements on the flow sheet and equipment, and obtain labour rates from Owner
- *Cost of Operating Supplies.* Consumables demands are developed from the scope of facilities and equipment definition, with costs obtained either from suppliers or in-house databases. The cost drivers that determine the rate of consumption of the major operating supplies must be

identified (these may not necessarily be the actual final product). Changes in consumption rates at different throughputs must be understood

- *Service Requirements.* Obtain rates for gas, electricity and water from utility companies. If the operation will be a large user of either gas or electricity, investigate whether lower rates can be negotiated. Take into consideration sliding scales for average and peak demands on these utilities. Electricity demand should be calculated using the estimated power requirements found on the major equipment list. Allowance should be made for minor equipment power requirements
- *General and Administrative (G & A).* The operating cost estimate should recognise both the G & A costs that will be required on site as well as other legitimate G & A costs that may be incurred elsewhere (for example divisional headquarters)
- *Rentals and Insurance.* The relevant percentages to be used for insurance as well as any applicable rentals (typically a rate per square meter applicable to a type of asset) must be obtained in discussion with the operating divisions
- *Solids Disposal.* Assuming that solid waste streams have been treated so that they are suitable for land filling as harmless, non-hazardous and non-toxic waste, obtain disposal costs from a local waste handling company. Obtain and include the costs of trucking material if done by the owner
- *Liquid Effluent Treatment and Disposal.* If a new effluent treatment facility is required, develop all the necessary reagent costs. If an existing facility will be used, develop costs for the additional reagents required
- Provide notes at the bottom of the cost estimate to help clarify details, indicate possibilities for cost improvement or provide a basis of major costs

9.4 Business Case

Ownership of the business case and the underlying business financial models typically rests with the operating divisions and not with the project. Development of the financial model itself may however rest with Transnet Projects Finance and IT. The project manager needs to clarify the project's responsibilities in this regard at the outset of each phase of the project. Key inputs to the business case, notably the capital cost and the project schedule, need to be provided by the project to the business case. Figure 9-6 summarises the key inputs and the parties responsible for them. The business case process is presented here for the project manager to understand the underlying business drivers for the project and the associated processes.

As the investment progresses through the different project phases it is evaluated against its alignment with Transnet's strategic framework. The document that summarises this alignment and accompanies the project as it applies for funding through each of the stage gates is referred to as the business case.

The feasibility study business case is requesting funds for the project execution. The authorisation limits of the different bodies determine how far it must progress through the business case work flow (Figure 9-7). Most mega projects will be required to proceed through to at least the Transnet EXCO or board.

The investment forum is not a body that approves funding. However all projects needing to proceed to Transnet CAPIC and EXCO need to have been approved by the investment forum. The investment

forum tends to focus more on the project's alignment to Transnet's strategy and the financial evaluation.

