



TS 00018:3.0
Framework

Technical Supplier Assurance Framework

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Review

This document should be reviewed following any significant changes in business processes and at least on an annual basis. The document owner will provide an independent assurance review on implementation of this framework to the TfNSW Technical Supplier Assurance Community of Practice on an annual basis.

Preface

The TSA Framework focuses on the supply of technical services and products to TfNSW and defines the assurance required to give justified confidence that the technical aspects of an asset or service change have been appropriately considered and conducted.

The intent of the TSA Framework is to provide assurance that technically capable organisations and technically competent individuals are working on Transport assets. The TSA Framework is underpinned by the Technically Assured Organisation (TAO) Scheme which recognises organisations technical capability. Entities that seek to provide self-assured technical services to Transport are required to become a TAO.

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1 Introduction

As a government entity and the ultimate owner, along with the Transport Asset Holding Entity (TAHE), of multi-modal assets that are used to deliver transport services, Transport for NSW (TfNSW) has an overarching obligation to achieve the best possible outcome for its customers, taxpayers and the State.

TfNSW works to deliver great outcomes for customers, communities and the people of NSW – outcomes that seek ‘to make New South Wales a better place to live, work and visit.’

This translates into a large program of work, delivering assets and services for customers across the state. In order to deliver such a large program, TfNSW draws on technical expertise from a range of suppliers to deliver assets and services. The technical capabilities, both internal and external to TfNSW, make up a highly capable Transport Sector.

1.1 Purpose

The TSA Framework intends to provide a clear and consistent approach to technical assurance as it relates to suppliers throughout TfNSW. It also defines roles and responsibilities of technical service and product provisions as well as their associated assurance across the Transport Sector.

This document is primarily for TfNSW staff and industry partners. Implementation of the Framework aims to deliver value for TfNSW, its customers, industry partners, communities and the people of NSW. Value is realised through:

- an appropriate balance of cost, risk and performance
- an outcome-based focus to encourage innovation and continuous improvement
- assurance and justified confidence that the transport and project outcomes are achieved
- recognition and application of technical competency, capability and systems.

1.2 Scope

This Framework applies to all self-assured technical supplier assurance arrangements for asset changes and services that TfNSW is accountable. Its use is mandatory across Transport and TAHE owned assets in the Heavy Rail, Light Rail and Metro modes. It is used on a selected project, or activity basis, for other modes of Transport.

The Framework applies to all self-assured services and products where technical decisions are made. The scope of services includes a full range of engineering disciplines alongside other technical areas such as sustainability in design, electromagnetic compatibility, fire and life safety, systems safety and human factors. It applies to all phases of the asset life cycle.

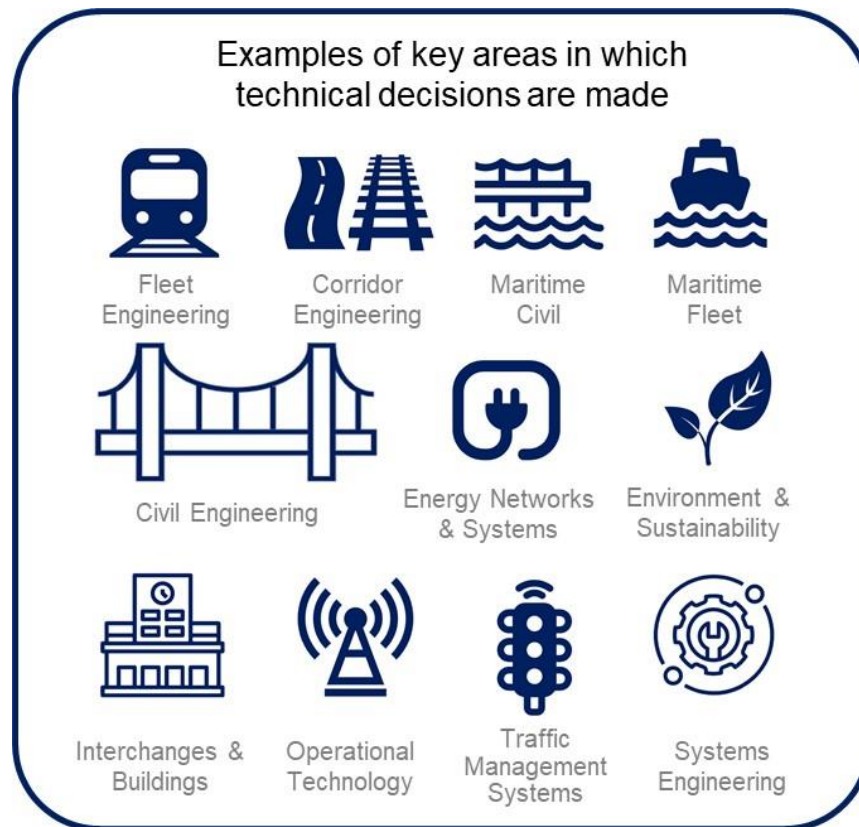


Figure 1: Examples of areas with technical decisions

A full list of technical services within the scope of this framework is available in TAO Engineering Services (TS 06197.3).

1.3 Related frameworks

The TSA Framework is one of six integrated asset related frameworks which work together to provide a consistent approach across the life cycle of TfNSW's assets and services (Figure 2).

The **Asset Management Framework** aligns TfNSW to the NSW Treasury Asset Management Policy and relevant national and international asset management standards such as the ISO 55000 series.

Within the Asset Management Framework there is a commitment to review capability requirements periodically to evaluate the effectiveness of actions taken. Competency of technical product and service providers will be verified as part of TfNSW's technical supplier assurance and contract management processes.

The **Standards Management Framework** outlines the way transport standards are developed, managed and governed for application to assets used in TfNSW business.

