GOVERNANCE, QUALITY MANAGEMENT AND VERIFICATION

Delivering a project within the framework of an Alliance

INTRODUCTION

This paper is designed to provide people joining an alliance project team with a basic understanding of some key project management concepts which are fundamental to good governance, quality management and verification of the project. The focus here is on Works delivered by an Alliance. No attempt has been made to describe the alliance framework in detail.

It is assumed that the reader is familiar with the concept of an Owner procuring new infrastructure through a contract between the Owner and a Constructor. Such a contract is administered by a Superintendent, whose role is to ensure that both parties fulfil their contractual obligations. Typical duties of the Superintendent are to assess progress and certify claims for progressive payment of work done, approve variations to the contract and approve extensions of time to the contract. The Superintendent also undertakes quality surveillance of the Work during construction.

By contrast, an Alliance can be formed by a contract agreement between an Owner, a Designer and a Constructor to work together and to take collective responsibility for self-administration of the contract. If there is a problem, it is everyone's problem; no one is to blame. There is no Superintendent. The function of quality surveillance is replaced by the Alliance taking responsibility for quality control, surveillance and certification of its own work. In the model described in this paper, the Owner assures itself of the integrity of the Alliance's processes by engaging an independent Verifier.

GOVERNANCE

What does it mean? And perhaps more importantly, why should I care?

A significant portion of any Alliance Agreement is devoted to Governance, Management and Organisation. These are very important operative provisions of the agreement and they apply to every member of the project team.

Reference will be made to the Coal Stream Alliance Jilalan to illustrate how these provisions are applied in practice. However, the processes are equally applicable in other alliances.

For the Coal Stream Alliance:

1. QR has decided to deliver the civil works component of the project through the contractual framework of an alliance.

2. The alliance is required to deliver the project with good governance. This is clearly stated in the Alliance Agreement. Each manager has an obligation to read and understand the agreement – it is a binding contract.
3. To achieve good governance, the Alliance must develop project-specific management plans to establish and maintain effective control of the project – that is, to manage risk.
4. The Alliance is responsible for defining the project. This means writing documents (collectively described as 'Project Definition Documents') which translate the Owner's business requirements (its Functional Requirements) into a description of physical Works which, when built, will deliver the functionality that the Owner wants.
5. The Owner, QR, has appointed a Verifier to review the Project Definition Documents against QR's Functional Requirements and to carry out ongoing checks of the design and construction of the Alliance Works.
6. The Verifier is required to assure QR by way of Certificate, at the completion of the Definition Phase of the project that the project defined by the Project Definition Documents complies with QR's Functional Requirements.
7. The Verifier is further required to assure QR by way of Certificate at Practical Completion that the completed Works have been designed and constructed in accordance with the Project Definition Documents and QR's Functional Requirements.
8. The constructed design must be certified by the Design Manager.
9. If the Functional Requirements change during the project, then the resulting change to the design must be subjected to the same quality control processes as the original project works.
10. The completed project cannot be verified unless the quality management system is transparent, has integrity, and provides evidence of an unbroken, traceable chain of quality control from the start of the project to the end of the project. Each alliance participant – the Constructor, the Designer, and the Owner - is both individually and collectively responsible for creating this unbroken, traceable chain of quality control.

What Governance Means

The formation and meaning of the word 'governance' comes from the Latin words *gubernare* and *gubernator*, which refer to steering a ship and to the steerer or captain of a ship. According to the *Oxford English Dictionary*, it also means good order. From understanding the formation of the word it can be seen that governance means more than simply being on course: it is also being shipshape and in good condition.[1]

In its narrower sense, it refers to control of corporations and to systems of accountability by those in control. It is commonly used in the context of

compliance with legislation pertaining to companies, but it also transcends the law because we are looking not only at legal control but also de facto control of corporations. In an alliance, we are looking at accountability, not only in terms of legal restraints but also in terms of systems of self-regulation and the norms of so-called 'best practice'. [2]

The basic tasks of governance are to ensure:

- good financial management;
- good risk management;
- effective implementation of the mission; and
- effective balancing of the stakeholder' needs, within an appropriate system of accountability.[3]

Principles for Corporate Governance

Within a corporation, a high standard of corporate governance can be achieved when:

- Boards and management have high ethical standards;
- Directors act in the best interests of the company;
- Directors are competent;
- The board effectively monitors management's performance;
- There is a proper balance between independence of directors and good communication between the board and management; and
- The board's governance processes are transparent, and fully disclosed to investors.[4]

It is apparent that openness and disclosure of information are essential operating principles for good governance.

Risk Management

All companies face risk. In fact, the modern company developed as a method of spreading the risk of business failure.

Today, the concept of risk management extends beyond financial management to risks of legal liability under such matters as health and safety, public liability, trade practices, property, and environment protection legislation.

Risk management is an area of governance because:

- Business is conducted in an increasingly complex legal environment;
- Failure to attend to risk can lead to extensive corporate and personal liability and legal sanctions;
- Defending the consequences of unmanaged risk is costly.

The choices open to management are:

- To accept the risk;
- To institute adequate control systems and compliance programs to guard against the risk;

- To terminate the conduct in question;
- To transfer the risk to another by contract such as insurance or outsourcing.[5]

Any system of risk management needs to balance risk and control.

Governance in an Alliance

An Alliance functions in much the same way as a Corporation. In place of the 'Board' and 'Directors', read 'Alliance Leadership Team' and 'Alliance Management Team', and in place of 'Company', read 'Project'.

However, a fundamental difference is that an alliance is, in most cases, conceived and designed to exist for a limited life; less than two years is common. An alliance therefore presents the participants with a challenge: to rapidly build a project team with a disciplined culture that will establish and maintain effective governance, management and control of the Work and all of the activities of the alliance.

The Alliance Leadership Team is an executive management group made up of one or two representatives from each company participant. It provides strategic direction and leadership to the Alliance Management Team.

The Alliance Management Team is the second tier of management. It is the group responsible for managing and coordinating the day-to-day activities of the Integrated Project Team and of the Work under the Alliance. In other words, this group collectively takes responsibility for self-administration of the alliance contract and for delivery of the project.

The Integrated Project Team is the team of people chosen by the participants to deliver the Alliance Works – anyone working on the project.

The Alliance Manager is responsible for providing leadership to the Alliance Management Team and the rest of the Integrated Team, and for setting an example of commitment to the Alliance Charter. The Alliance Manager is also responsible for ensuring that the alliance meets or exceeds its objectives. He/she is accountable to the Alliance Leadership Team and is responsible for delivering the Project Proposal.

The role of the Alliance Manager should not be confused with the role of the Owner's Project Manager who is responsible for coordinating the Owner's contribution to the Alliance.

Communication between the Alliance Leadership Team and the Alliance Management Team can be:

- by a specific direction from the Alliance Leadership Team to the Alliance Manager and the Alliance Management Team, or
- by response to a written request from the Alliance Management Team for resolution of any differences or issues that are referred to the Alliance Leadership Team by the Alliance Management Team, or

- by discussion between the Alliance Manager and the Alliance Leadership Team at meetings, often held monthly or more frequently during critical or more intense phases of the project.

Obligations of the Alliance Team

The charter of the Alliance Agreement requires that the alliance participants make a commitment to work collaboratively to achieve 'best for project' outcomes.

The Honourable Justice David Byrne, Victorian Supreme Court, stated in an address titled *The Future of Litigation of Construction Law Disputes*, 'Any departure from the tried and true path involves risk. The taking of risk involves confidence and courage and acceptance that mistakes might be made.'

Participants in an alliance face an equivalent challenge because, to behave in accordance with the alliance charter will require a cultural change, a change that will require each person to take a more professionally detached view of their responsibility to their parent company employer and a more cooperative approach with colleagues on the project team.[6] Trust is fundamental.

To focus on 'best for project' outcomes does not require the individual to compromise their obligations to their employer. It merely requires behaviour that reflects a commitment to work collaboratively, giving as much weight to the interests of the Alliance as to their own self interest.

Role of the Alliance Management Plan in Governance

To ensure good governance of its project, that is, to manage it well, the Alliance is required to develop a comprehensive plan for delivering the project. This is called the Alliance Management Plan. The Alliance must then execute the project in accordance with that plan.