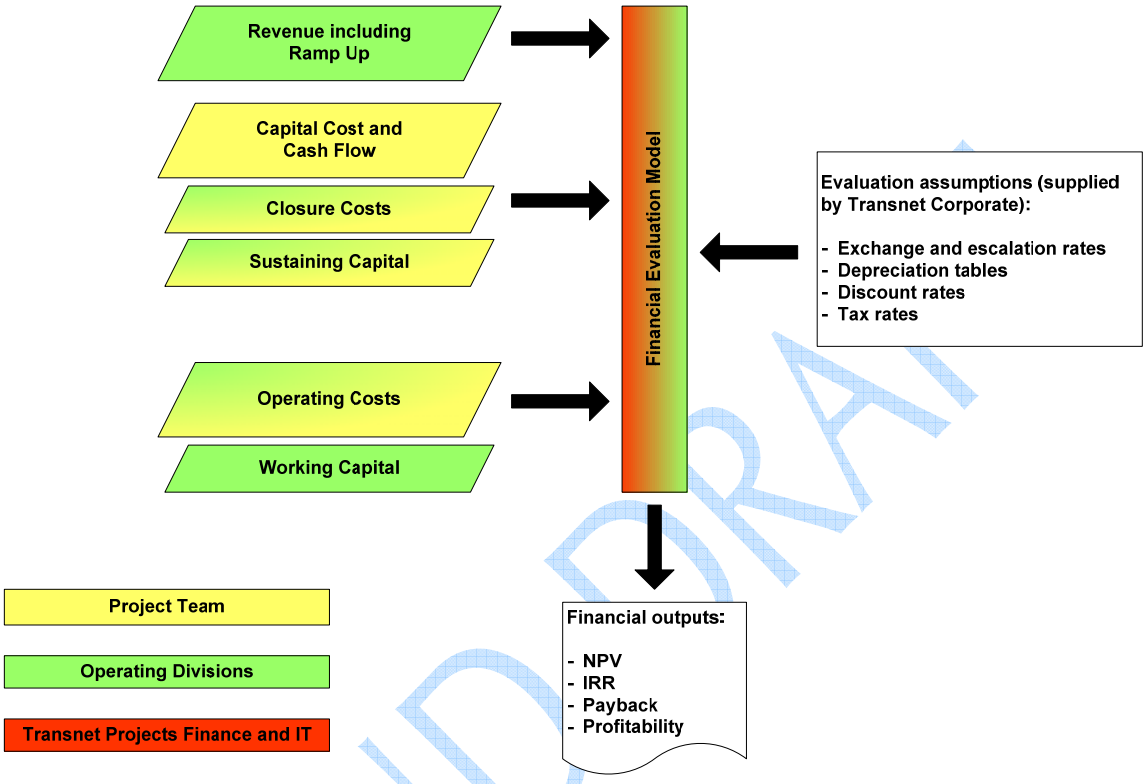

Figure 9-6: Key inputs to the financial evaluation inputs and those responsible

9.4.1 *Context*

The business case is the summary document that presents the project to the different decision making bodies in the organisation when funds are requested. As such the document must contain sufficient information for an informed decision to be made. It explains why the particular investment is aligned with the Transnet's strategic framework, supports Transnet and/or the various divisions' business plans and is consistent with Transnet's environmental, health and safety, social and broader economic policies. At the feasibility study phase, the investment has already proceeded through the concept and pre feasibility phase and as such it will be similar to what was presented in the pre feasibility case updated to reflect the greater understanding of the capital costs, schedule and financial returns of the project that have been obtained.

9.4.2 *Content of a feasibility phase submission*

The written submission should include:

- A short description of the investment and its history (including the progression from concept, pre feasibility to feasibility)
- Confirmation of the alignment with Transnet's strategic framework including confirmation of consistency with Transnet's environmental, health and safety, social and broader economic policies

- Market analysis explaining the need and the target market
- Revenue and operating cost estimates to inform the financial evaluation
- A feasibility study level capital cost estimate
- A financial evaluation of the selected option incorporating a sensitivity analysis to key variables
- A summary of the key risks and assumptions as well as a mitigation plan for the key risks
- An execution schedule
- A description of the salient points to be included in the Project Execution Plan (PEP) for the execution phase
- A recommendation to approve / not approve the funds required to proceed to execution based on achievement of the User Requirements Specifications including established investment criteria for the feasibility study phase
- An explanation of how any provisions or conditions arising from the earlier steps in the approval process (i.e. decisions from the previous CAPICs in the project Lifecycle) have been incorporated in the project