The **Configuration Management Framework** builds on the roles and responsibilities defined in the Asset Management Framework, particularly the asset custodian, and defines the authority required to make and recommend changes to TfNSW's assets and services.

The **Systems Engineering Framework** is currently in development and is intended to support the Asset Management Framework through the provision of a structured development process across the life cycle taking into consideration both the organisational and technical needs.

The **Technical Capability Framework** provides TfNSW with a structured and systematic approach to managing its technical capability. It establishes a shared language to describe the capabilities needed to perform work at different levels across TfNSW.

This document, the **TSA Framework**, focuses on the supply of technical services and products to TfNSW and defines the assurance required to give justified confidence that the technical aspects of an asset or service change have been appropriately considered and conducted.

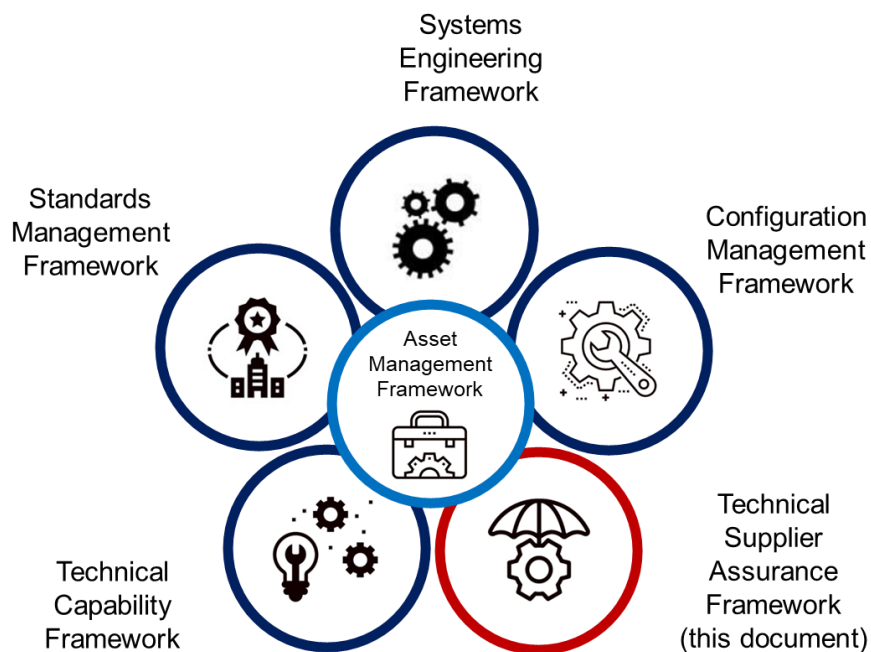


Figure 2: Six integrated asset related frameworks

2 Referenced documents

The following documents are cited in the text. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document applies.

Australian standards

AS/NZS ISO 19011:2019 Guidelines for auditing management systems

Transport for NSW standards

TS 01504 Asset Assurance and Governance Plan Technical Requirements

TS 06197.1 TAO Authorisation Requirements

TS 06197.2 TAO Authorisation Scheme

TS 06197.3 TAO Engineering Services

TS 06197.4 TAO Engineering Services Matrix – Rail

TS 06197.5 TAO Engineering Services Matrix – Maritime

TS 01471 (T MU AM 06006 ST) Systems Engineering Standard

TS 01465 (T MU AM 06014 GU) Guide to Systems Integration

TS 01467 (T MU MD 00014 GU) Multi-Discipline Rail Infrastructure Design Management

Other referenced documents

TfNSW Asset Management Framework

TfNSW Asset Life Cycle Key Roles

TfNSW Configuration Management Framework

TfNSW Standards Management Framework

TfNSW Technical Capability Framework

TPP 19-07 NSW Treasury Asset Management Policy for the NSW Public Sector

ISO/IEC/IEEE 15288 Systems and software engineering – System life cycle processes

3 Terms, definitions and abbreviations

AGP Assurance and Governance Plan

AMB Asset Management Branch

Asset custodian The entity accountable for the end-to-end life cycle management and performance of assets (including asset condition, risk and reporting) on behalf of the asset owner to achieve agreed customer and community outcomes

Asset owner The entity that is the owner of the asset

Asset steward The entity given the responsibility by an asset custodian to oversee part of the life cycle process for an asset

Assurance A set of structured and planned activities conducted through the asset life cycle providing progressive justified confidence that objectives are being achieved and that the asset is or will be fit for purpose

Audit Systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled

Due diligence Risk based checks on a delegated party to provide a degree of oversight that the delegated delivery processes and assurance activities are being done to an appropriate standard

JoS Judgement of significance; an assessment of the technical risk introduced by the implementation of the design and considers both the probability and consequence of partial performance or failure of a design

Operational Integration A process that integrates new or altered assets and services into operation

RASCI Defined roles and responsibilities for an outcome

- Responsible – performs the task
- Accountable – accountable for the outcome
- Support – assists those responsible
- Consulted – for advice and clarification
- Informed – of progress and affected by the outcome

SCA Safety change assessment

Service provider A party providing a service to an accountable party or responsible party either directly or indirectly

Standard setter An entity accountable for setting standards and assurance framework. It 1) establishes and administers Standards Management Framework and standards, and provides risk-based assurance that they are applied; and 2) provides technical subject matter expertise, services and support related to standards.

System Integrator An entity that a) is responsible for ensuring separate subsystems collectively aggregate into a complete system. These subsystems may be provided by separate parties or a single entity; and/or b) ensures that the complete system integrates (merges/joins) into the existing system of systems network

Technical assurance Confidence that the technical aspects of an asset or service change have been appropriately considered and conducted against a set of requirements to achieve an agreed outcome

Technical due diligence* An engineering function that deploys an engineering workforce and is relied upon by the Asset Custodian.