The plan is essential to good governance because it provides the means of demonstrating to the project financiers how the Alliance proposes to manage all of the risks associated with taking a project from concept through design and construction, to commissioning and handover – the point when the financiers can expect to see the beginning of a return on their investment.

Each participant organisation will have its own policies, plans and procedures. These will have been developed to suit the organisation's needs. But it cannot be expected that these plans can just be patched together and presented as a plan for the Alliance.

The alliance is a separate entity from the participant organisations. It must capture its governance and management processes in a tangible and communicable form so that nothing is left open to interpretation later when vested interests have changed. Not everything can be done electronically. Processes must be captured, formalised and written down for use as a reference point.

The Alliance must develop its own plan – one that is specific to the needs of the project. If the plan is well designed and complete then it will deliver business systems which are integrated and consistent with the Owner's governance obligations to its primary stakeholders.

By signing the Alliance Agreement, the alliance participants made a commitment to at all times adhere to the procedural and other requirements stated in the Alliance Management Plan. Good governance therefore dictates that the alliance must be able to demonstrate compliance with the Alliance Agreement. It must also be able to demonstrate compliance with its own Alliance Management Plan.

Evidence of compliance with the Alliance Management Plan can be provided by audit of performance against the stated requirements of the plan. To be effective, audits must be commenced early in the project life and conducted regularly thereafter. This will allow the management team to implement any necessary corrective actions, before performance drifts too far off course.

The Role of the Verification Management Plan in Governance

The Alliance Management Plan is actually 'a suite of documents which set out the policies and procedures that 'we believe will ensure we establish and maintain effective governance, management and control of our alliance'.[7] The Verification Management Plan is one document within this suite.

Alliance Agreements place specific obligations on the alliance participants. For example, Clause 14 of the Coal Stream Project Alliance Agreement states that:

- *'We will develop and implement a verification plan for the Alliance Works which will satisfy all of the requirements of QR and of Queensland Transport in its capacity as the regulator of Queensland rail infrastructure under the Transport Infrastructure Act 1994';* and
- *'The Verifier will confirm that the verification plan complies with QR's policies and procedures in relation to verification'.*[8]

The requirement for the alliance to obtain the Verifier's endorsement of the Verification Management Plan is an effective quality control 'hold point'. It is a control mechanism designed to prevent the alliance from proceeding with the project until it has developed policies and procedures that are consistent with the Owner's greater governance obligations. This is a vital component of risk mitigation for both the Alliance and the Owner.

LANGUAGE AND DEFINITIONS

Clear, precise and consistent communication is the foundation of an efficient team. This aspect of project delivery is frequently overlooked and undervalued. Communication management is especially important for an alliance because the team has to contend with not only the diverse individual

communication nuances of the individuals, but also the different communication structures of the Alliance Participant organisations.

To begin, there must be a common understanding of the meaning of key words and terms. The management plans, processes and roles and responsibilities of key positions should therefore all be written using agreed definitions.

Some examples of important definitions from the Coal Stream Alliance Agreement which are relevant to governance, verification and quality management are:

> FUNCTIONAL REQUIREMENTS - defined as 'QR's requirements for Alliance Works as set out in Schedule 2 (of the Alliance Agreement) for the (Project) and advised by QR in its Referral Notice for Additional Projects.'
>
> PROJECT DEFINITION DOCUMENTS - defined as 'the documents prepared in the Project Definition Phase to describe the scope of works, functional requirements of and performance standards for the Alliance Works.' Included within this definition are the Project Brief, Works Definition Documents, all reports, plans, specifications , drawings, flow charts, procedures and any other documents produced by the Alliance which contain the methodology for delivery and construction of the project.
>
> VERIFIER - defined as 'the person described (in the Agreement) (who may be a QR employee). The reference is to a role, rather than a particular person and this role will be discussed shortly.

Additional definitions are necessary to describe basic project quality management processes to assist the team in achieving good governance. The following are listed in the natural order that they are applied to the flow of work. They have been taken from the Oxford Dictionary and it is recommended that these definitions be used by an Alliance when developing the various component parts of its Alliance Management Plan:

> CHECK - suddenly arrest motion; control to secure accuracy; to make sure of; test by comparison
>
> INSPECT - look closely into; examine officially.
>
> ASSURE – to convince; to state positively the happening of fact
>
> ASSURANCE - formal guarantee; a statement intended to inspire confidence
>
> CERTIFY - attest formally by written certificate; to give a legal right of redress.
>
> CERTIFICATE - document formally attesting a fact, especially to the bearer's fulfilment of conditions, stating that legal conditions have been satisfied.
>
> VERIFY - establish the truth of; examine for this purpose.

'Validate' vs 'Verify'

Before progressing, one should pause to consider the subtle difference in the meaning of the words '*Validate*' and '*Verify*'.

To *Validate* is to confirm or establish the truthfulness or soundness of something, whereas, to *Verify* is to check whether or not something is true by examination, investigation or comparison.

Validation here refers to a process or processes within the alliance, or within an alliance participant's own organisation. For example, the alliance Non-Owner Participant Designer's own in-house Design Quality Management Plan would most probably require that the design be validated by internal peer review prior to drawings being issued for construction. Within an alliance, the Non-Owner Participant Designer would still validate its design to satisfy its in-house quality control processes but in addition, is required to certify to the Owner through the Alliance, that the design is consistent with the Functional Requirements of the alliance's Owner Participant.

Verification here refers to the process applied at the interface between the Project and the Owner, to give the owner (independent) assurance that the completed and delivered Work is as-ordered and that it is fit for purpose.

QUALITY

Who is responsible for Quality?

Consider this example of the most simple of projects: 'I decide that I need a camp fire to warm myself. I know how to build the fire that I want. I have access to matches and fuel; dry kindling and wood of various sizes. I build my fire and sit at a safe distance from it so that I am warmed to the degree I want. In this instance, I did not need to document anything to deliver this project, yet the end product exactly met my needs. In this example, I was solely responsible for, and totally in control of the quality of the end product.

At the other extreme of project procurement complexity is the project that is procured and delivered within the framework of an alliance. In this environment, hundreds of people will be drawn from numerous organisations and groups within those organisations. Each will contribute in some way to the quality of the delivered Works. Each person therefore has a responsibility to manage their own work process so that they can demonstrate to the receiver of their contribution that the required quality has been delivered.

The Alliance, acting as a single entity, is responsible for ensuring that there is a continuous, complete, and fully transparent documented chain of objective evidence which demonstrates the quality of the final product. It is this body of evidence that the Verifier relies upon to verify the Alliance Works.

The Quality Management Chain

It may be of assistance in understanding how these definitions are applied to quality management by considering the following:

If I am doing some work, I **check** that what I have done is correct;

The person receiving my work will **inspect** that work before proceeding to build upon what I have done.

A more senior person in the team who has overall responsibility for the work is then called upon by higher level management to give **assurance** that the work has been constructed and delivered as per the plan or specification;

Upon receiving this assurance, the plan owner or the designer of the work then **certifies** to the Buyer (ie., the Owner), that the work is 'as-ordered', and that it is fit for purpose.

The quality chain does not stop here. A principle of business that has existed for millennia prevails. Expressed in Latin as *Caveat emptor* – let the buyer beware. This maxim dictates that the buyer must ascertain for him/her self the good quality of the goods purchased. The buyer must see to it; the seller thus disclaiming responsibility for the buyer's disappointment. Therefore, the Buyer, (ie., the Owner), or a representative, **verifies** the quality of the goods being received before taking delivery.

Intermediate Quality Management Chain Processes

Total quality management requires that processes be implemented to provide an unbroken chain of control from project inception through to project delivery.

During the design phase of the project, the Alliance must consider all matters relating to the safety of the design – 'whole of life' considerations. This will require consultation between the Business Owner, the Asset Owner (who may be different from the Business Owner), the Designer, the Constructor, and the people who will be responsible for operating and maintaining the completed Works after the Alliance has disbanded.

The alliance participants have a collective responsibility to produce a totally integrated design. This can be achieved by conducting progressive peer review of the design as it is developed. This should be done on an individual engineering discipline basis and by peer review during interdisciplinary engineering design checks.

