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Recycled Materials in Rail Infrastructure

Reference Guide – October 2022

An initiative of Victoria's Big Build



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1. Introduction

The *Reference Guide for Recycled Materials in Rail Infrastructure* (this guide) is part of a strategic Victorian Government commitment to optimise the use of recycled and reused materials in rail construction.

The guide provides a summary of current industry standards, specifications and documents from Rail Transport Operators (RTOs) in Victoria, the Department of Transport (DoT, formerly Public Transport Victoria) and Australian standards that support the use of recycled materials in rail infrastructure.

RTOs that form the basis of this guide include:

- Victorian Rail Track Corporation (VicTrack)
- Metro Trains Melbourne (MTM)
- V/Line
- Australian Rail Track Corporation (ARTC)
- Yarra Trams.

Close to 120 major road and rail projects are delivered under Victoria's Big Build, which provides an invaluable opportunity to change how waste is used in Victoria and increase the use of recycled and reused materials in transport infrastructure construction.

¹The guide builds on the considerable work already undertaken across government to encourage the use of recycled materials in construction and more broadly, including Victoria's Recycling Infrastructure Plan (formerly the Statewide Waste and Resource Recovery Infrastructure Plan) (Sustainability Victoria), the Recycling Industry Strategic Plan (Department of Environment, Land, Water and Planning), the Extractive Resources Strategy (Department of Jobs, Precincts and Regions), the Social Procurement Framework (State of Victoria) and the Recycling and Resource Recovery Infrastructure Evidence Base Report (Infrastructure Victoria) as well as trials, research and standards and specifications developed by DoT.

1.1 How to use these guidelines

This guide is intended for use by designers, contractors, department or project sustainability leads, asset owners and others working on major rail infrastructure projects during the planning, pre-tender and construction stages.

This guide can be utilised to efficiently identify what recycled materials can be used in certain rail infrastructure applications.

The applications outlined are primarily track and civil. Many of the applications are considered safety and/or service critical assets, and therefore are subject to appropriate systems assurance procedures.

Suppliers can use this guide to determine potential areas of development and demand.

This guide does not replace current DoT or RTO standards. It is to be used as a quick-reference guide to identify opportunities for using recycled materials and other reuse applications in line with current design and construction standards.

Information in this guide has been drawn from RTO documentation at the time of publishing and is to be read in conjunction with the latest standards, specifications, contract documents, codes of practice and technical notes.

This guide should be read in conjunction with the Reference Guide for Recycled Materials in Road Infrastructure (road guide), when considering road pavement and other road-related applications common to rail projects, as well as the Reference Guide for Recycled Materials in Ancillary Infrastructure (Ancillary guide). These documents are available on the [ecologiQ Knowledge Hub](#).



1.2 Using recycled materials

Reuse: There are a variety of well-established reuse applications within rail infrastructure that enable the remaining serviceability of products and materials to be utilised on the network. These applications are subject to quality assessment and approvals to ensure rail asset quality is maintained.

Recycled materials:

Supplementary cementitious materials (SCMs) in concrete, crushed glass, recycled steel and recycled crushed concrete are commonly used in construction to supplement traditional virgin materials. There are additional opportunities in emerging materials (e.g. ballast reuse). These materials can provide quality, cost-saving and availability opportunities and offer long-term environmental and social benefits.

Type approvals: All products that are part of safety or service-critical rail infrastructure must undergo 'Type Approval' – a robust assessment process by the relevant RTO – prior to their application on the network. This ensures only products/materials with proven performance are used.

The use of recycled products and the accepted percentages in materials are not overly prescribed or excluded from the Type Approval process. Guidance to navigate the Type Approval process and identification of opportunities to increase the uptake of products containing recycled material is detailed within this guide.

2. Reference Documents

2.1 Victorian Rail Track Corporation (VicTrack)

VicTrack's [Engineering Standards Library](#) contains standards to inform the design, construction, commissioning, operation and decommissioning of their assets and infrastructure, including infrastructure which is maintained, repaired, operated and managed by the franchise lessees and PTV.

The standards are updated versions of the VRIOG standards and Telecommunications Engineering Information in the form of standards, specifications and technical data.

Relevant VicTrack standards include in this guide are shown in *Section A.1 of Appendix A*.

2.2 Department of Transport (DoT)

DoT (formerly PTV) develops and manages the Network Technical Standards which set out the overarching technical requirements for rail operation, maintenance and construction across Victoria.