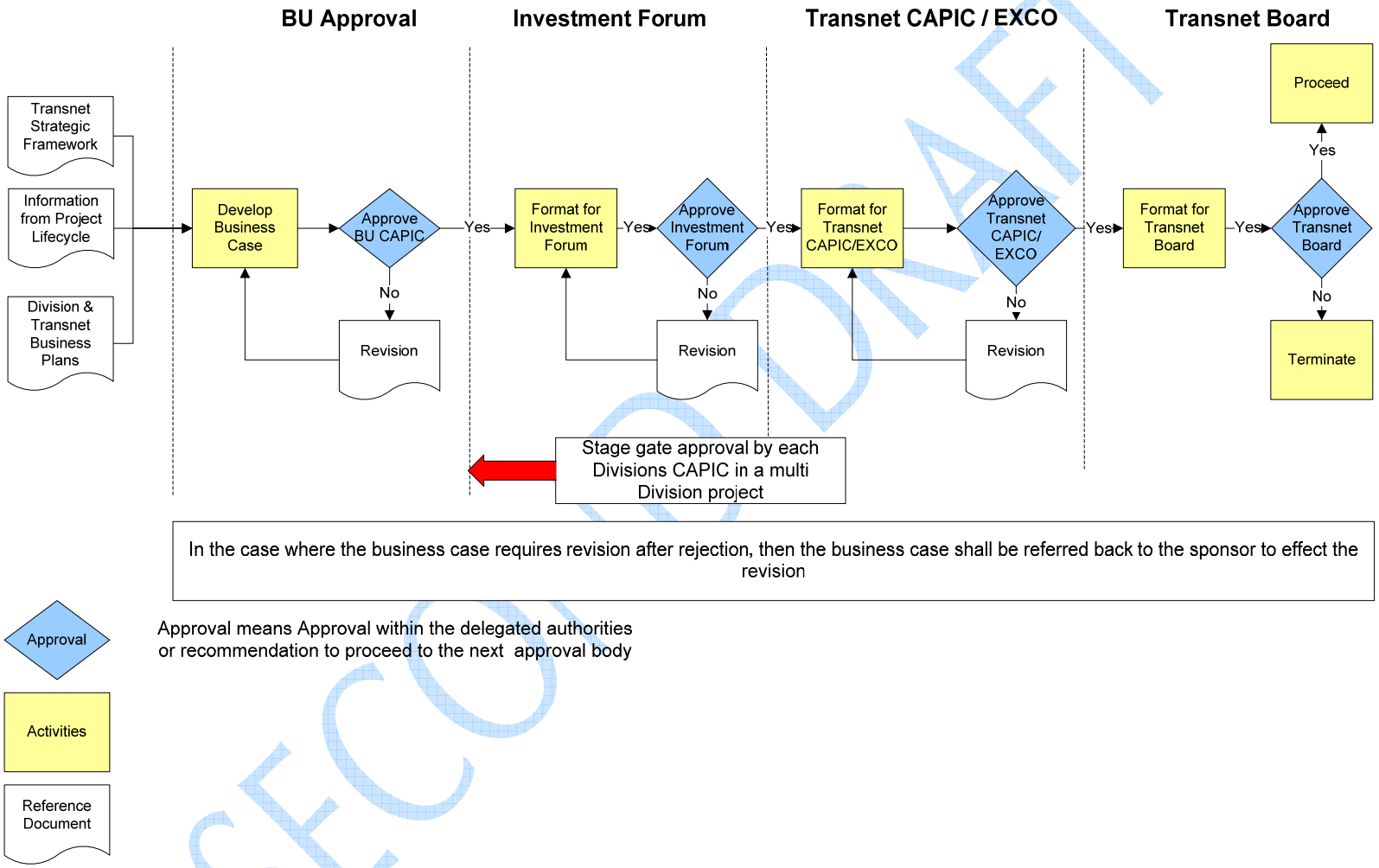

Figure 9-7: Business Case Work Flow

9.4.3 *Financial Evaluation*

In order to remain competitive and ensure long term sustainability Transnet management has to invest in activities that have a positive shareholder return and are acceptable to most if not all stakeholders.

A company's financial value is largely driven by its ability to generate cash flow over the long term. A company's cash flow generating capability is determined by its long term growth and its ability to generate returns on invested capital that exceeds its cost of capital. When management make decisions it is therefore necessary to evaluate the financial impacts of the decisions.

Financial valuation is an important aspect of all project Lifecycle phases. While the principles remain the same the detail differs as more detailed information becomes available. It is important that the evaluation model be fit for purpose; the effort that is applied should be proportionate to the level of capital investment required and the strategic imperative of the investment.

At the feasibility study phase the financial evaluation effort now shifts from being a supporting tool in option selection to being an absolute measure of the potential value of the investment. The model used to confirm that the preferred pre feasibility option was financially viable should form the basis of the feasibility evaluation model.

9.4.3.1 *Purpose*

In the pre-feasibility phase the preferred option has been selected. This selected option should represent the optimum balance of risk and returns that is aligned with Transnet's strategic framework. The financial evaluation in the feasibility therefore only looks at the selected option, but does so in more detail using the revenue, timing, operating and capital cost developed in the feasibility study.

The financial evaluation in the feasibility phase:

- Evaluates the preferred option in absolute terms to confirm if there is a potential value opportunity that justifies proceeding to execution

Besides financial criteria, investments need to consider other issues. The ownership of strategic considerations, as well as operating and revenue parameters needs to rest with the operating divisions.

Whilst not owning the financial model, the project manager must have a sound understanding of what input information and assumptions have been used and be able to meaningfully interpret the outputs. The operating divisions and the financial modeller need to ensure an alignment on the revenue and operating cost assumptions used in the financial model.

9.4.3.2 *Financial Evaluation Approaches*

The typical approaches to financial evaluation are:

- Comparable multiples: In this approach an investment is compared to other investments by looking at earnings and cash flow multiples implied by multiples based on physical factors (e.g. the cost per annual unit of capacity). These multiples are then compared to other similar investments. While this process is useful from a benchmarking (e.g. comparing potential costs of production relative to competitors) and 'reality check' perspective it should not be relied upon as the sole method of financial evaluation beyond the concept phase

- Comparable transactions: This method looks at similar transactions that have taken place in the market place. This method is more applicable to the evaluation of capital purchases than the execution of projects, which due to their unique nature seldom have a comparable transaction that is recent, sufficiently similar and about which detail is readily available
- Discounted Cash flow: This approach looks at the future cash flows of the investment and discounts them back to a specific date to generate an estimated value for the investment at the specific date. The future cash flows are discounted because cash flows in the future are considered less valuable than current cash flows due to their greater risk and uncertainty. The discount rate represents the minimum return below which the investment decision will be negative, and above which the project may be developed with a certain probability of achieving minimum returns

Recommended Approach

At feasibility study level the discounted cash flow is the recommended approach for evaluating investments. The level of information available for estimating revenue, operating and capital cost, and their timing has matured to a level where the discounted cash flow approach can be meaningfully applied. The other evaluation approaches may be used, but only to provide support, to the discounted cash flow analysis.

Special cases

There are special categories of investment decision, for example property purchases, where the comparable transactions approach together with the strategic requirements to purchase the property may be the only viable method of evaluating the decision.

Complementary analyses

Cost competitiveness in relation to competing producers in the marketplace and the projects position on the overall cost competitiveness curve can also assist in informing the investment decision. Competitors whose infrastructure may already be amortised, or who have some other competitive advantage may be more capable of weathering market downturns.

Required input information

Projects typically concentrate on the capital cost and the construction and ramp-up schedule required to achieve a specific throughput and quality. This is the project team's prime area of expertise and focus. The financial evaluation however requires substantial additional rigour in the generation of the operating cost, revenue and the integration of timing assumptions. These require a significant input from the operating divisions as these are their areas of expertise and focus.

Chapter 10

10. FEASIBILITY REPORT

10.1 Feasibility Report

10.1.1 General

The purpose of the Feasibility Report is to document the scope, procedure and outcomes of the Feasibility Study (FEL-3) in a clear and consistent manner, in order to facilitate the quick and accurate review and evaluation of those outcomes. It also provides a detailed summary of the process and various actions taken for record purposes.