TAO Technically Assured Organisation

Technical supplier A party, external or internal to TfNSW, providing a technical service related to TfNSW's assets and services

TfNSW Transport for NSW

* This definition is subject to further review and will be confirmed in a future release.

4 Technical supplier assurance at TfNSW

Technical supplier assurance is the justified confidence, based on objective evidence, that the technical capabilities of a service provider have been appropriately considered and assessed as fit to work on TfNSW assets. It is also the justified confidence that technical aspects of an asset or service change have been appropriately considered and conducted against a set of requirements to achieve an agreed outcome.

TfNSW uses its technical capability as an informed buyer, in conjunction with capability that resides in private or other public sectors, to deliver technical products and services. Delegating technical authority to suppliers, both internal and external to TfNSW, has inherent risks. This drives the need and requirement for an assurance framework through which governance and acceptance of technical deliverables can be evidenced.

Technical supplier assurance is the process by which TfNSW gains justified confidence that technical risks inherent in the work are being managed in accordance with relevant risk and safety management frameworks (i.e. eliminated or minimised So Far As Is Reasonably Practicable). A larger, technically assured supply chain increases TfNSW's capacity to deliver the required portfolio of work. As shown in Figure 3, technical supplier assurance is in place to assure that risks are being managed so that:

- Assets are acquired, operated, maintained, renewed and disposed in a safe manner;
- New and novel technologies are fit for purpose;
- Assets and services are integrated with various transport modes and places;
- Assets and services are delivered without unnecessary disruption or expense;
- Assets and services are safe, efficient and reliable;
- Transport network changes are sustainable and deliver the desired outcomes without unintended consequences; and
- Transport network changes represent optimal balance of cost, risk and performance for NSW.

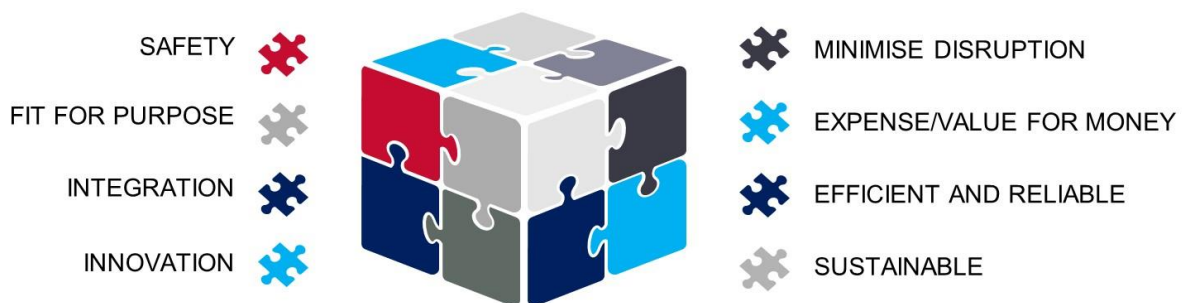


Figure 3: Outcomes from Technical Supplier Assurance

The greater the risk potential is, the greater assurance is required to provide justified confidence on outcomes.

TfNSW is accountable for the whole-of-life transport outcomes, whereas projects are responsible for the project outcomes. The two need to be aligned to make sure that the overarching transport outcomes are achieved.

Through consistent application of this Framework, TfNSW gains justified confidence that both project outcomes and transport whole-of-life outcomes are met.

Justified confidence is not simply gained through activities that manage a supplier and their product or service. Instead, it is gained through knowledge and observations that the appropriate technical capability is in place, the systems and processes are fit for purpose and are actively deployed. Activities that provide confidence include:

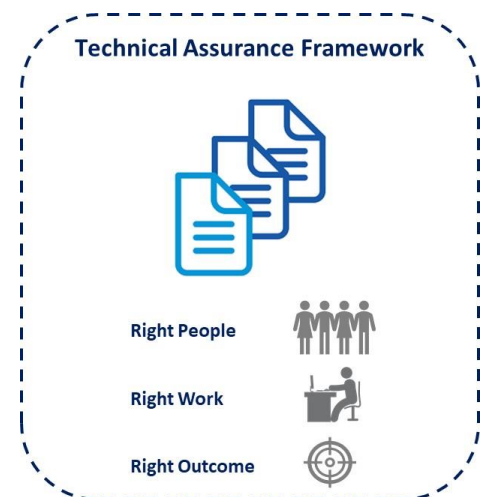
- Supplier authorisation
- Technical capability matching
- Configuration management
- Due diligence activities
- Systems audits
- Framework audits
- Gateway reviews.

Both TfNSW and industry have a shared responsibility of getting the right outcomes for their customers. There are inherent risks in the work that TfNSW delivers.

Implementation of the TSA Framework and related requirements ensures the management and mitigation of those risks.

The way that technical supplier assurance mitigates these key risks is by proactively assuring that technically capable organisations and technically competent individuals work on TfNSW assets. The TSA framework provides justified confidence that TfNSW has the right people, doing the right work and that TfNSW will be provided with appropriate evidence that it is meeting its obligations (right outcome).

The TAO scheme is the primary mechanism by which TfNSW achieves technical supplier assurance.