Further explanation of these processes is beyond the scope of this paper, but it should now be apparent that for good governance, the Alliance must document all of its activities relating to these processes.

The Role of the Verifier and Process Transparency

In the Coal Stream Alliance, good governance requires that all aspects of the project be fully transparent to QR - an entity separate from the alliance, as distinct from QR as a participant to the Alliance.

In turn, QR's governance processes must be transparent to Government Regulatory Authorities and to the State Government.

Clause 9.3(b) of the Coal Stream Project Alliance Agreement prescribes that: *QR will appoint a Verifier to:*

> *(i) review the Alliance Works Definition Documents against QR's Functional Requirements; and*
> *(ii) carry out on-going checks of the design and construction of the Alliance Works against the Alliance Works Definition Documents during the Alliance Works Execution Phase.*[9]

It can be seen from this that the verifier's role sits outside the alliance. It sits between the alliance, of which QR is a participant, and QR as Owner and as a separate entity.

QR receives progressive assurance from the Alliance through monthly project status reports submitted to the Alliance Leadership Team. Quite separate to this, QR receives independent assurance from the Verifier.

The verifier produces two certificates. The first is issued towards the end of the Definition Phase of the project when the alliance submits its Project Proposal to the Owner. [The proposal is a suite of documents which includes the Target Cost Estimate for the project.] The second certificate from the Verifier is issued at the time of Practical Completion.

Clearly, **the verification process spans the full life of the project**. It is not just a process that is applied once construction work has commenced on site, as is the case with the traditional construction superintendence role.

Consistent Quality Management Processes

If the Owner requires the quality of the whole project to be verified, then shouldn't consistent quality management processes be applied through each phase of the project's life?

The most complex project can be built by following the philosophy of 'divide and conquer'. Work from the global to the project specific; from the general to the particular; from the outside to the inside. Then confirm the quality of the work by progressive close-out. Start at the smallest unit and 'back out' of the project; work progressively outwards – this limits the magnitude of the possible error.

Survey position, for example, is controlled by working from Permanent Survey Marks (PSMs) external to the project, inwards to project specific Control Stations, then in closer to Temporary Bench Marks (TBMs) then in closer still to the actual set-out of the individual work elements. The magnitude of positional error is then easily controlled by checking and closing out back to the Control Stations.

In a similar fashion, the design of the Alliance Works can be controlled through the documentation, working inwards from the Alliance Agreement to the Works Definition Brief, to the Works Definition Documents, to the Specifications and the detailed Drawings for Construction. Construction quality is then controlled by documents such as the Lot Plan, Lots, Inspection and Test Plans, Work Method Statements and Checklists.
The construction team effectively 'backs out' of the project by constructing more and more individual work elements and progressively closing-out the site quality records, attaching test results to Lot Conformance Reports, to Package Certification, to Commissioning and Handover, through to final Project Certification and Verification.

Figure 1 shows how a project can be broken down progressively into smaller and smaller pieces of work, and then constructed by assembling the completed elements.

To allow the whole project to be verified, quality must be controlled throughout the life of the project. This can be done by applying the construction-phase quality record system to the activities performed in the Works Definition Phase of the project.

In the construction phase, a 'Lot' is created for each element of work. It is not difficult to extend this quality record system to the Works Definition Phase. The simplest application of this record system to the Works Definition Phase is to create a 'Lot' for each component part of the Alliance Management Plan.

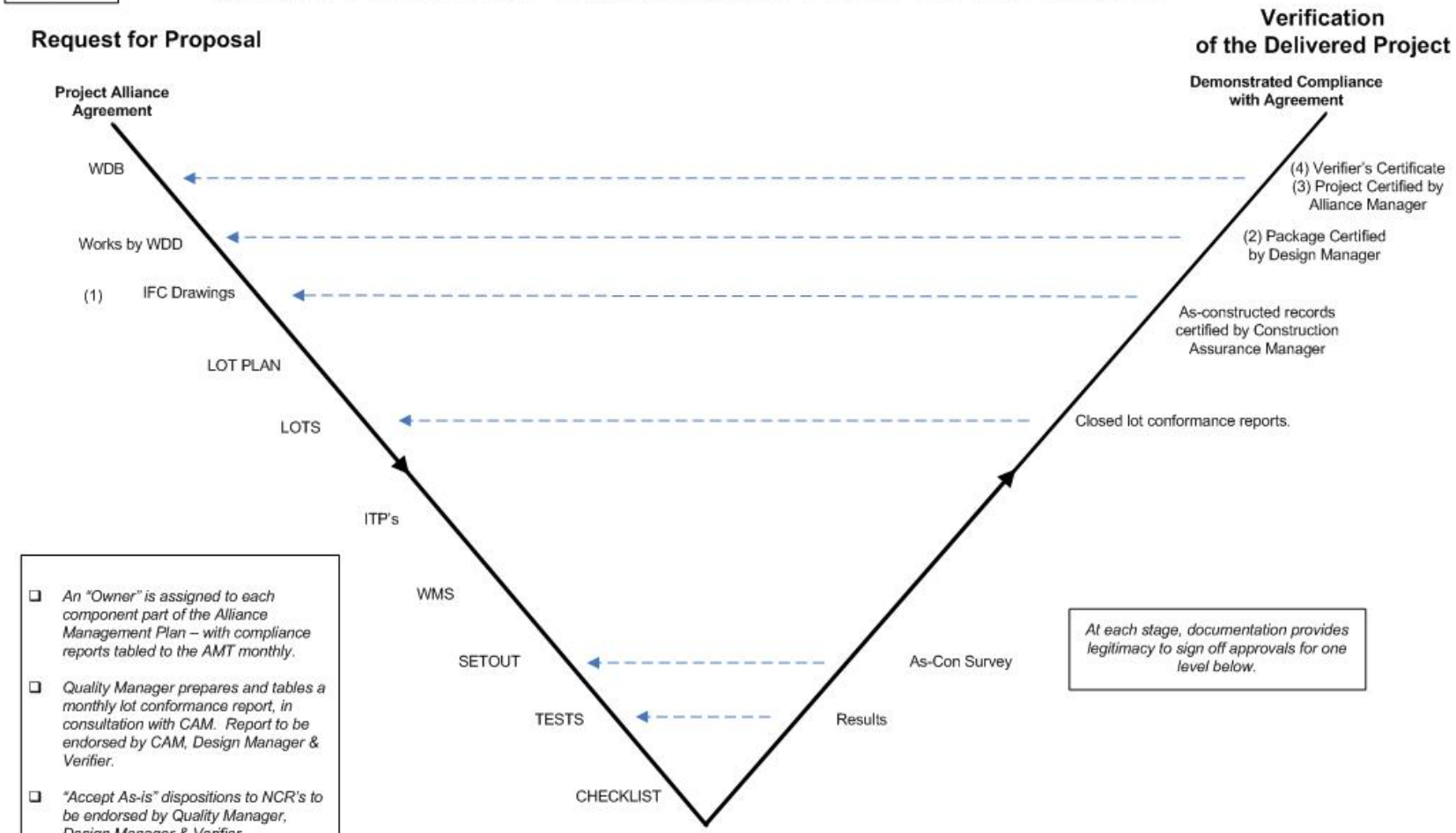
As an extension of the requirement for the constructor's field engineers to take responsibility for, and ownership of, the site quality records, the Alliance Manager could assign ownership of each management plan to a member of the Alliance Management Team and then require accountability from these plan owners to implement the plans and demonstrate project compliance through audit.

If, at the time of Practical Completion, each plan owner is able to certify to the Alliance Manager that the alliance has implemented and complied with each management plan, then the Alliance Manager will be able to credibly certify that the whole project has been constructed in accordance with the Alliance Agreement and the Alliance Management Plan. The Alliance Manager's obligation to provide this certification is discussed later in this paper.

By adopting this approach, the quality of all work performed by the Alliance can be captured in a single record system. Each part of the project is covered by a Lot for which there is an Inspection and Test Plan. The Alliance can demonstrate that each Lot has been closed once the work has been completed. Thus, good governance is clearly visible.