RTO standards form the primary reference for allowances and material specification requirements, however, were originally derived from the Victorian Rail Industry Operator Standards (VRIOGS), which is a compilation of the original PTV/PTC standards.

Direct reference is not made to these documents within this guide, however, can be accessed via the [PTV Drawing](#)

[Management System](#). Access information is provided in *Section A.2 of Appendix A*, user registration is required for access.

Other DoT standards are further referenced within RTO standards as Industry References where required. Specific mention is not made to these standards, however, are available at <https://www.vicroads.vic.gov.au/business-and-industry/technical-publications>.

A list of all standards and specifications referenced in this guide is provided in *Appendix A*.

2.3 Metro Trains Melbourne (MTM)

The current MTM standards, specifications and technical notes used in this guide are shown in *Section A.3 of Appendix A*.

At the time of issue, MTM were in the process of renumbering documents and migrating them to a new Metro Controlled Document External Portal. The hyperlinks provided in this document refer to this new portal where available. It should also be noted that Legacy Document Numbers are adopted within this guide, due to their familiarity with the industry and shall be revised with the new document numbers in subsequent revisions once the process is finalised by MTM.

In some instances documents are still housed on the [MTM Document Portal only](#).

MTM Track Maintenance Instructions (MTMI) set out all requirements and procedures to be followed when installing and maintaining welded track on the Melbourne metropolitan train network. These are not available on the document portal.

2.4 V/Line

The current V/Line standards, specifications and technical notes used in this guide are shown in *Section A.4 of Appendix A*. These documents are available at [V/Line Network Access Portal \(VNAP\)](#). A user registration is required to access.

2.5 Australian Rail Track Corporation (ARTC)

The current ARTC procedures, specifications and technical notes used in this guide are shown in *Section A.5 of Appendix A*.

These documents are available at [Infrastructure Standards: ARTC Extranet](#) Inland rail documentation can be accessed via the [Inland Rail online portal](#).

For the purpose of this reference guide, only ARTC Documents with applicability to Victoria have been referenced.

2.6 Yarra Trams

Yarra Trams' current reference list of standards for Infrastructure and Operational Control and

Management Systems is accessible via their [compliance standards website](#).

Yarra Trams Engineering Management System documents referenced in this document are not publicly available. Relevant Yarra Trams standards, specifications and technical notes used in this guide are shown in *Section A.6 of Appendix A*.

2.7 Major Transport Infrastructure Authority (MTIA)

Major Transport Infrastructure delivery projects – including rail projects as part of Rail Projects Victoria (RPV) and Level Crossing Removal Project (LXRP) – may prepare technical reports on the compatibility or appropriateness of an existing standard or specification and its endorsement for use on a project. The documents used in this guide are shown in *Section A.7 of Appendix A*.

RPV and LXRP are major delivery bodies, with their sustainability policies supporting the implementation of reuse and recycled materials within projects. For further details refer to the [RPV sustainability policy](#) and [LXRP sustainability policy](#).

2.8 Other references

Other relevant references to this guide are included in *Section A.8 of Appendix A*.

3. General Considerations

The following points should be considered when exploring opportunities to reuse and use recycled material in the construction of rail infrastructure.

Rail industry:

The Victorian rail network is managed by five principle rail transport operators. Each is responsible for providing and maintaining the infrastructure and to ensure the safety of rail infrastructure. The key stakeholders and core agreements are illustrated in Figure 1 (shown on right).

- **VicTrack:** asset owner for most of Victoria's rail land and infrastructure. The majority of VicTrack's assets are leased to the rail infrastructure managers and rolling stock operators
- **MTM:** Metropolitan rail network
- **V/Line:** Regional rail network
- **ARTC:** Interstate network (and interstate freight operator)
- **Yarra Trams:** Melbourne light rail tram network.

Refer to Section 7 for overview of the Victorian Tourist and Heritage Rail network.

Other industry bodies include:

- **Freight Operators:** ARTC (interstate) and Pacific National
- **Peak Body:** [Australasian Railway Association \(ARA\)](#)
- **Australian Research Centres for Rail:** [Australian Centre for Railway Innovation \(ACRI\)](#), [Rail Industry Safety & Standards Board \(RISSB\)](#)
- **Rail Research Centres for Victoria:** [Monash Institute of Railway Technology \(IRT\)](#)
- **Victorian Universities undertaking relevant research:** [Swinburne University of Technology](#), [RMIT University](#).