5 Guiding principles

The following guiding principles form the foundation of the TSA Framework and the associated requirements and models:

- **Guiding Principle 1**
Allow for greater market capability and capacity
- **Guiding Principle 2**
Present assurance commensurate to the risk and be scalable
- **Guiding Principle 3**
Present an integrated assurance view that is mode agnostic
- **Guiding Principle 4**
Provide confidence that the right level of assurance is provided when TfNSW or the supply chain are delivering
- **Guiding Principle 5**
Enable growth and provide confidence in the transport sectors capability
- **Guiding Principle 6**
Enable innovation and optimal outcome from the transport sector

6 Key roles

Key roles across technical supplier assurance include:

- **Asset owner:** the entity that owns the assets i.e. TfNSW or TAHE
- **Standard setter:** the entity accountable for setting standards and assurance framework. It 1) establishes and administers Standards Management Framework and standards, and provides risk-based assurance that they are applied; and 2) provides technical subject matter expertise, services and support related to standards. i.e. AMB
- **Asset custodian:** the entity accountable for the end-to-end life cycle management and performance of assets (including asset condition, risk and reporting) on behalf of the asset owner to achieve agreed customer and community outcomes i.e. respective TfNSW divisions.
- **Asset steward:** the entity given the responsibility by an asset custodian to oversee part of the life cycle process for an asset. It is responsible for the management and performance of assets on behalf of the asset custodian for the required life cycle stage. Typical activities can be associated with capital projects, or operations and maintenance phase of an asset. Entities internal or external to TfNSW that carry out Asset Steward functions are required to have the relevant TAO accreditation when performing technical services, producing technical deliverables or making technical

decisions. The scope of services considered to be technical services are defined in TAO Engineering Service (TS 06197.3).

- **TAO:** the entity that is authorised to provide self-assured engineering services to TfNSW and work on transport assets. An entity that has a demonstrated technical capability and delivers that capability via its approved assurance framework.

7 Delegated technical authority and assurance

Specialist skills are a feature of the transport sector which brings a need for complex subcontracting arrangements. Organisations in TfNSW's supply chain range from large construction companies and design consultancies to small, specialised companies.

TfNSW has TAOs that deliver self-assured technical products and services across the life cycle of its assets.



Figure 4: TfNSW asset life cycle

TfNSW uses a three-level assurance model to delegate technical authority and establish clear accountabilities at each level.

- Level 1 Self-assurance: TAO / Asset Steward (if applicable)
- Level 1 Due Diligence: Asset Steward
- Level 2 Intra-business: Asset Custodian (accountable Division) / Client
- Level 2 Business Partner: Standard Setter (Safety, Environment & Regulation)
- Level 3 Independent: Asset Owner (Audit and Assurance – internal / external)

This model allows TfNSW to assess that its risk exposure is appropriately controlled when technical authority is delegated through each level. It also allows TfNSW to assure itself that the asset custodians, stewards and TAOs are capable of complying with relevant asset management, legislation and regulatory obligations and contractual requirements.

Technical authority is delegated, based on proven skills and capability, from the asset owner to the standards setter who is accountable for setting standards for products and services and establishing the related assurance frameworks. AMB as the standard setter authorises an entity as a TAO. This assures that technically capable organisations and technically competent individuals work on transport assets. Through surveillance activities, the standard setter provides assurance that a TAO operates within its scope and that the technical and systems capability and competency systems still meet TAO authorisation requirements.

The asset custodian, as an informed client, is accountable for managing the whole of life outcomes of the asset. The asset steward is accountable for assuring changes to the asset during required asset life cycle stage. The TAO is accountable for delivering a fully self-assured product or service within its authorised technical capability areas. It is responsible for delivering the required outcome defined by the scope of service, activity or function that it has been asked to perform. In some cases, the asset steward and service provider (TAO) roles may be held by the same organisation.

Via delegating technical authority, Transport empowers its supply chain to offer innovative products and services that provide optimal value and performance of TfNSW assets.

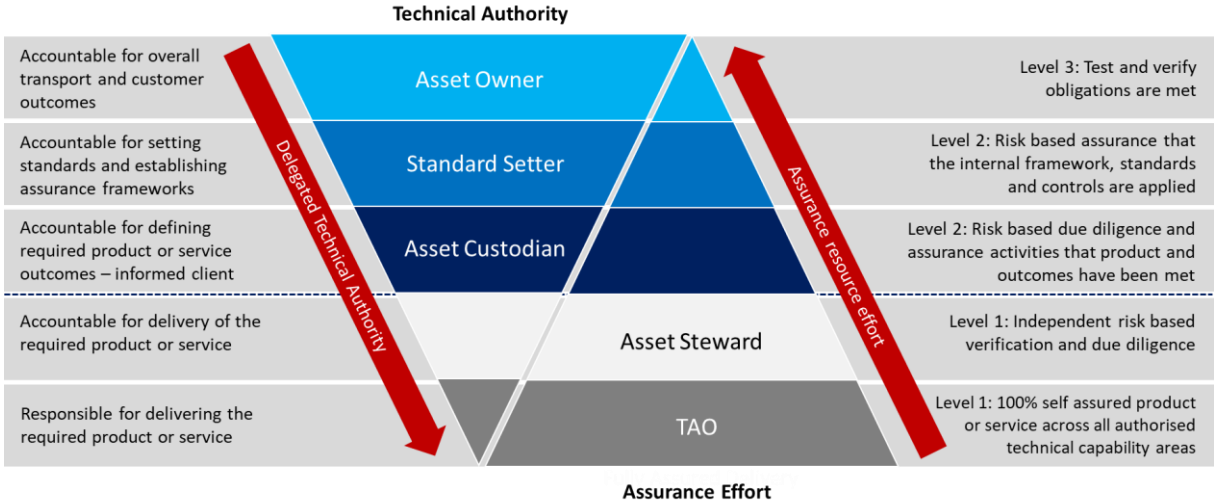


Figure 5: Technical authority and assurance

8 Key activities

Key activities across technical supplier assurance include:

Authorisation:

- Establish and maintain assurance frameworks and standards
- Assess and authorise TAOs

Life cycle delivery:

- Identify need for products and services, define required outcomes
- Deliver the required products and services

Assurance:

- Surveillance of TAOs
- Risk based assurance and due diligence
- Self-assurance during delivery
- System integration related assurance