Figure 1

QUALITY CONTROL THROUGHOUT PROJECT LIFECYCLE



Project Phases

A project has a 'life'. The start and the finish points are easily defined and commonly understood, but something that is frequently not appreciated is that the time between the start and the finish can be easily divided into distinct phases. Logically, the task of demonstrating good governance will be made easier if the activities required to deliver the project are divided and grouped according to the natural phases of the project. From this it follows that the various component parts of the Alliance Management Plan can then be written to manage the risks specific to each phase of the project. Such a structure provides the fundamentals of a robust quality management system.

The Coal Stream Alliance Agreement defines two specific project phases, the Alliance Works Definition Phase and the Alliance Works Execution Phase.

The Alliance's obligations during the **Alliance Works Definition Phase** of the project are prescribed by the provisions of Clause 9.2 of the agreement. This states that during the Alliance Works Definition Phase, '*we will carry out the following services in relation to the Alliance Works:*

- *(i) prepare the Alliance Works Definition Documents (which must be consistent with the Functional Requirements);*
- *(ii) liaise with key stakeholders to address their requirements;*
- *(iii) negotiate agreements for access roads and tracks to and from the Site;*
- *(iv) arrange for early procurement of long lead items and enter in to early Contracts;*
- *(v) prepare and finalise a Target Cost Estimate and Target Completion Date for the Alliance Works based on the Alliance Works Definition Documents;*
- *(vi) prepare and finalise the AMP;*
- *(vii) conduct workshops for the preparation of the Target Adjustment Guidelines contemplated by Clause 22.2 (of the PAA) and prepare Target Adjustment Guidelines;*
- *(viii) carry out Interim Alliance Works in accordance with Clause 10 (of the PAA)* [10]

The Alliance's obligations throughout the **Alliance Works Execution Phase** are prescribed by the provisions of Clause 14.3 of the Coal Stream Alliance Project Alliance Agreement. They are:

'*We will perform the work under the Alliance:*

- *(i) in a safe, diligent and skilful manner;*
- *(ii) so that we and our employees, subcontractors, suppliers and other agents … comply with all applicable laws, regulations, industrial agreements, awards and rules;*

(iii) with the aim of meeting or exceeding, and achieving an optimum balance of the various objectives stated in the Alliance Charter and/or directed by the Alliance Leadership team;

(iv) in accordance with the consents

(v) so that the Alliance Works

a. reach a stage of Practical Completion on or before the Target Completion Date;

b. meet the requirements and minimum standards set out in the Project definition Documents;

c. are suitable for their intended use as stated in the Functional requirements and the Project Proposal;

d. comply with Legislative requirements in force at the time;

e. are free from defects by the date of Final Completion, and

f. do not infringe any patent, copyright, registered design, trademark or name or other protected right; and

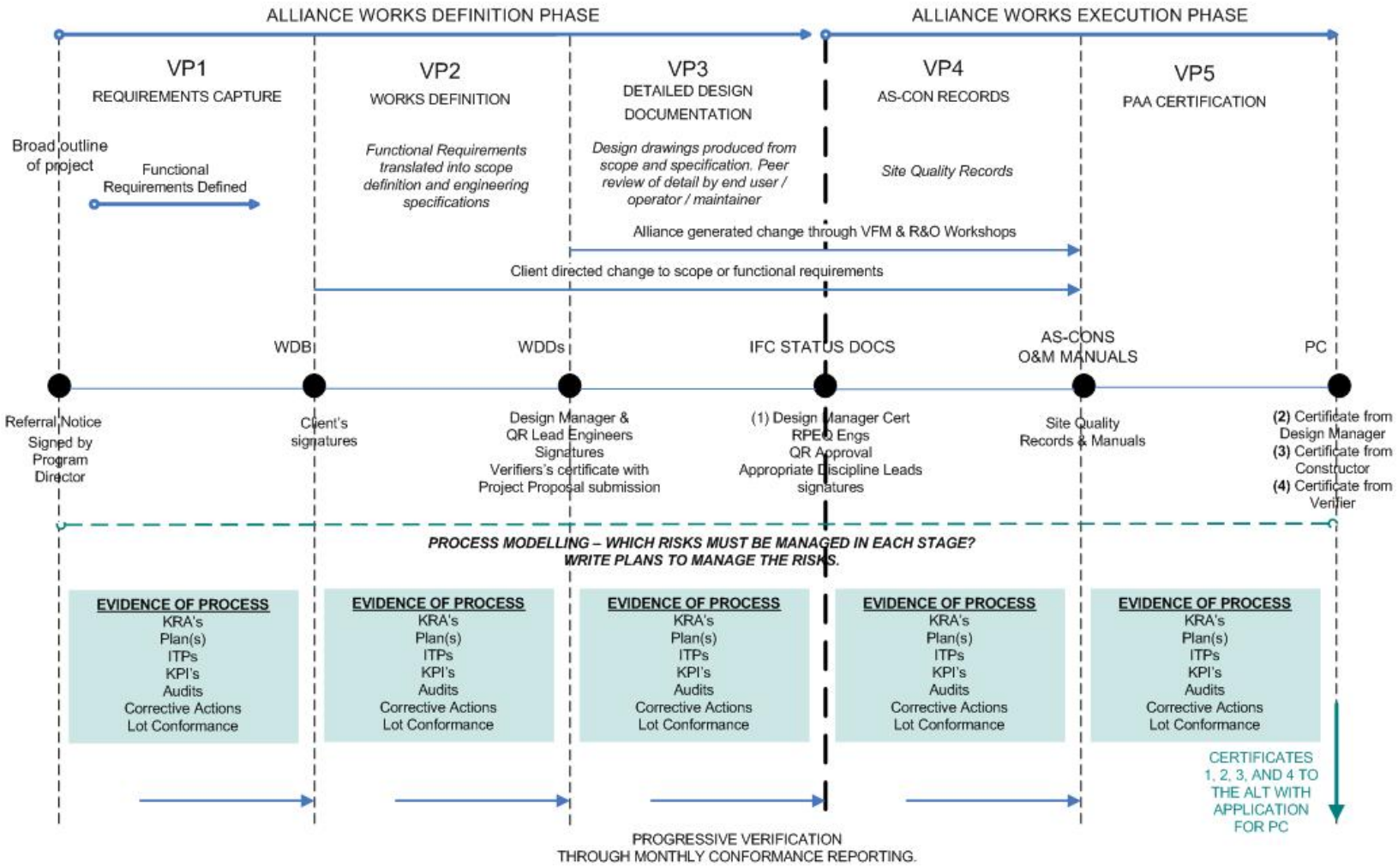
(vi) in accordance with QR's Code of Conduct.[11]

The essential point to understand here is that our obligation through both of these project phases is to work as an alliance team and to develop a plan to deliver the Works in a way that will permit the work to be verified.

QR, as the Owner, requires the alliance (we people) to develop a Verification Management Plan that is acceptable to and is approved by, the Verifier. The Alliance Agreement prescribes that the Verifier certify that: '***the Alliance Works have been designed and constructed in accordance with the Alliance Works Definition Documents and QR's Functional Requirements***'. This cannot be achieved unless the alliance's quality system is continuous through the project phases and is capable of controlling the quality of the work within each phase.

Figure 2

QUALITY MANAGEMENT THROUGH PHASE-SPECIFIC PLANS



VERIFICATION

Verification Management Plan – Outline of the Process

Verification is made possible by the body of documentation generated by the alliance, provided that the individual documents within this body can be linked together to show a continuity of control. The documentation provides proof that the work has been done according to previously approved plans.

The Coal Stream Alliance's Verification Management Plan recognises the natural life cycle of the project. Consistent with the work flow processes, it further divides the two primary project phases, the Works Definition Phase and the Works Execution Phase, into five phases to facilitate progressive verification. These are:

1. VP1 – Requirements capture
2. VP2 – Works definition
3. VP3 - Detailed design documentation
4. VP4 - As-constructed records
5. VP5 - Practical Completion

Completion of Verification Phase VP1 is marked by the finalisation of the Works Definition Brief. This document lists the Business Owner's Functional Requirements and describes the scope of the project in general terms. The Business Owner signs the completed Brief to testify that it describes the project that the Owner wishes to buy. From this point on the Owner relies heavily upon the Alliance delivering Works consistent with this brief, and the assurance from the verifier that the Alliance has in fact done this.