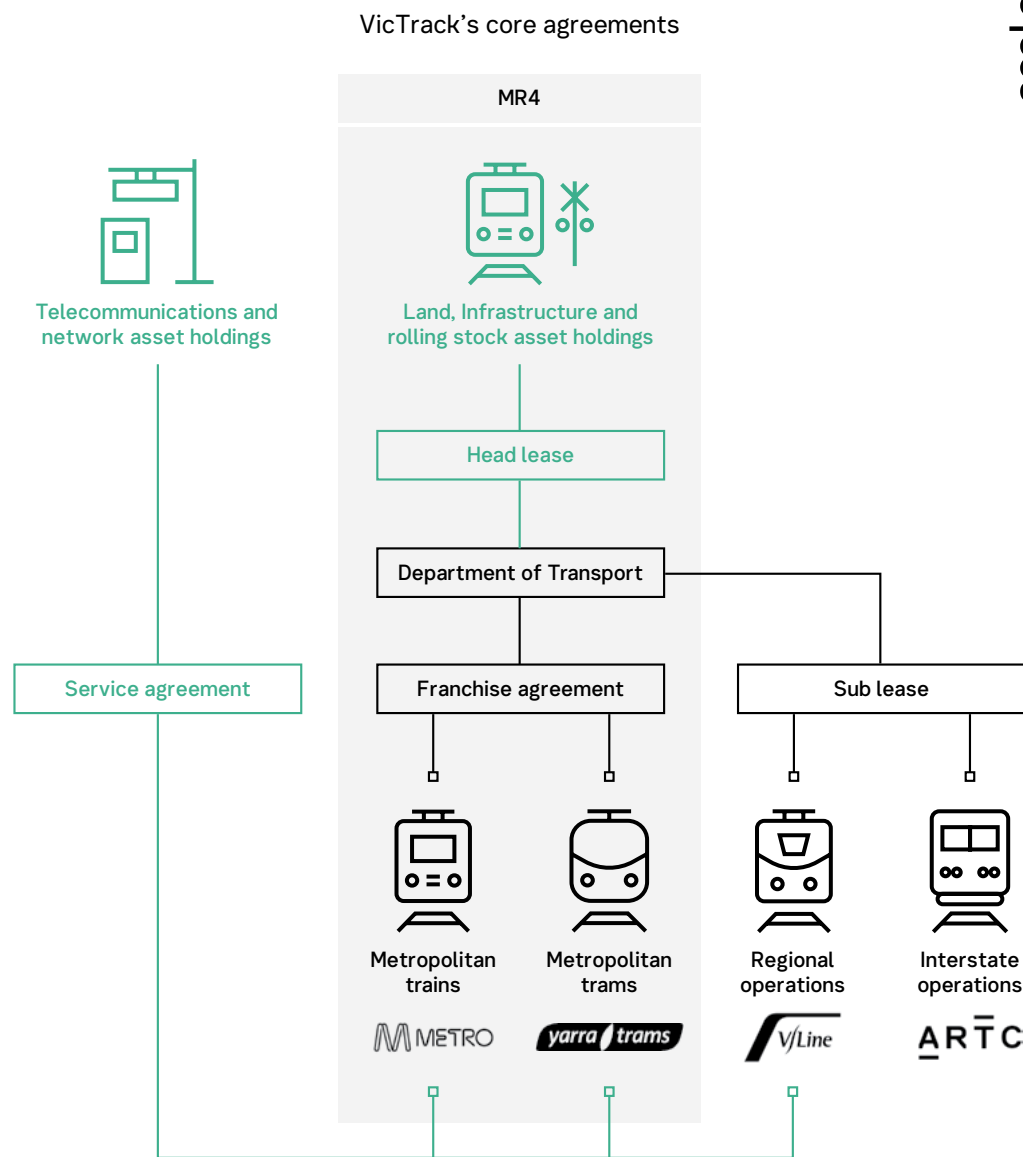


Figure 1 – VicTrack's core agreements

Project relevant standard baselines and exemptions:

- For RPV and LXP, standards baselines and exemptions are documented on the respective project space (note: relevant permissions are required to access [LXP eHub](#) and [RPV/MTM Engineering Collaboration Space](#))
- Relevant documentation for each project is to be referred to as part of product/material selection to confirm approvals.

Safety and environmental management:

- Materials and products must meet the standards and specifications prescribed by the relevant authority/operator and be approved for use
- All activities involving recycled materials (i.e. sourcing, transporting, processing and placing) must meet the relevant statutory and regulatory requirements
- The environmental management requirements of each RTO must be met, as identified in *Table 1*
- Compliance with [EPA requirements](#).