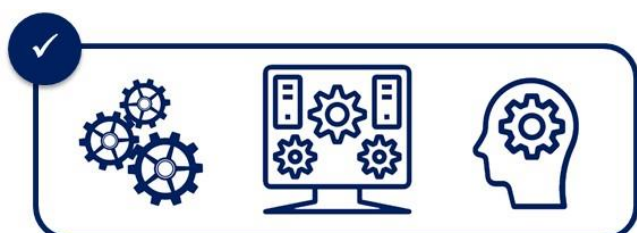
8.1 Authorisation

Organisations in TfNSW supply chain range from large construction companies and design consultancies to small, specialised companies. These organisations, along with entities internal to TfNSW, make technical decisions relating to transport assets and services therefore are required to be authorised. Entities that make technical decisions relating to transport assets and services on behalf of TfNSW are also required to be authorised as a TAO if the scope of activity is covered by TAO Engineering Service (TS 06197.3). This is mandatory for rail, and identified for specific projects across other modes of Transport.

Any decision on whether to receive self-assured services via the TAO scheme in a non-mandatory mode, should be based on a project specific value proposition. The value proposition should consider how risks can be reduced while balancing cost and performance. Joint agreement is to be gained from the client, asset custodian, asset steward, and the standard setter (i.e., AMB) in such circumstance.

The TAO authorisation process, as detailed in TS 06197.2, outlines the pathway to qualify organisations to deliver self-assured technical products and services as a TAO for TfNSW.

The authorisation process includes an assessment of demonstrated and proven technical and systems capability, including competency systems.



The TAO authorisation requirements, as detailed in TS 06197.1, outline the necessary organisational systems, management capabilities and practices expected to be in place. Periodic surveillance of services and products provided by a TAO is a condition of authorisation. Risk based surveillance assures that a TAO is operating within its authorised scope and that its technical and systems capability including competency systems still meet TAO authorisation requirements.

TAO authorisation does not detract from TfNSW's role in appropriately managing and assuring any contracts it enters into, its contractors and their activities. TfNSW remains accountable throughout the process for achieving appropriate outcomes for the people of NSW.

Roles and responsibilities for authorisation activities are provided in Table 1.

Table 1: Authorisation activities RASCI

High Level Activity	Asset Custodian	Asset Steward	TAO	Standard Setter	Procurement / Commercial
Set technical supplier assurance requirements	C	C	C	A/R	C
Develop and oversee Framework and Scheme	C	C	C	A/R	C
Apply for TAO status to provide technical assets and services	-	I	A/R	C	I
Apply for relevant TAO authorisation to make technical decisions or produce technical deliverables	I	A/R *	-	C	I
Authorise TAOs	I	I	I	A/R	I
Actively close non-conformances associated with TAO authorisation	I	I	A/R	C	I
Surveillance audits of TAOs	I	I	S	A/R	I

* If the asset steward performs technical services, produces technical deliverables or makes technical decisions.

8.2 Life cycle delivery

Life cycle delivery takes place across the asset life cycle, from demand/need through to operate and maintain and renew/dispose. It can also take place across different phases of the life cycle at the same time, for example a new rail line is installed at the same time as an old line is

decommissioned. Life cycle delivery activities require combined effort from asset custodian, asset steward and TAOs to achieve an agreed outcome.

As an informed client, asset custodian usually identifies the need for a product or service, and defines required outcomes. The asset custodian then works with the asset steward to ensure that the correct business requirements are set out to achieve the desired outcome. Technical advice is provided by an asset steward or TAO that is authorised in the relevant areas, during these development phases. Any entity delivering self-assured technical services for lifecycle delivery is required to be authorised as a TAO. TAOs are responsible for delivering self-assured products and services within their authorised technical capability area.

The key roles across life cycle delivery are shown in the V life cycle delivery Figure 6. These are focused on the acquire phase but equally apply to enhancements delivered in the operate and maintain phase of the life cycle. The operate and maintain life cycle activity is focused on service outcomes achieved through appropriate maintenance of assets and include preventative and corrective maintenance, like for like replacement and minor enhancements.