The Verifier must be able to certify to the Owner that documentation produced after the Works Definition Brief and the final constructed Works, is consistent with and meets these Functional Requirements.

Verification Phase VP2 is completed when the Functional Requirements and general description of the scope have been developed into a tangible design upon which a Target Cost Estimate can be prepared. This is evidenced by a series of Works Definition Documents, each signed by the Design Manager and by the appropriate lead discipline engineers from within QR. The Works Definition Documents give a detailed engineering interpretation of the scope of work described in general terms in the Works Definition Brief. Each Works Definition Document is supported by concept drawings and engineering specifications for that component of the project.

The completion of Verification Phase VP2 marks an important point in the life of the project because it is at this point that the alliance team must assemble the documents that comprise the Project Proposal. Clause 11.1 of the Coal Stream Project Alliance Agreement prescribes the Alliance's obligations with respect to preparation of a Project Proposal.[11]

The Project Proposal must include the first certificate from the Verifier. The requirement for this certificate represents a quality 'Hold Point' because it allows the Owner to receive independent assurance from the Verifier that the Alliance has not misinterpreted the Owner's requirements and proceeded to produce a design which in inconsistent with the Functional Requirements.

Verification Phase VP3 is complete when signed and approved drawings are issued 'For Construction'. Each drawing and document is signed by the Designer, as a Registered Professional Engineer in Queensland, the Design Checker and the Alliance Design Manager, and to ensure that the Designer has detailed the work described in the Works Definition Document consistent with QR's requirements, each drawing and specification is also signed as 'Approved' by QR's relevant Principal Engineer and by QR's Civil Manager Coal and Freight. [Civil Coal and Freight is a Section of QR that provides engineering services to the QR Business Owners]

For the Coal Stream Alliance, QR appointed the Civil Manager Coal and Freight as the Verifier to provide assurance to the Business Owner that the finished product, if built in accordance with the drawings, will meet QR's requirements. The QR Business Owner accepts this assurance because it has confidence in the technical expertise of the Civil Coal and Freight section and because the Verification Management Plan requires ongoing peer review of the design by QR's engineers.

Verification Phase VP4 is completed when the Alliance delivers to QR, through the Alliance Leadership Team, a full set of project drawings which have been revised to show the actual as-constructed detail of the completed physical Works, together with the construction quality records and all necessary Operating and Maintenance Manuals.

The final stage of verification, Verification Phase VP5, is completed when the Designer participant, the Constructor participant, and the Verifier each certify the Works to the Alliance Manager. The combined effect of these certificates is to allow the Coal Stream Alliance, as an entity, to provide verification to the QR Asset Owner, that it is now safe to run trains on the newly constructed works. This in turn allows QR to complete its internal Safety Validation processes.

Appendix 1 of this paper details the prescribed requirements of the Verification Management Plan – the actions performed by the Verifier to confirm that each verification phase has been completed.

Appendix 2 of this paper details the corresponding requirements for Audit of the Verification Management Plan.

Appendix 3 of this paper describes the significance of QR's approval of drawings prior to the drawings being released with 'Issue .For Construction' status.

Certificate of Practical Completion

The Alliance can only fulfil its obligations under the Alliance Agreement when it is able to deliver the completed project, or an approved Separable Portion of the project, to the Owner and the Owner is satisfied that the Work is practically complete, ie., that it is fit for its intended purpose, notwithstanding some minor outstanding work or minor defects.

The contractual mechanism for handover is a Certificate of Practical Completion. Clause 19.3 of the Alliance Agreement prescribes the process. It requires the Alliance Manager to request the ALT to issue a Certificate of Practical Completion at such time as the manager considers the works to be practically complete. This request must be supported by the various certificates defined in Phase VL5 of the verification process. The required wording of each of these certificates is prescribed by the agreement as follows:

1. Clause 19.3(b)(i) – *a certificate from the person nominated in the Design Management Plan included in the Alliance Management Plan that the design of the Alliance Works fully complies with the Alliance Works Definition Documents.*

   Under the Design Management Plan, that person is the Design Manager. The Design Management Plan requires the Design Manager to provide a certificate for each Works Package, then, to provide an over-arching certificate which satisfies Clause 19.3(b)(i)

2. Clause 19.3(b)(ii) – *a certificate from the person nominated in the Design Management Plan included in the Alliance Management Plan that the Alliance Works have been constructed in accordance with the Alliance Works Definition Documents.*

   Under the Design Management Plan, the Construction Assurance Manager is required to provide a certificate for each completed Works Package, and then, the Alliance Design Manager, as the nominated person, provides an over-arching certificate for the whole of the completed Works, thus satisfying the requirements of Clause 19.3(b)(ii)

3. Clause 19.3(b)(iii) – *a certificate from (the Constructor) that the Alliance Works have been constructed in accordance with the Project Alliance Agreement and the Alliance Management Plan*

   This certificate is particularly onerous, because to be able to sign, the Constructor must have documentary evidence that all of the Alliance's obligations as defined in the Agreement, and all of the processes defined in the Alliance Management Plan have been followed, and that the integrity of these processes has been confirmed by audit.

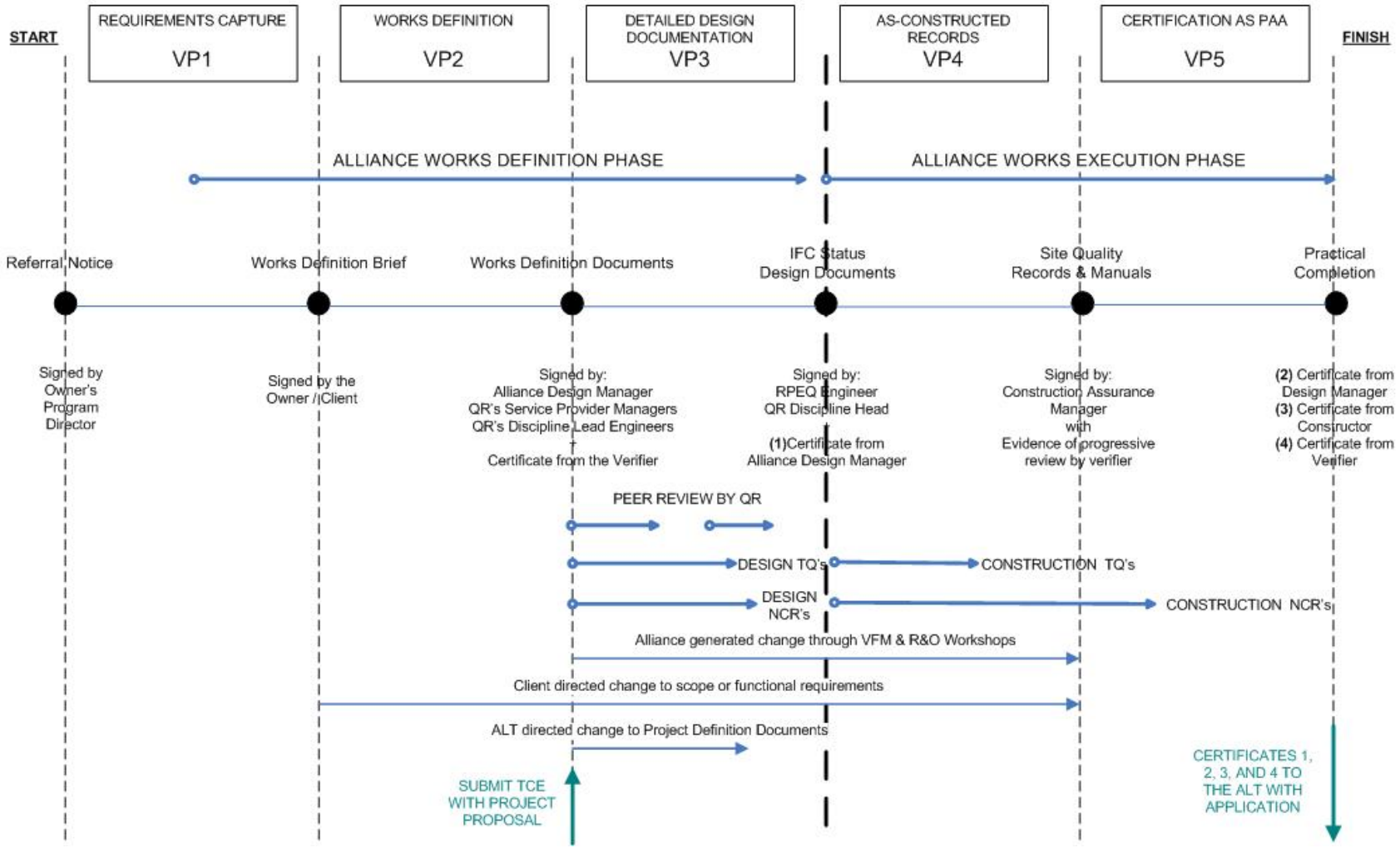
4. Clause 19.3(b)(iv) – *a certificate from the Verifier that the Alliance Works have been designed and constructed in accordance with the*