10.1.2 Contents

The Feasibility Report, in order to be consistent, and address all relevant elements of the project is to be structured as follows:

- Executive Summary
- Introduction
- Goals and Objectives of the Project
- Scope
- Cost Summary
- Schedule
- Value Engineering/ Possible Savings
- Risk
- Project Management Strategy
- Project Execution Plan
- Conclusions and Recommendations
- Lessons learned
- Appendices

10.1.3 Appendices

Typically the following documents should be appended to the Feasibility Report to support the contents of the main document:

- Key Activities, Deliverables/ Scope Boundaries and Acceptance Criteria
- Level 3 or Feasibility Cost Estimate Summary and Details
- Basis of Estimate
- Cost Estimate Contingency/Risk analysis report
- Detailed Summary of Indirect Costs

- Project Cash Flow
- Comparison between previous Pre-feasibility Estimate and latest Feasibility Estimate
- Business Case submission
- Level 3 Schedule
- Basis of Schedule
- Risk Register
- Project Drawings
- Project Execution Team Organogram
- Project Execution Plan (PEP Document)
- Specialist Reports, such as:
  - Traffic Report
  - Rail Report
  - Architectural, Civil, Electrical, Control and Instrumentation, Mechanical Base Documents
- Any important correspondence required to support the findings of the Study

Chapter 11

11. FEASIBILITY APPROVAL

11.1 Deliverable:

- Approval for release of Feasibility Study Report
- Approval for project to proceed to Execution

11.2 Action:

11.2.1 Review against User Requirements Specification

- Process

  When the study is approaching completion, the User Requirements Specification is reviewed by the Owner and the project manager to confirm that the stated goals, specifications and business benefits have been achieved (or are no longer relevant). The results of this review are used as inputs to the assessment by the Owner and the project team of the success of the project.

- Outcomes

  In the event of a non-compliance, either an action plan is to be prepared to achieve compliance, or an explanation of the reason that compliance is no longer relevant. In the event (relevant) compliance cannot be achieved, the reason for non-compliance shall be recorded in the completed project review documentation.

  Any relevant information from this review shall be communicated appropriately.

11.2.2 FEL-3 Gate Review

- Process

  The Gate Review is undertaken as a due diligence to ensure the work has been completed in accordance with the Work Plan, meets the requirements of an FEL-3 study and provides the targeted level of confidence in the outcomes (capital estimate). The Gate Review uses as the basis of the review the marked up version of the FEL-3 Gate Review Guidelines which were agreed and signed-off between Project Director and Project Manager during set up (see Section 6.2.3). The Gate Review may be undertaken in one of two ways:

  - Internally within Transnet Projects (prior to submission of the Study Report) as a quality management measure
  - Externally, in conjunction with Operating Division representatives. This process will be facilitated by the review team leader assigned at the start of the study

  The Gate Review Process is set out in Appendix B.

- Responsibility

  The Project Sponsor is responsible to see that the Gate Review occurs and the Review Team Leader is responsible to carry out the Review.

- Outcomes

  The Gate Review team will consolidate their observations and findings regarding the work done during the phase and arrive at an assessment that the work done has achieved one of the following statuses and submit a report to the Project Sponsor and Project Manager.

  - Approved
  - Hold – Further Minor Verification Required
  - Fail – Further Major Verification Required

11.2.3 Business Case Assessment against Financial Criteria

It is the Operating Division's responsibility to undertake the business case assessment, and, in the event of a favourable outcome – to secure approval and funding for the project to proceed to the FEL-4 Execution phase.

- Process

  The process for progressing the Business Case through the Divisions, CAPIC, Investment Forum and Transnet Board is depicted inFigure 9-7 and described in section 9.4.2 above.

  The Business Case takes inputs from the Feasibility Study project and the Operating Divisions. The Feasibility Study report with its associated Gate Review Report are the primary inputs from the Feasibility Study project. Other inputs including strategic fit, broader risk analysis, revenue and operating cost projections are largely sourced from the operating divisions. These are compiled into a Business Case which is to be amended and presented in the format required for each successive audience in the approval sequence. The Business Case needs to include the cost and time estimates for delivery of the FEL-4 Execution project as this budget mandate is sought with the Business Case approval.

- Responsibility

  Development of the Business Case and its progression through the approvals processes rests with the operating divisions. Transnet Projects may assist in the process as agreed in the User Requirements Specification at the outset of the study project.

- Outcomes

  The possible outcomes of the Business Case Assessment and the further actions are given below. These eventualities could occur at each of the steps in the sequence:

  - Approved in which case the Business Case may proceed to the next step in the approval sequence. If Board approval is obtained, the FEL-4 Execution project may proceed with the approved budget and schedule and within the bounds of the provisional Project Execution Plan for the Execution project included with the Feasibility report and Business Case
  - Rejected in which case the process terminates and all documents should be filed with the project Close-out and the decision referred to the project sponsor or originator to decide whether to continue or abandon the prospect

- Further work or information required in which case the Business Case needs to reconsider the submission and undertake the additional work or collect the required information and resubmit the Business Case
- Approved with conditions in which case the Execution project can either proceed directly as above or the conditions need to be evaluated to ascertain if the Execution project can indeed proceed under the defined conditions. If not, the response is to be fed back to the authority which laid down the conditions for further consideration

Chapter 12

12. CLOSE-OUT

12.1 Administrative Close-out

The next phase of the project may or may not proceed soon or immediately after conclusion of this phase. It may also never happen. It may or may not be addressed by the same project team or even the same organisation. In closing out the current phase of the project, the project team needs to bear this in mind. It is therefore incumbent on the team to close out the project, archive all documentation in a structured format such that it is relatively simple to retrieve and continue the project at a later stage, even with a new team. Archive the way you'd like to find it if you were expecting to lead the next phase.