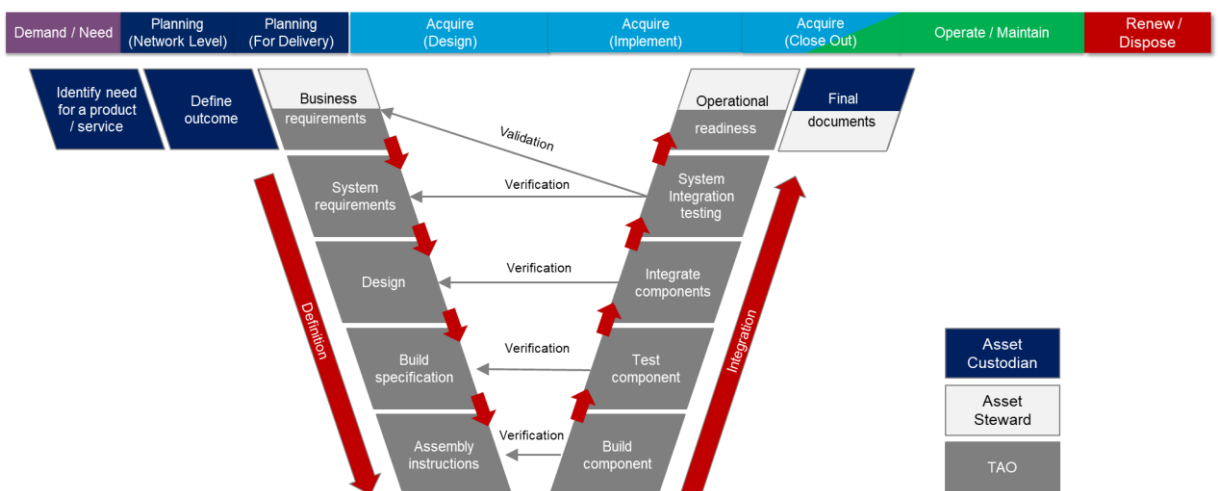


Figure 6: Key roles in V life cycle delivery

Depending on the work being delivered, the asset custodian and/or asset steward decide on the appropriate delivery method for the project or program of works. An entity internal to TfNSW can choose to deliver products and services itself, under its own TAO authorisation or it can decide to obtain services from another party be they a private or public entity. Suitable arrangements are made for engaging TAOs, depending on whether they are a TfNSW, private sector or public sector entity. When procuring services from the private sector, there are three contracting scenarios that must be complied with. These contracting scenarios seek to provide the required TAO coverage and apply equally across the asset life cycle phases:

- **Single TAO coverage:** used for smaller contracts where TfNSW receives fully self-assured products or services from one TAO.
- **Multi-layered TAO coverage:** used for larger contracts where TfNSW receives fully self-assured products or services from a TAO who in turn sub-contracts to other TAOs

or non-TAOs. In this scenario where a non-TAO is sub-contracted, the work must fall within the engaging TAO's scope of authorisation and be assured under their systems.

In the multi-layered TAO scenario, the TAO engaged by TfNSW is expected to hold authorisation in systems engineering and engineering management services which enables effective delivery of engineering management activities, such as managing design/construction/delivery resources, directing people and organisations to deliver according to the engineering processes.

- **Specialist TAO coverage:** generally used where the majority of the work is not rail, a non-TAO may be contracted to provide project management services only. A TAO is sub-contracted and is accountable for providing self-assured technical products or services. In this scenario the contracted non-TAO is not to provide any technical services or make any technical decisions.

In each scenario, a TAO can only provide self-assured products or services within its authorised scope, as defined in TS 06197.4. These scenarios are applicable, but may be supported by different arrangements, when services are being delivered by a TfNSW or public sector entity as they contribute to the overall assurance approach. Refer to Figure 7.

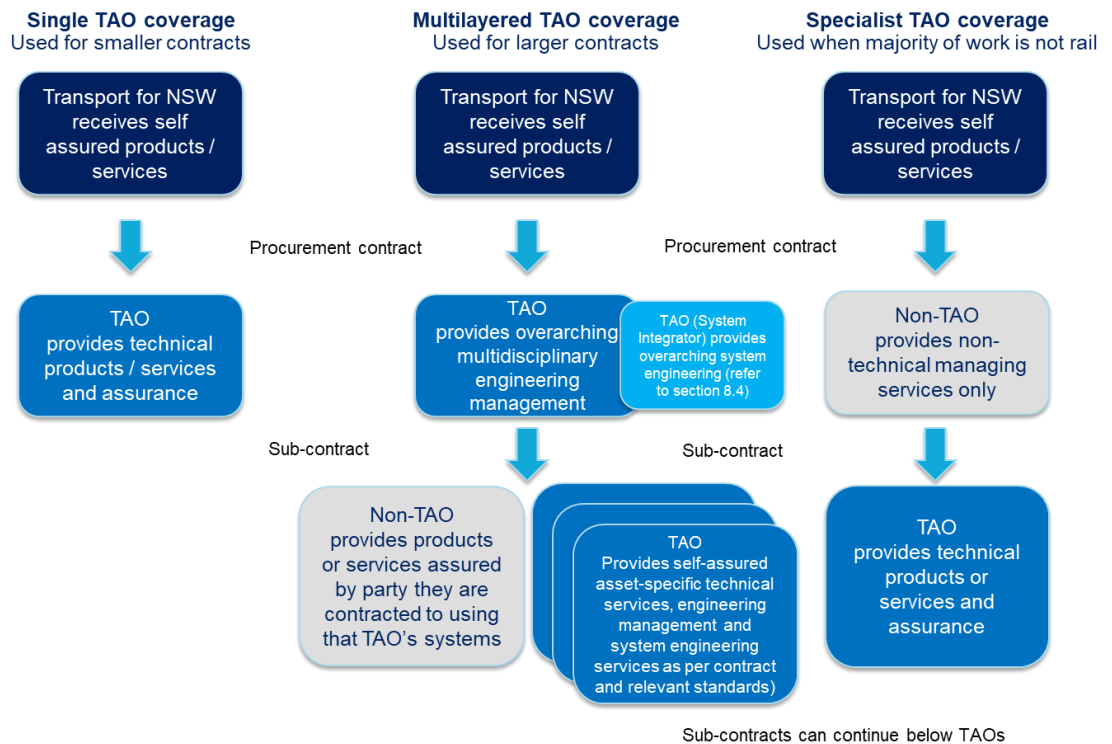


Figure 7: Contracting Scenarios

During life cycle delivery, TAOs are accountable for the following activities:

- Stakeholder engagement and management necessary to deliver the products / services

- Coordinating delivery of the outcomes with the next user and end user of the work including technical interfacing and integration as specified in the contract
- Assuring their own engineering services or products as well as any other sub-contractors' products or services for which they are accountable
- Compliance with TfNSW standards, policies, specifications, legal frameworks and safety requirements

Asset Steward's accountability and responsibility vary depending on the life cycle phase for which they take stewardship of the asset.

An overview of the key life cycle delivery activities, roles and responsibilities for the provision of technical products and services is provided in Table 2. The accountabilities refer to technical activities not financial delegations.