Alliance Works Definition Documents and QR's Functional Requirements.[12]

By reflecting on the significance of these certificates, one can see that the Business Owner can be confident that the delivered project will meet its needs because the Alliance has demonstrated continuous control of the project from start to finish – from identification and development of Functional Requirements to suit the Business Owner's Operating Plan, to carrying these Functional Requirements through design development, evaluating options and identifying how value for money can be enhanced, through to producing a design which can be linked back to the Definition Documents, to validation of the adopted design criteria and assumptions upon which the design was based by the Design Participant overseeing construction, including validation of any 'scope and/or design changes', through to certification that the Work has been executed in accordance with the contract agreement and the Alliance Management Plan, and most importantly, through demonstrating the integrity of the Alliances actions by verification. In short, the processes and documentation behind these linked certificates demonstrate good governance of the project by the Alliance.

Figure 3

VERIFICATION PHASES FOR PROJECT DELIVERY BY ALLIANCE



Control and Certification of Change

Good governance dictates that risks should be managed with appropriate controls.

The concept that the alliance team must actively manage quality during the Alliance Works Definition Phase of the project was introduced earlier. It has also been argued that the Alliance Management Plan should be structured around the natural phases of the project and that the component parts of the Alliance Management Plan should be written to manage the risks that are specific to each phase of the project.

By observing that the Verifier is required to certify to the Owner, at the time the Project Proposal is submitted to the Alliance Leadership Team, that '*the Alliance Works Definition Documents comply with QR's Functional Requirements'*, and is further required to certify at the time of Practical Completion that '*the Alliance Works have been designed and constructed in accordance with the Alliance Works Definition Documents and QR's Functional Requirements'*, one can see that the alliance quality management processes must accommodate and account for 'change' - change to either the project scope of work or the design of the project work. Change may be introduced at any time in the project life between when the Verifier gives his/her first assurance to the Owner and when the Verifier gives his/her second and final assurance to the Owner. Refer to Figure 3.

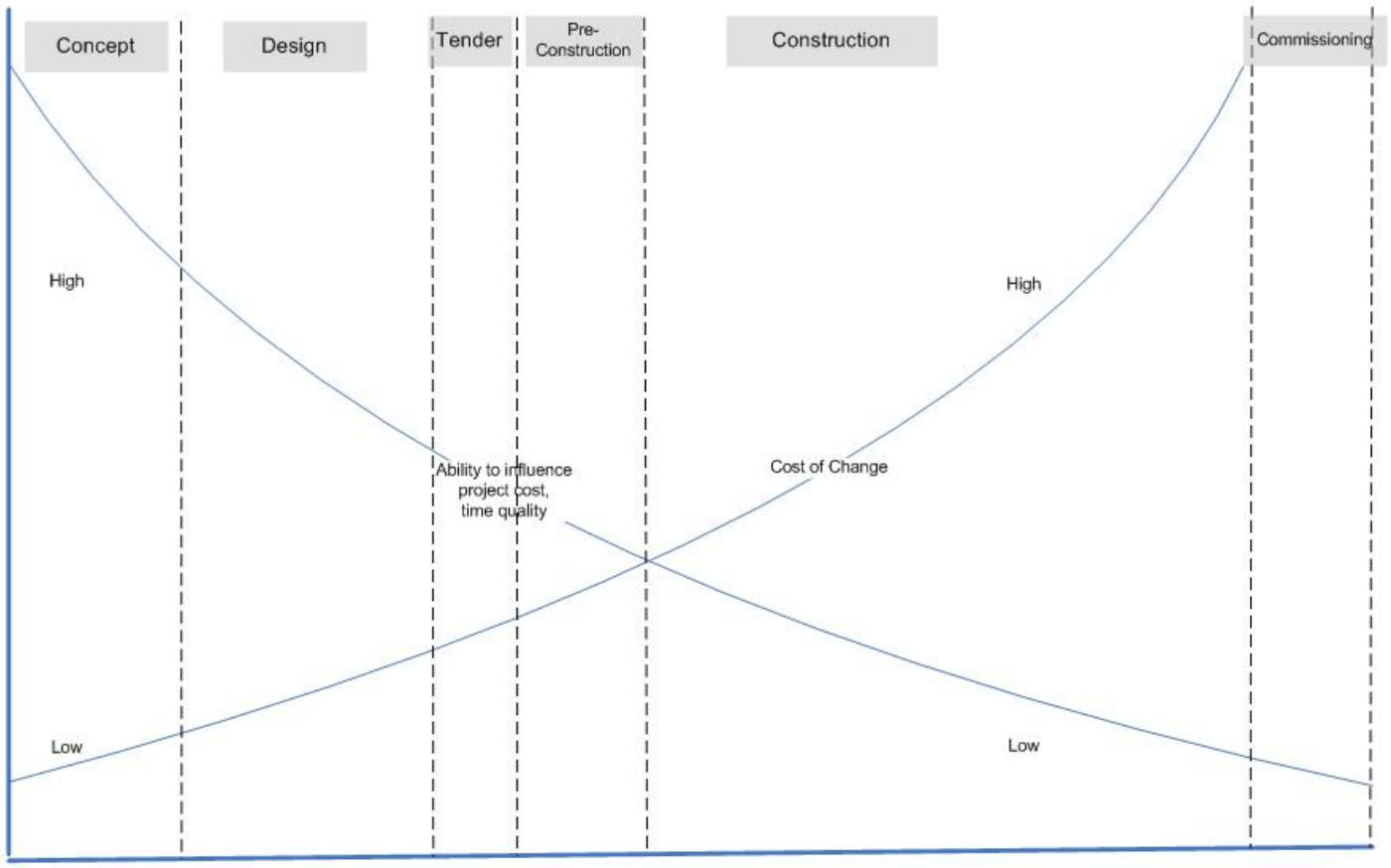
Any published text on Project Management will advise that scope management is perhaps the project manager's greatest challenge. In an alliance, it is the responsibility of the Alliance Management Team to manage change. As stated by Fleming, 'There is likely no factor that would contribute more to the success of any project than having a good and complete definition of the project's scope of work'[13], and, 'Unless the full scope is properly defined and then managed throughout the life of a project, the ability to meet the objectives will be severely compromised'.14

Changes to project scope often result from a desire to make improvements in the final product deliverables. The alliance must have in place some kind of change-control procedure that will allow the project to approve or reject changes, based on a deliberate determination. Changes in work scope should not inadvertently happen because someone failed to prevent them. Rather, scope changes should only result when specifically approved by a person authorised to make changes.[15]

The completed project cannot be verified unless 'change' is subject to the same quality control processes as the original project works. There must be continuity of assurance between the two certificates issued by the Verifier.

Figure 4

PROJECT LIFE CYCLE



Cost is controlled by m monitoring against the approved Budget
Time is controlled by monitoring against the Baseline Master Program
Quality is controlled by monitoring against the Specification

Value for Money vs Cost of Change

An important objective of an alliance is to deliver value for money. The alliance must be able to demonstrate to all stakeholders that, through the collaborative efforts of the alliance participants, the Owner has received a better than business-as-usual outcome.

It is commonly recognised in the construction industry that time and effort spent considering various engineering options early in the project's life has a disproportionally high potential to reduce the total installed cost of the project, as compared to the same time and effort spent later in the life cycle. As a corollary to this, if the design is changed once construction has begun, then the adverse cost effect of the change will significantly outweigh any possible benefit to the project.