The Project Manager is responsible for the completion of Close-out.

12.2 Knowledge Management and Lessons Learnt

The section in the Feasibility Study Report for lessons learned will be sub-divided to include all departments or disciplines as the case may be (including Project Management) where potential to execute work more efficiently was apparent during the course of the job.

Lessons learned is part of the Transnet Projects continuous improvement process and has the potential to significantly improve the work methods on future projects if sufficient information is provided by the personnel closest to the subject process.

Significant issues will most likely have been recorded during the progress of the job and the project progress reports may provide the information if it was not specifically recorded under Project Lessons Learned during project delivery.

If the project completed presents a future opportunity for Transnet Projects to do further duplicate or expansion work this section of the report will be regarded as critical in subsequent project development and planning.

Appendix A

Transnet Gate Review Guidelines – Sample Documents

Appendix A – Example Extracts from Gate Review Guidelines

A.1 Functional Work Sheet

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PROJECT LIFECYCLE GUIDELINES

DELIVERABLES STATUS

FEL 3 FEASIBILITY STUDY - including Basic Engineering

PROJECT DETAILS	
Project Number	
Project Title	
Project Manager	
Project Sponsor	
Project Execution Office	
Profit Centre	
Client	
Project Capital Value	

REVIEW DETAILS		
Date(s) of Review		
Review Team		
	Name	Area(s) of Responsibility
Project Team		
	Name	Project Role

REVIEW OUTCOME SUMMARY				
Assessed Status	Approve ☐	All Key Deliverables meet or exceed the required progress status. **No further action is required before proceeding with the next Project Phase.**		
Note: "Key deliverables" are those that - if not met - pose an impediment to the next project phase.	Hold ☐	Not all Key Deliverables meet the required progress status. **Minor Verification Required - Proceed to next phase but complete certain requirements identified during the review process**		
	Fail ☐	Insufficient Deliverables meet the required progress status. **Major verification work is needed to satisfy minimum requirements and resubmittal for Gate Review before proceeding to the next Project Phase.**		
Sign-off	Review Leader		Date	
	Project Manager		Date	
	Project Sponsor		Date	

Note*: "Status Achieved" column can be completed by either using tick-boxes or traffic light colour coding as above

REF	DELIVERABLE	REQUIRED STATUS	STATUS ACHIEVED	COMMENTS
1	**EXECUTION PLANNING**			
1.01	Project Execution Plans	*Final Draft*	☐	
1.02	Project Set Up	*Finalised*	☐	
1.03	Scope of Facilities	*See 1.02*	☐	
1.04	Scope of Hatch/JV Services	*Complete*	☐	
1.05	Hatch Services Contract/Commercial Agreement	*PO secure-filed*	☐	
1.06	JV/Alliance Relationships	*Complete*	☐	
1.07	Business Plan	*Finalised*	☐	
1.08	Owner Interfaces	*Detailed*	☐	

A.2 FEL Summary Sheet

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PROJECT LIFECYCLE GUIDELINES

DELIVERABLES STATUS

REF	DELIVERABLE	FEL 1 CONCEPT STUDY	FEL 2 PRE-FEASIBILITY STUDY	FEL 3 FEASIBILITY STUDY (Includes Basic Engineering)	FEL 4 IMPLEMENTATION (Includes Detailed Engineering)
8.2	**CIVIL - PORTS AND MARINE**				
8.21	Geotechnical Data	*Preliminary Site Geotechnical Data* Based on limited site geotechnical investigation - few boreholes and surface test pits.	*Indicative Site Geotechnical Data* Geotechnical Report based on site-wide initial borehole drilling and surface test pits. Initial lab tests completed.	*Definitive Geotechnical Data* Foundation design data based on location-specific boreholes for critical structures. All lab tests completed.	*Final* Foundation design data based on location-specific boreholes for critical structures. All lab tests completed.
8.22	Site Conditions	*Public Domain Data* Data based on public domain information, usually large scale maps for topography, wave climates, regional data for seismic & climatic.	*Preliminary Site Data* * Site-specific topographical data with levels ± 1 m. * Prelim seismic study * Site-specific climatic and wave data.	*Detailed Site Data* * Site-specific topographical data with levels ± 0.3 m. * Definitive seismic study. * Site-specific climatic and wave data.	*Final* * Site-specific topographical data with levels ± 0.3 m. * Definitive seismic study. * Site-specific climatic and wave data.
8.23	Digital Terrain Model and Bathymetry	*Conceptual* Topographical data imported from published information.	*Detailed* Topographical data imported from detailed survey	*Detailed* Topographic data imported from detailed survey.	*Final* Issued for use.
8.24	Seismic Data (if relevant)	*Public Domain Data* Data based on public domain information, usually regional data	*Preliminary Site Data* Preliminary seismic study	*Detailed Site Data* Definitive seismic study.	*Final* Issued for use.
8.25	Design Vessel Criteria	*Preliminary* Design Vessel Criteria internal issue only. Based on generali industry publisded criteria	*Draft* Industry analysis to confirm Design Vessel size range. Issued for Client Review and comments. Input into Terminal	*Final* Design Vessel design criteria defined and approved by Client and Marine Authority.. Issued for use.	*Frozen* Design Vessel design criteria defined and approved by Client and Marine Authority.. Issued for use.