Table 2: Life cycle delivery activities RASCI

High Level Activity	Asset Custodian	Asset Steward	TAO	Standard Setter	Procurement / Commercial
Identify stakeholder and user needs	A/R	R	R	C	S
Define capability requirements and options	A/R	R	R	C	S
Feasibility studies	A/R	R	R	C	S
System requirements	A	R	R	C	S
Concept or reference design	C	A	R	C	S
Design	C	A	R	C	S
Fabrication and manufacture	C	A	R	C	S
Construction and installation	C	A	R	C	S
Technical system interfacing and integration	C	A	R	C	S
Inspection and test	C	A	R	C	S
Operational integration	A/R	R	C	C	S
Commissioning	C	A	R	C	S

High Level Activity	Asset Custodian	Asset Steward	TAO	Standard Setter	Procurement / Commercial
Asset handover	A	R	R	C	S
Operations and maintenance	C	A	R	S	S
Decommission, disposal and renewal	C	A	R	C	S

8.3 Assurance across life cycle delivery

Technical assurance is conducted across all phases of life cycle delivery. A risk-based approach to assurance is applied where governance, assurance and due diligence are scalable to the size, novelty, complexity and risk of the projects and services being delivered. The outcome of technical due diligence is technical assurance and therefore this function requires appropriate authorisation to be conducted on behalf of TfNSW. This is reflected in assurance arrangements specific to the delivery of a project/service in the Assurance and Governance Plan (AGP) or equivalent developed by asset steward. Refer to TS 01504 for details.

Asset steward takes a risk-based approach when establishing and delivering assurance for a project or program of works. Figure 8 shows how the risk assessment flows into the contract activities.

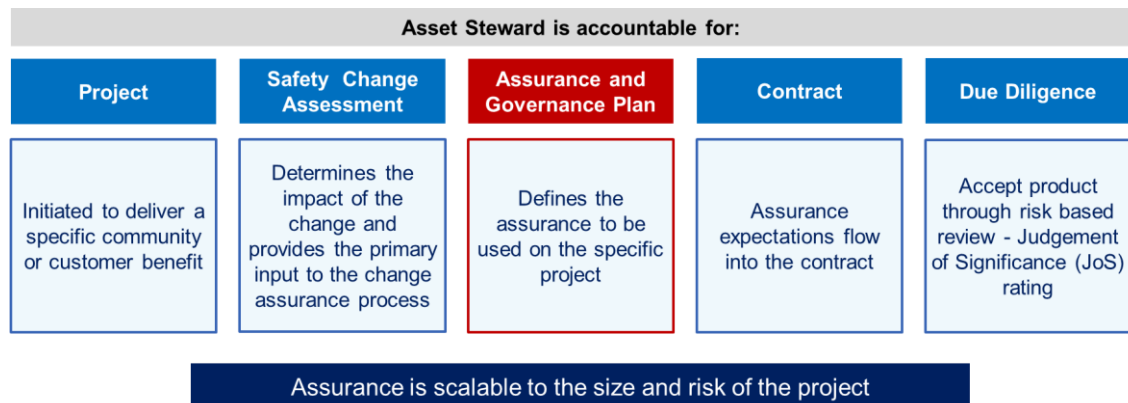


Figure 8: Key assurance activities during life cycle delivery

The TAO engaged remains accountable for delivering a fully self-assured product or service, in line with its authorised capability in all cases. The outcome of the SCA or JoS assessment does not remove the requirement for assurance being provided by the TAO.

Assurance and governance are required to be documented in an integrated Assurance and Governance Plan (AGP) or equivalent when there is program of works. Such plans should align with the prescribed assurance approach, contracting and delivery scenario (see section 8.2 for details) and the delivery team composition and structure. Progressive delivery and assurance against the plan should be reflected in the delivery/project plan. The exact format and content of

this plan may vary depending on the project, while evidence showing assurance should be made available upon request.

Figure 5 in Section 7 illustrates how asset steward and asset custodian undertake risk-based assurance activities. The asset steward undertakes assurance activities through risk-based verification and due diligence to ensure requirements of a project or activity are met. The asset custodian’s assurance focuses on achievement of expected business and customer outcomes. These activities are planned according to the size and risk that a specific project or activity presents and reflect the assurance, verification, and validation arrangements specific to the project. The layers of assurance are also shown in Figure 9.

In addition to this, the standard setter provides assurance that the framework, standards and controls have been provided and implemented. Ultimately, the asset owner is accountable for ensuring that transport obligations have been met and customer outcomes have been delivered through deployment of the framework and scheme.

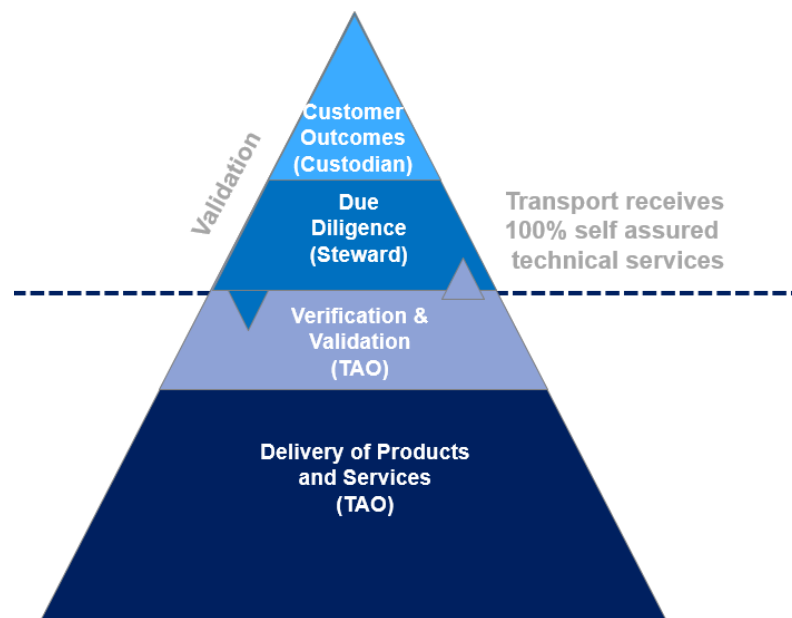


Figure 9: Key assurance activities during life cycle delivery

An overview of the roles and responsibilities for the assurance activities is provided below.