Table 1 – Environment and Sustainability requirements

Infrastructure Manager	Environmental requirement
VicTrack	VT-PO.167: Environmental Sustainability Policy PR-GL 003 - Environmental Management Plan – When Working on VicTrack Land PR-GL 004 - VicTrack Soil Reuse Guideline
MTM	Metro Environment & Sustainability Policy LO-SQE-PRO-014 – Safety and Environmental Requirements for Contractors and Third Parties
V/Line	SAPO-3: Environment (Policy) SAPR-67: Environmental Management of Hazardous or Prescribed Waste SAPR-68: Environmental Management of Earthworks and Soil Disturbance SAPR-9: Safety, Security, Health & Environment Risk Management Process
ARTC	Environmental Policy Inland Rail Environment and Sustainability Policy Inland Rail Sustainable Procurement Policy RSK-PR-001 - Risk Management
Yarra Trams	PA-015-PO-0001: Sustainability and Environment Policy

Note: Links to V/Line’s standards and type approved product list require access to Extranet.

Whole-of-Life (WoL) carbon emissions:

- Traditional quarried materials often have a large embedded carbon cost from production, to construction and to final recycling/disposal
- Use of recycled materials to replace or supplement traditional quarried materials may reduce WoL carbon emissions, but consideration should be given to all transportation/processing/recycling requirements (e.g. collection, cleaning, processing and delivery)
- Materials and products sourced locally to a project site can provide benefits to WoL carbon emissions through a reduction in transport carbon emissions
- End of life material recyclability should be considered in the context of WoL assessments.

Sourcing/Supply:

- Selection and use of recycled materials must consider the source/supply availability of such materials.
- Reuse of on-site materials and the adoption of recycled products can

benefit project sites. This includes by reducing transportation requirements and increasing flexibility during construction (e.g. composite sleepers may be cut to suit onsite, resulting in increased opportunity for bulk product purchase for manipulation as required by each specific project, which can reduce typically long lead times)

- Sourcing restrictions may be due to project location (high cost of material transport) and/or market availability;
 - Existing markets (e.g. crushed concrete) are readily available and commonly used to supplement/complement traditional quarried materials in road pavement construction
 - Emerging markets (e.g. reclaimed ballast, recycled plastics) are less developed. This is due to a lack of data leading to uncertainty around their impact on the environment, health and safety, asset performance and their reuse as part of a circular economy; and/or a lack of consistent and reliable material supply. Refer to *Section 7* for more information on these areas

– RTO approved products for track structures and components are commonly supplied from overseas, such as China, Germany, Austria and UK. This reference guide focuses on what is accepted in current standards and approved products records at the time of publishing. Further assessment should be made on WoL considerations and opportunities to introduce locally supplied products that utilise Victorian waste streams.

Waste management hierarchy:

- Ideally, production of waste from rail infrastructure projects should be avoided; however, this is often not practical. In cases where avoiding waste material generation is not feasible, it is important to minimise waste production, and reuse or recycle valuable construction resources wherever possible
- This document provides support for addressing the 'reuse' and 'recycle' steps of the Waste Management Hierarchy *Figure 2* (shown right).





Figure 2 – Waste Hierarchy (EPA Victoria, 2019)



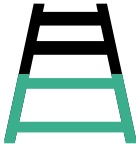



3.1 Recycled Material Sources and Usage

Table 2 provides a summary of the current and emerging recycled material sources and their current areas of use. Refer to the road guide for further detail of road-related material applications.

Table 2 – Recycled material sources and general applications for use

Recycled Material	Sources	Processing	General Applications
 <p>Concrete</p>	<ul style="list-style-type: none"> Demolition works Returned loads Other infrastructure construction activities 	<ul style="list-style-type: none"> Removal of contaminants, followed by crushing and screening 	<ul style="list-style-type: none"> Maintenance access (unbound granular) pavements as crushed rock replacement.
 <p>Glass</p>	<ul style="list-style-type: none"> Container glass cullet 	<ul style="list-style-type: none"> Removal of contaminants, followed by crushing to required grade (e.g. glass fines) 	<ul style="list-style-type: none"> Recycled Glass Sand (RGS) approved for use as bedding and embedment material for drainage piping and Combined Service Route (CSR) EPA fact sheet: Use of glass fines
 <p>RAP</p>	<ul style="list-style-type: none"> Removal of asphalt from existing road pavement 	<ul style="list-style-type: none"> Crushing and screening 	<ul style="list-style-type: none"> Driver and maintenance walkways Access roads Approaches to RRV pads Facilities/depots walkways and pavements
 <p>Supplementary Cementitious Material (SCM)</p>	<ul style="list-style-type: none"> Waste by-products including Fly Ash, Ground granulated blast-furnace slag (GGBFS), Amorphous Silica 	<ul style="list-style-type: none"> Treated to comply with AS/NZS 3582.1, AS/NZS 3582.2 and AS/NZS 3582.3, respectively 	<ul style="list-style-type: none"> Used to replace a proportion of the cement in Portland cement Additive to concrete rail sleeper mixes, subject to type approval procedure