Appendix B

Gate Review Process Outline

1. Gate Review Process Outline

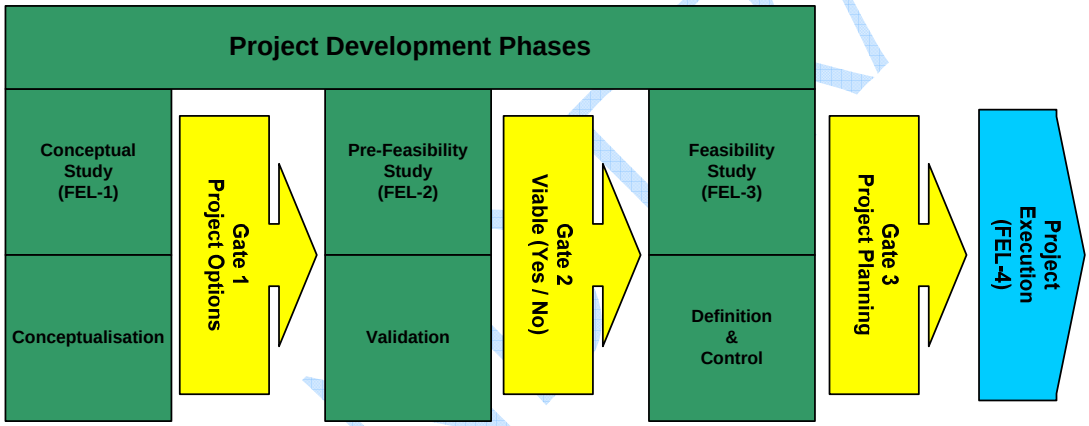
1.1 Purpose

The Project Lifecycle Management Process is a means of effectively controlling a project by breaking it into manageable stages or phases.

The Gate Review process provides a mechanism for management reviews of critical project outputs (engineering definition, capital estimate, schedule, EPCM fees estimate, execution plan, risk management), at the completion of each phase of a project's development to ensure project performance (development and execution) is as per plan. That is, towards the end of the relevant project development phase (FEL-1, FEL-2, FEL-3 or during the Execution phase).

The Gate Review provides a basis to assess the viability of the project and grant the necessary authorisation for the project to proceed to the next phase.

This process is more clearly illustrated in the diagram below:



1.1.1 Gate Description

1.1.1.1 Gate 1 (FEL-1)

Technology Assessment and development of options - Internal high-level review of identified needs and solution options as well as an assessment of the required technology in order to assess its attractiveness as a possible business investment. Decision required by the Owner whether to proceed with a Pre-feasibility Study (FEL-2) or abort the process.

1.1.1.2 Gate 2 (FEL-2)

Most viable option identified and sufficient work completed to determine potential for project viability. Framework for Feasibility Study established. Decision required by the Owner whether to proceed to Feasibility Study (FEL-3) Phase.

1.1.1.3 Gate 3 (FEL-3)

Review of Comprehensive Scope of Work and Project Execution Plan.

Decision required by the Owner whether to proceed to the Execution Phase.

1.1.1.4 Gate 4 (FEL-4)

Review of the Definitive Estimate (typically when engineering is between 60% and 100% complete and construction has commenced).

May entail interim execution reviews for high risk projects.

1.2 Responsibility for Conducting Gate Reviews

The Project Sponsor is responsible for ensuring that the Gate Review Process is applied to the project. Transnet's Director – Project Review is responsible for organising and executing the review and reporting back to the Project Manager and Sponsor.

1.3 Gate Review Process Overview

The Gate Review process broadly comprises the following steps:

- Preparation of documentation prior to the review
- Selection and briefing of the Gate Review team
- Project team internal preparation
- Gate Review workshop (see agenda below)
- Quantitative risk workshops and determination of capital cost contingency (may be done as part of the Gate Review process (see agenda) but should preferably be done by the project team prior to a Gate Review
- Operations Division and Transnet Projects Senior Executive(s) review and approval to release documentation
- Gate Review report

The core of the Gate Review is the review workshop, which will use the PLP Gate Review Guidelines as the basis of the review and the review agenda.

No critical final stage documents (capital estimate, EPCM estimate, schedule, execution plan) and reports are to be formally issued to the Owner prior to the Gate Review.

1.4 Transnet Project Lifecycle Gate Review Guidelines

The Project Lifecycle Guidelines set out the expected standards for deliverables (quality, level of development) at the completion of each Front End Loading phase. The

The Project Lifecycle Guidelines have been structured for use as the detailed agenda for the Gate Review (see Agenda below). The Review Team and the Project Team work through the deliverables lists to assess the status of the project's deliverables against the project phase deliverables quality standards presented in the Guidelines.

1.5 Gate Review Agenda

The following table presents a typical Gate Review Agenda for an FEL-3 Gate Review. Fro earlier phase reviews this template may be "collapsed" to address only the functional areas relevant to that particular FEL phase work plan.