Table 3: Assurance activities RASCI

High Level Activity	Asset Custodian	Asset Steward	TAO	Standard Setter	Procurement / Commercial
Establish and maintain frameworks, standards and controls	-	I	I	A/R	I

High Level Activity	Asset Custodian	Asset Steward	TAO	Standard Setter	Procurement / Commercial
Implement the Supplier Assurance Policy / Framework	A	R	R	S	S
Define technical capability for project	A	R	-	-	I
Include technical capability check in procurement requirements	-	A	-	-	R
Include requirements clauses in contract	-	A	-	-	R
Plan and document assurance and governance activities	I	A/R	R	S	-
Provide self-assured delivery	-	I	A/R	-	-
Check technical capability during project	A	R	-	-	-
Technical due diligence reviews / design reviews	A	R	S	-	-
Inspection and test completion review	A	R	S	-	-
Principal requirements and user requirements validation	A	R	S	-	-
Principal's review for compliance with the contract	A	R	S	-	S
Sampling, monitoring or audits that test TAO system deployment	A	R	S	S	-

8.4 System integration related assurance

System integration ensures separate subsystems collectively aggregate into a complete system, and that the new system integrates within the existing system of systems. It includes distinct activities within project management, procurement, risk, system safety assurance and

others. This is a recognised engineering practice referenced in both international and Transport standards.

Typical integration functions on engineering projects include:

- Operational/Business/network integration.
- Project/program management/Integration delivering project management functions.
- Engineering Management capability that is expected to be deployed at every necessary level of the project/contract organisational breakdown structure (OBS) to ensure coordination.
- Technical and system safety integration and other system engineering functions that look after all aspects of the internal and external product or service interfacing and deliver the integrated assurance including operation safety argument.

Operational, business and network integration is usually conducted within Transport. Project and program management functions can be carried out by asset steward or service provider. Engineering management, technical integration, system safety integration, system engineering and technical asset specific activities are delivered by TAOs with appropriate authorisation in each area.

Technical system integration makes relevant technical decisions and brings together component elements into one system, ensuring that the elements function together as a complete system, and ensuring that the new system integrates within the existing system of systems. System integration arrangements for the project are expected to be captured in the AGP or equivalent.

Figure 10 shows the layers of integration expected for Transport project delivery.

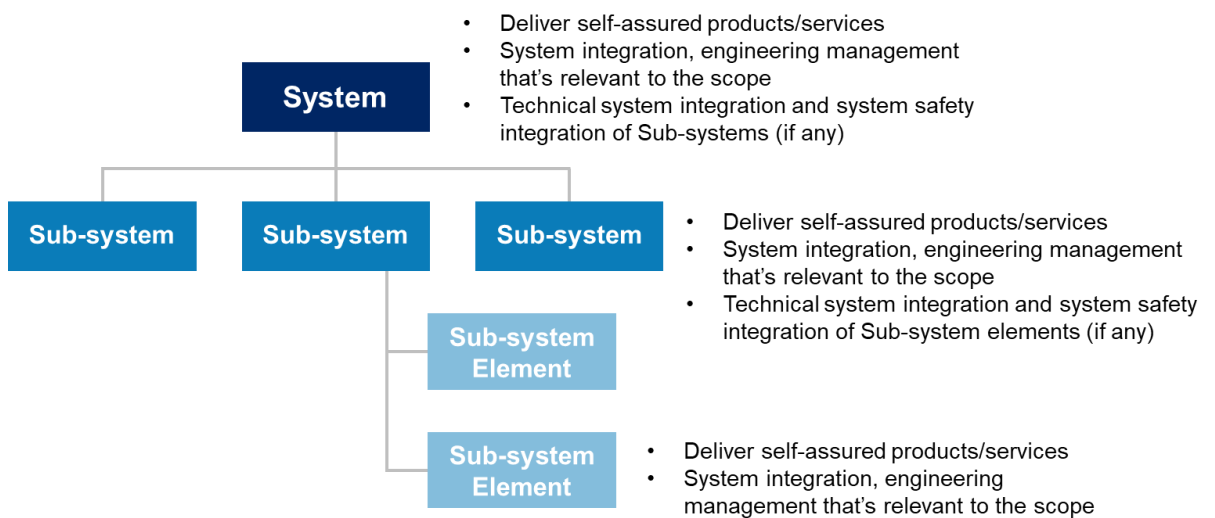


Figure 10: Layers of technical system integration (TAO)

At all levels, a TAO is required to use its own authorised engineering management system to deliver self-assured products or services which include system integration and engineering management relevant to their scope of works.

At system and sub-system levels, a TAO with explicit system integration and other necessary system engineering capabilities authorisation as well as suitable engineering management authorisation needs to be engaged when the scope of work is split across multiple service providers including TAOs and non-TAOs.

It is preferred for the party that signs an agreement or contract with Transport to hold both systems engineering and engineering management capability. This party may perform systems integration functions itself or contract this activity to a TAO with the relevant authorisation. The entity undertaking the integration is often referred as the systems integrator entity. It is accountable for both the technical system integration and system safety integration. The same capability is expected to be held if this role is being undertaken by an internal Transport entity. It is also possible that a systems integrator is engaged separately either by Transport or another contractor where multiple parties are involved.

System integrator entity deploys its authorised capability to assure overarching technical integration of the system/product, and to direct scope management between packages, including management of emergent properties, whereas TAOs with asset-specific authorisation integrate and assure their own work packages.