Stated another way, the potential to add value to a project rapidly diminishes with time, while past a certain point, the potential to cause a net increase in project cost rapidly increases with time. Clearly, there is a break even point in the life of a project when the team's focus must move from adding value through planning and engineering to saving money by controlling change.

The alliance can manage this tension between value for money considerations and cost of change considerations by adopting a Pareto-type analysis approach to the problem. Refer to Figure 5.

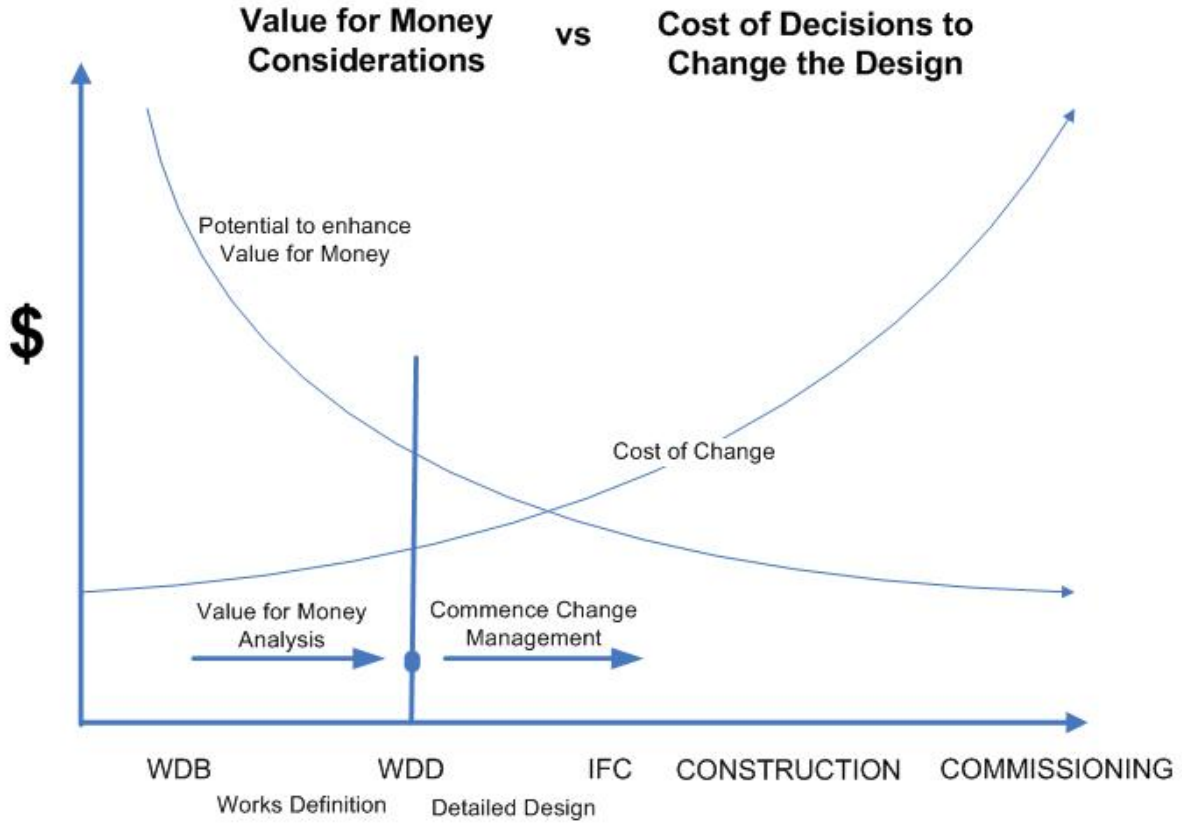
It should be recognised that management plans must be kept simple and user-friendly to be effective. If not, they will be left shelved and unused. It should be further recognised that the collective energy of the team is greatest when it is focused on the minimum number of concurrent issues. Logic therefore suggests that optimum project performance will be achieved if Value for Money analysis is completed when Verification Phase VP2 is completed, and Change Management is commenced when Verification Phase VP3 is commenced. In practice, there will be some overlap. The Alliance must keep this overlap to a minimum.

This management approach will serve to sharpen the focus of the alliance team and minimise the following risks:

- Risk of design cost over-run;
- Risk to program through late issue of drawings;
- Risk that 'change' will creep in without following due process of:
    - Reference back to Works Definition Documents;
    - Subjection to full peer review by the Owner's Service providers;
    - Appropriate Safety in Design interrogation;
    - Thorough Interdisciplinary Design Check by the Alliance.
- Procurement risk;
- Construction cost risk, including the most insidious risk – cost due to lost project momentum and morale; and ultimately,
- Verification risk.

Figure 5

IMPACT OF DECISIONS ON PROJECT OUTTURN COST



There is clearly a point in the life of a Project when opportunity to add value through consideration of "new" design ideas has expired, the possibility of saving money by refinement of design then being outweighed by the cost of introducing change to the design or scope.

CONCLUSION

A project has a relatively short and finite life. To deliver it, a team comprised of people from diverse backgrounds will be rapidly assembled. Each person will bring to the project their own personal skill set which is unlikely to encompass every aspect of project delivery. Time will be limited and will preclude in-depth training in unfamiliar aspects of project delivery. Consequently, few will have an opportunity to see more than their own particular part of the delivery process – they will not get to see what lies behind good governance, quality management and verification of a project delivered by alliance between an Owner, a Designer and a Constructor.

This paper has attempted to illustrate to the reader that:

1. The Alliance Agreement requires the participants to deliver the project with good governance.
2. To achieve good governance, the Alliance must develop appropriate, project-specific management plans to establish and maintain effective control of the project.
3. The Alliance is required to self-administer it's contract. This includes taking responsibility for controlling and certifying the quality of its work.
4. In the example, the Owner appointed a Verifier to provide independent assurance to the Owner that the Alliance managed project risk with good governance.
5. To do this, the Verifier was required to review the Project Definition Documents against the Owner's Functional Requirements and to carry out ongoing checks of the design and construction of the Alliance Works.
6. Before handover of the completed Works, the Verifier was required to certify that the completed Works had been designed and constructed in accordance with the Project Definition Documents and the Owner's Functional Requirements.
7. The completed project cannot be verified unless 'change' has been subjected to the same quality control processes as the original project works.
8. Quality must be controlled throughout all phases of the project using consistent processes.
9. The quality management system must be transparent and provide evidence of an unbroken, traceable chain of control through all phases of the project, from the start of the project to the end of the project.
10. Each Alliance Participant – the Constructor, the Designer, and the Owner – is responsible, both individually and collectively, for creating this unbroken, traceable chain of quality control.

The Alliance Agreement prescribes obligations on the Alliance Participants during two distinct project phases – the Works Definition Phase and the Works Execution Phase. The Alliance Verification Management Plan recognises that these natural phases of the project lifecycle can be further

subdivided. Consequently, verification has been structured to occur progressively through five phases:

1. Verification Phase 1 – Requirements Capture;
2. Verification Phase 2 – Works Definition Documents;
3. Verification Phase 3 – Detailed Design Documents;
4. Verification Phase 4 – Execution Phase; and
5. Verification Phase 5 – Practical Completion Documentation.

It is noteworthy that 60% of the verification activities occur before construction commences. This may be surprising to many people.

In essence, it does not really matter how the Owner chooses to verify the physical works, since quality control systems for construction have been in general use throughout industry for some time and physical works are inherently visible. The real challenge is to provide integrity and transparency to activities which occur during the Definition Phase of the project – the capture of Functional Requirements, Value for Money considerations, Safety in Design considerations, and Change Control processes.

It is hoped that this paper has made good governance, quality management and verification processes less obscure to those people tasked with delivering a project within the framework of an alliance.

VERIFICATION MANAGEMENT PLAN – Prescribed Requirements

The Verifier performs the following actions to confirm that each phase of the verification process has been completed:

VP1 – Requirements Capture

An audit of the Works Definition Brief and subordinate supporting documents shall be undertaken by the Verifier to the extent necessary to confirm to the Alliance that the captured requirements reflect the Owner's operational and functional needs.

VP2 – Alliance Works Definition Documents

The Verifier shall, through delegated authority, review the Alliance Works Definition Documents and verify that they comply with the Owner's functional and operational requirements.