Typical (FEL-3) Gate Review Agenda

Project Name :

Project FEL Phase : FEL-1/ FEL-2/ FEL-3

Study Type : Concept/ Pre-feasibility/ Feasibility

Review Dates :

Day	Time	Activity	Project Team	Reviewer
Mon		**Project Definition**		
	8 – 10 am	Project outline, project organisation/responsibilities, documented scope of work and current status; schedule; capital estimate status; work done to validate the Study outputs; Owner's expectations; project risk overview	Project Manager	Review team
		Key issues and challenges facing the project	Project Manager	Review team
	10 - 12	**Engineering**		
		Status; level of engineering definition completed; guided by the Gate Review Guidelines	Eng Mgr, Leads	Specific reviewers
		Health and Safety – in design		
		Environment and Community – in design		
		Sustainable Development Design		
	12 - 1	Lunch		
	1 – 3	Process Design		
	3 - 4	Layout/ Model walkthrough		
	4 - 5	Mechanical		
Tues		**Engineering (cont'd)**		
	8 - 10	Civil		
	10 – 12	Structural		
	12 - 1	Lunch		
	1 – 2	Piping		
	2 – 3	Electrical		
	3 - 4	Control and Automation		
	4 - 5	Value Improving Practices in Engineering		
Wed		**Project, Procurement and Construction Management:**	PM + Final Leads	Specific reviewers
	8 - 9	Procurement and Contracting		
	9 - 10	Schedule		
	10 - 11	Health and Safety – in execution		
	10 - 11	Environment and Community – in execution		
	11 - 12	Construction Management/Planning		

	12 - 1	Lunch		
	1 - 2	Modularisation and Logistics		
	2 - 3	Commissioning		
	3 - 4	Project Execution Planning - overview		
	4 - 5	Value Improving Practices in Execution		
	5 - 6	Project Execution Systems		
Thur	8 - 9	Risk		
	9 - 12	**Capital Cost Estimate:**	PM, Estimator,	Review team
		Capital cost estimate review		
		- basis of estimate		
		- status of quantities		
		- status of market pricing:		
		- site labour: productivity; rates		
		- EPCM estimate		
		- Benchmarking		
		Operating cost estimate review		
	12 - 1	Lunch		
	1 - 5	**Quantitative Risk Workshop – Schedule Risk**	Internal/+ Owner	Review team
Fri	8 - 5	**Quantitative Risk Workshop – WBS Risk**	Internal/+ Owner	Review team
		Capital Risk		
		Operating Cost Risk		
Mon	8 - 12	**Quantitative Risk Workshop – Project Risk**	Internal/+ Owner	Review team
	12 - 1	Lunch		
	1 - 5	**Quantitative Risk Workshop – Owner's Cost Risk**	Internal/+ Owner	Review team
Tues	8 - 12	**Run risk model**		
	1 - 3	**Review model outputs**		
	3 - 4	Review team consolidate /observations/recommendations		Review team
	4 - 5	Initial feedback/discussion with project team		Review team
	5 - 6	Review with Transnet Senior Executive: Operating Division CEO's+ Project Sponsor/ Senior Project Manager to approve release.	PM	Review team
Wed		**Feedback to team**		Review team
		Complete Review Report		Review team

The review process applies the Gate Review Guidelines for the relevant project phase, Concept, Pre-feasibility, Feasibility or Execution Phase (FEL-1, 2, 3 or 4), completing the guideline checklist for that FEL phase as the review progresses.

1.6 Gate Review Team

The composition of the Gate Review team needs careful consideration.

Essential elements include:

- Experienced leader (with extensive experience in project development phases (especially phases FEL-1, FEL-2 and FEL-3)
- Technical expert(s) in the key technical fields (may vary with the stage gate – i.e. at FEL-3 and FEL-4 each discipline should be adequately represented
- Cost estimating, scheduling and risk expertise, relevant to the project scope matter
- Key implementers who have managed similar projects, and can critically review implementation strategies (sometimes separating project management, construction management and commissioning)
- The team must (by and large) come from the business – this ensures comprehensive understanding of the business requirements. This team must not be confused with any "Peer Review" team which may come from outside of the business (preferable) to validate the discipline specific tasks and conclusions – this is a normal part of a Quality process.

1.7 Gate Review Outcomes

The Gate Review team will consolidate their observations and findings regarding the work done during the phase and arrive at an assessment that the work done has achieved one of the following statuses:

1.7.1 Approved

- All key deliverables meet the required project phase quality standard
- No further action is required before proceeding to Business Case assessment

1.7.2 Hold -Further Minor Verification Required

- Not all key deliverables meet the required project phase quality standard
- Proceed to Business Case assessment but complete certain requirements identified during the review process

1.7.3 Fail - Further Major Verification Required

- Insufficient deliverables meet the required project phase quality standard
- Do not proceed to Business Case assessment
- Complete specific requirements identified during the review process, updating previous data and / or reports and re-submitting these for another Gate Review

Note: "Key deliverables" are those that - if not met - pose an impediment to the next project phase. The judgement of the Review Team in determining the overall assessment must be discussed with the Project Team at the time of drawing the conclusion.

Typically the guidelines are not used to "pass" or "fail" a body of work but more to a) focus on what work is lacking and needs to be addressed up before completion, and more particularly to b) understand where the soft parts of the work are and how that needs to be recognised in the estimate and risk assessment/contingency analysis activities.

1.8 Feedback and Approval to Release

When the Review Team has collectively drawn their conclusions, they are shared with the project team leadership – to ensure any misunderstandings are clarified. Once this is in place, the Review Team presents their findings to the Operating Division (OD) leaders for endorsement of the findings, and recommended remedial actions (if there are any).

The OD leaders then provide feedback to the Review Team and the Project Team with authority to issue the deliverables, take remedial actions (as agreed) and importantly, provide the resources (people, funds, time) and organisational commitment to the deliverables.

1.9 Gate Review Deliverable

The Gate Review team produce a Gate Review Report that records the process, findings, recommendations and working documents. Refer to typical Gate Review Report Table of Contents below: Refer to Gate Review Report Template available through Transnet document management system. See standard report contents list below.

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Gate Review Assessment

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Meeting Action List

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Estimate Class Analysis

Appendix D

Risk Review Report

Appendix E

Senior Executive Briefing – Meeting Minutes

Appendix C

Typical Communication Plan

No.	FROM WHOM/OWNER	TO WHOM	WHAT	WHEN	HOW	DESIRED EFFECT
	(Who is the message owner/stakeholder)	*(Who is the target audience/stakeholder)*	*(What needs to be communicated to stakeholders/what do they need to understand and act upon)*		*(What communication methods/tools are most appropriate for the stakeholder(s) groups?)*	*(what action/change/level of understanding do we want from this communication/what is the goal of this communication)*
1.00	Programme Manager	Transnet Head Office	Update on Projects	Monthly	Reports	Awareness of project progress by key stakeholders
1.01	Programme Manager	Transnet Operating Divisions	Update on Projects	Monthly	Presentation/meeting	Awareness of project progress by key stakeholders and "buy-in" from Business Units
1.02	Programme Manager	Transnet Operating Divisions	Project News	Quarterly	External newsletter	Information sharing on projects (less formal than monthly presentations)
1.03	Programme Manager (via Transnet H.O.)	Public	Incidents/Issues/Situations	Ad hoc		Keep public informed
1.04	Programme Manager (via Transnet H.O.)	Public	Crises	Ad hoc		Keep public informed
1.05	Programme Manager	Government - Dept of Public Enterprises, Eskom, etc	Project information on existing and new projects	As reqd	Meetings	Information sharing
2.00	Programme Co-ordinator	Programme Manager, Programme Directors, Snr Project Managers	Strategic Issues	Fortnightly	Meeting	Resolve programme level issues
2.01	Programme Co-ordinator	Programme Discipline Leads	Co-ordination across programme	Fortnightly	Meeting	Inform, raise issues
2.02	Programme Co-ordinator	HMG JV Steercom	Update on Projects	Monthly	Meeting	Keep Steercom informed
2.03	Programme Co-ordinator	Programme Team	Programme's "People" News	Monthly	Internal newsletter	People Engagement, teambuilding
2.04	Programme Co-ordinator	Programme Team and Small Projects Team	Updates on all projects - where they're at, goals for the period, progress, etc	Six-monthly	Feedback event	Stakeholders get a clearer picture of what the programme is about, celebrate key milestones, inform
2.05	Programme Co-ordinator	Programme Site teams	Updates on all projects - where they're at, goals for the period, progress, etc	Six-monthly	Feedback event	Stakeholders get a clearer picture of what the programme is about, celebrate key milestones, inform
2.06	Programme Co-ordinator	Programme Team	Programme Execution Strategy	Once-off	Visual - eg. posters	Team understanding of programme visions and mission
2.07	Programme Co-ordinator	Programme Team	Overview of programme - organogram, who's who, where to find people, what to do, etc	Once-off	Induction pack	People are kept up to speed and new recruits can "hit the ground running"
3.00	Project Services Managers	Programme Manager	Various Programme Issues	Weekly	Meeting and reports	Inform and resolve issues
4.00	HMGJV Steercom	HMGJV Steercom	Key risks, financials, key personnel, projects updates, other issues to raise at combined Steercom	Monthly	Meeting	Inform, raise key issues and deal with client concerns
4.01	HMGJV Steercom	Transnet Projects/JV combined Steercom	Key risks, financials, key personnel, projects updates, other issues	Monthly	Meeting	Action matters arising from morning meeting/presentation with clients (Business Units)
5.00	Programme Commercial Manager	HMG JV Steercom	Commercial and Financial issues	Monthly	Report	Inform
5.01	Internal Auditors	Programme Manager	Internal Audits	Ad hoc	Reports	report on procedural audits - invoicing, procurement, tendering & resourcing procedures, as well as financial audit
5.02	Programme Commercial Manager	HMG JV Steercom	Scope changes and compensation events on projects and within shared services	As required	Workshare, risk review register	Reduce risks
6.00	Senior/Project Managers	Transnet Operating Divisions and Programme Team	Update on Projects	Monthly	Presentation	Inform
6.01	Senior/Project Managers	Project Team	Update on Projects (incl performance on KPI's)	Monthly	Feedback Meeting	Inform & ensure team executes effectively
6.02	Senior/Project Managers	Project Team	Project Execution Plans	As reqd	Meetings	Project team executes effectively
6.03	Project Managers	Project Team	Project Charter, Project Lexicon, Organogram, templates, procedures, approval matrixes, systems, tools	As reqd	Training	Project team executes effectively