VP3 – Alliance Works Detailed Design Documents

The Design Manager shall verify the Alliance Works Detailed Design Documents against the Alliance Works Definition Brief. The Alliance Design Manager shall provide the Verifier with a document that states the documents represent the Owner's functional and operational requirements. [This is the certificate defined by Clause 19.3(b)(i) of the Project Alliance Agreement].

VP4 – Execution Phase

Compliance will be assured through the Alliance construction quality management system. This system is fully detailed in the Construction Quality Management Plan. Throughout the execution phase, the Verifier shall, in addition to the Alliance's audit requirements, conduct compliance audits of the Site Quality Records. The Verifier may, upon satisfying him/herself as to the records, communicate endorsements of the records progressively, through countersigning of the Alliance Manager's Monthly Conformance Report.

VL5 – Practical Completion

The Alliance Manager's request for Practical Completion made to the Alliance Leadership Team is supported by the certificates prescribed in Clause 19.3 of the Project Alliance Agreement.

The as-constructed works may legitimately differ from the works defined by the detailed design documents due to minor changes

which have been initialled and authorised on-site by the construction team, or by incorporation of major changes which have resulted from instruction from either the Owner or from the Alliance Leadership Team. Therefore, in order to provide an unbroken chain of verification, the Design Manager is required to provide a certificate to certify that the actual constructed works is in accordance with the Alliance Works Definition Documents. This is the second of the Design Manager's certificates and it is the certificate prescribed by Clause 19.3(b)(ii) of the Project Alliance Agreement.

It is apparent that the Business Owner can be confident that the delivered project will meet its needs because the Alliance has demonstrated continuous control of the project from start to finish – from identification and development of Functional Requirements to suit the Business Owner's Operating Plan, to carrying these Functional Requirements through design development, evaluating options and identifying how value for money can be enhanced, through to producing a design which can be linked back to the Definition Documents, to validation of the adopted design criteria and assumptions upon which the design was based by overseeing construction, including validation of any 'scope and/or design changes', through to certification that the Work has been executed in accordance with the contract agreement and the Alliance Management Plan, and most importantly, through demonstrating the integrity of the Alliances actions by verification.

The verification chain is concluded when, upon receipt of these three certificates, the Verifier provides a certificate to the Alliance Manager stating: *That the Alliance Works have been constructed in accordance with the Alliance Works Definition Documents and the Owner's Functional Requirements.*

VERIFICATION AUDIT PLAN

The Verification Audit Plan will require audit actions which:

1. establish whether the prescribed systems are in place;
2. assess whether those systems are adequate; and,
3. identify system improvements or behavioural changes necessary to achieve verification compliance.

The integrity of each phase of the verification process will be confirmed by audit as follows:

VP1 – REQUIREMENTS CAPTURE

An audit of the Works Definition Brief (WDB) and subordinate supporting documents shall be undertaken by the Verifier to the extent necessary to confirm to the Alliance that the captured requirements reflect the Owner's operational and functional needs.

AUDIT

Examine the paper trail of meetings with clients and processes used to achieve sign-off on the Works Definition Brief.

Issues Register
Preparation of Target Cost Estimate (TCE)
Review of TCE by Independent Estimator
Register of Instructions from Alliance Leadership Team
Evidence of Validation of Works Definition Brief
Client signatures on Works Definition Brief

VP2 – ALLIANCE WORKS DEFINITION DOCUMENTS

The Verifier shall, through delegated authority, review the Alliance Works Definition Documents and verify that they comply with the Owner's functional and operational requirements.

AUDIT

Examine the Works Definition Documents to confirm that each has been signed by the Design Manager and reviewed by the Owner's engineers.

Evidence of compliance with the Design Quality Management Plan;
Consistency with the Works definition Brief;
Detail the alternatives considered and departures;

Examine for evidence of document review and verification by appropriate signature.

VP3 – ALLIANCE WORKS DETAILED DESIGN DOCUMENTS

The Alliance Works Detailed Design Documents will be validated by the Alliance Design Manager against the Alliance Works Definition Brief. The Alliance Design Manager shall provide the Verifier with a document that certifies the documents represent a design consistent with the Owner's functional and operational requirements.

AUDIT

Confirm that the records contain a Certificate from the Design Manager, in accordance with the Project Alliance Agreement.

Confirm that the Design Management Plan has been followed – witness evidence of audit and corrective actions.
Confirm that Issued For Construction status drawings and Specifications have been signed by the Designer, the Design Checker and the Design Manager, and also signed as 'Approved' by the Owner's relevant Principal Engineers and by the Owner's Manager of Engineering Services as requisite evidence in support of the Design Manager's certificate.

Confirm that the Change Management Plan has been adhered to, and that the detailed design is consistent with the agreed Functional Requirements and approved changes.

VP4 – EXECUTION PHASE

Compliance will be assured through the Alliance Quality Management System. This system is fully detailed in the Construction Quality Management Plan. Throughout the execution phase, the Verifier shall, in addition to the Alliance's audit requirements, conduct compliance audits of the Site Quality Records.

AUDIT

Examine records for evidence of progressive verification of the constructed works.

Evidence of regular inspection of construction records

Performance by personnel defined in the Construction Quality Management Plan against their defined responsibilities
Evidence that endorsement of the records has been communicated to the Alliance Management Team progressively, through the Verifier, or delegate, by the Verifier's countersigning the Alliance Manager's Monthly Conformance Report.

VL5 – PRACTICAL COMPLETION

The Alliance Manager's request for Practical Completion made to the Alliance Leadership Team is supported by the four (4) certificates prescribed in the Project Alliance Agreement.

The as-constructed works may legitimately differ from the works defined by the Works Definition Documents due to minor construction changes which have been initialled and authorised on-site by the construction team, or by incorporation of major changes which have resulted from instruction by the Owner or by the Alliance Leadership Team.

In order to provide an unbroken chain of quality control, the Design Manager is required to provide a certificate to certify that the actual constructed works is in accordance with the Alliance Works Definition Documents. This is the second of the Design Manager's certificates. It provides evidence of validation of the adopted design criteria and assumptions used in the design.

The verification chain is concluded when, upon receipt of these three certificates, the Verifier provides a certificate to the Alliance Manager stating: *That the Alliance Works have been constructed in accordance with the Alliance Works definition Documents and the Owner's Functional Requirements.*

<u>AUDIT</u>

Confirm that the Request for Practical Completion is supported by the certificates prescribed by the Project Alliance Agreement.

SIGNIFICANCE OF QR's APPROVAL OF DRAWINGS

The Project Alliance Agreement defines the primary performance obligations of the Alliance Participants.

For the Coal Stream Alliance, QR, as Owner, has the specific responsibility to:

(i) arrange and ensure access to the Site;
(ii) fund the Work under the Alliance.

The Constructor Participant has the specific responsibility to provide construction resources and expertise.

The Designer Participant has the specific responsibility to provide design and engineering services.

The detailed design drawings are produced by the Design Participant. Sign-off of these drawings by QR's Senior Civil Engineer (or content expert engineer) means that the design meets QR's requirements, as defined and accepted by QR in the Works Definition Brief and the associated Works Definition Documents.

Sign-off of a drawing by the Civil Manager Coal and Freight, is as Verifier, signifying that due process has been followed - that is, that the design has been produced by a Registered Professional Engineer of Queensland (RPEQ), that checking and appropriate review has been undertaken against the Works Definition Brief and the Works Definition Documents, and that the drawing is now approved for construction.

The verification process applied to the design phase is no different to the process applied to the construction phase, where the Verification Manager, instead of the Senior Civil Engineer, will be checking that the construction has been undertaken in accordance with the design documentation, before being 'signed-off' by the Verifier via the Verifier's Certificate.

The QR Business Owner selected the Civil Manager Coal and Freight for the role of Verifier on the basis that this position within QR can provide assurance to the Business Owner that the Works meet QR's requirements. Civil Coal and Freight is a section of QR that provides engineering services to the various Business Units of QR. The Business Owner derives confidence that the finished product will be what is expected by the owner, even though the work was not precisely defined in the Works Definition Brief, from the Civil Manager's proven technical expertise in the field of railway civil engineering.

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