Recycled material	Sources	Processing	General applications
<p>Steel Furnace Slag (aggregate)</p> 	<ul style="list-style-type: none"> By-product of steelmaking – either basic oxygen steel (BOS) slag, or electric arc furnace (EAF) slag 	<ul style="list-style-type: none"> Slag can be produced from either the refining of pig-iron in an oxygen converter or, by melting scrap steel 	<ul style="list-style-type: none"> Drainage blanket Capping layer
<p>Steel</p> 	<ul style="list-style-type: none"> Reclaimed (scrap) steel 	<ul style="list-style-type: none"> Melted in an electric arc furnace (EAF) and cast into sections for rolling into products 	<ul style="list-style-type: none"> Structural steel Reinforcing bars Steel mesh Steel rod Wire
<p>Ballast (Emerging*)</p> 	<ul style="list-style-type: none"> Reused from existing/modified track formation 	<ul style="list-style-type: none"> Remove fines to the extent practical and dispose offsite. If any fines/soil within ballast material, sample to determine if suitable for reuse (including leachability testing) 	<ul style="list-style-type: none"> Reuse in track (temporary and permanent condition currently in trial) Placed as drainage blanket in track formation Maintenance access unbound granular pavements
<p>Plastic (Emerging*)</p> 	<ul style="list-style-type: none"> Commercial, industrial and municipal waste 	<ul style="list-style-type: none"> Sorted into plastic types/categories Shredded and granulated Cleaned/washed Dried, decontaminated and pelletised. Reprocessed/reformed into recycled products 	<ul style="list-style-type: none"> Composite rail sleepers Drainage pipes/pits Service conduits/pits Geosynthetics Fencing Level Crossing Panels Road-Rail Vehicle (RRV) access pads Miscellaneous (signage/sealants etc)

Several trials incorporating recycled plastics in composite sleepers have commenced under provisional type approval

* Emerging materials refers to those in development, which may or may not have been approved for use. For additional information, refer to Section 7 on Emerging materials.



4. Specified Material Applications

This section provides an overview of reuse and recycled material applications currently allowable within RTO standards and specification.

A list of tables is provided on the following page to help navigate the material applications and the associated document, links to documents are provided in *Appendix A1-A5*.

Table 3 provides a quick reference table that outline the areas of opportunity for component reuse and adoption of recycled materials. In some instances, recycled materials may only be used as supplementary materials, or in specific areas of use.

Table 3 – Material applications reference table

Topic	Sub-section	Reference
Reuse applications	Heavy rail (MTM, V/Line, ARTC)	Table 4
	Light rail (Yarra Trams)	Table 6
Recycled material applications	Track	Table 5a
	Sleepers and components	Table 5b
	Track formation	Table 5c
	Geocomposites, textiles, geogrids and ballast mats	Table 5d
	Subsurface drainage	Table 5e
	Combined Services Route (CSR)	Table 5f
	Utility protection	Table 5g
	Fencing	Table 5h
	Level crossings	Table 5i
	Miscellaneous	Table 5j
	<ul style="list-style-type: none"> ▪ Tactile ground surface indicators (TGSIs) & raised pavement markers (RPMs) ▪ Platform gap fillers ▪ Signage ▪ Sealants ▪ Walkway gratings ▪ End of track protection 	
	Other infrastructure	Table 5k
	<ul style="list-style-type: none"> ▪ Structures ▪ Pavements – formation ▪ SUP, footpaths, edgings etc ▪ Pavement (asphalt and spray seals) 	
Light rail (Yarra Trams)	Table 7	
Tourist and Heritage Rail		Section 7.2

4.1 Definitions and abbreviations

For the purpose of the following tables, reuse and recycled material are defined as:

- **Reuse:** The non-destructive collection of goods for use within the rail network in its primary or secondary forms, such as:
 - Serviceable asset: An asset with remaining useful life that may be economically redeployed on the public transport network or transferred to an approved third party
 - Site-won materials: Re-processed and placed within the network
- **Recycled material:** Waste materials that are processed to meet the performance requirements of standards to form new products or materials suitable for use
- **Abbreviations:** CC = Crushed Concrete, CR = Crumb Rubber, SCM = Supplementary Cementitious Material
- **Slag:** Shortened version of slag aggregate (separate to GGBFS as an SCM, refer [Table 2](#))
- For descriptions of various material categories, as referenced in these guidelines, refer to [Appendix B Table B.1 - Material Descriptions](#).

4.2 Allowable limits

Allowable limits for recycled materials within their respective application are not commonly expressed within the current RTO standards and specifications. Product material composition is subject to the relevant Australian standards (as directed by the RTO standards or procedures) and approvals.

In cases where Australian standards do not identify requirements (e.g. with emerging materials), the assessment and testing of a recycled/reused product may be managed through wider industry accepted references, however, would be subject to relevant approvals.

If the material composition of a product has been adjusted (i.e. to increase the percentage of recycled content), then it will be subject to re-approval prior to acceptance and use on the network.

Where applicable, indicative allowable limits of recycled materials are noted. Recycled content should be confirmed with the product supplier or manufacturer, as limits may vary due to supply and performance requirements

4.2.1 Recycled content in steel

Steel is typically manufactured using a combination of virgin and scrap (recycled) steel. The two primary methods are integrated Blast Furnace (BF) / Basic Oxygen Steelmaking (BOS) and Electric Arc Furnace (EAF). EAF primarily uses scrap steel.

It is to be noted that both types of steelmaking are complementary processes, with neither one considered superior to the other, as scrap steel EAF steelmaking cannot be produced without scrap steel created via the integrated steel manufacturing process.

Typically, 10–15% of post-consumer steel is recycled through the BF process, whereas the EAF process using scrap steel uses a much higher content (e.g. 70% recycled steel to manufacture reinforcing steel). Waste reduction can be achieved through early involvement with projects, minimising material use and the need for onsite cutting or modifications.

4.3 Limitations

- The standards and specifications identified may not preclude the use of recycled materials, however adoption of any recycled materials/products would be subject to approvals
- All reuse applications are subject to compliance with relevant RTO standards & specifications and typically include requirements for condition assessment and approval
- Products documented on the RTO Type Approved registers have been used to validate allowable areas of recycled materials in *Table 5a-k*. This validation is only relevant at the time of writing this guide
- The uses identified in the tables relate to applications within the rail corridor only (refer to the Ancillary guide for other non-service and safety critical opportunities)
- NATA accredited independent testing and verification is required for all products and materials being used within the rail corridor. Quality assurance shall be ensured by the product supplier and evidence submitted to RTO's as standards require
- Products shall be manufactured under a third-party certified Quality Assurance System.

4.4 Serviceable assets reuse procedures

VicTrack and DoT Transport Services have responsibilities for the disposal of rail infrastructure assets and Operations and Control Management Systems (OCMS) under their control. As such, both VicTrack and DoT have developed a procedure and strategy respectively to optimise the reuse of serviceable assets within the rail network.

Thereby, limiting the disposal of assets with remaining useful life and supporting compliance with relevant policies and agreements. To maximise the effectiveness of these procedures, it requires early identification of surplus materials (from source projects) and alignment with all stakeholders, including projects, RTOs and approving and regulating bodies.

VicTrack and DoT Transport Services procedures are outlined below to support their implementation.

4.4.1 VicTrack surplus materials hierarchy for disposal

The VicTrack Disposal of Assets Procedure (VT-SP-143), should be used for assets owned and controlled by VicTrack. The surplus materials hierarchy for disposal outlined in *Figure 3* compliments VT-SP-143 by providing guidance on the key steps and expected timeframes to implement the disposal of assets procedure.

This hierarchy applies to any track materials which are removed as part of projects and cannot be reused on-site. The hierarchy's intent is to:

- Give all sectors within the rail industry an opportunity for reuse, as well as clarity on the priority and order in which these materials are made available
- Provide clarity on the process to be followed and define timelines to ensure reasonable progression of process
- Minimise the amount of waste produced by projects
- Provide clarity on asset ownership and expectations on all parties.

Figure 3 – VicTrack Surplus Material Hierarchy for Disposal

Step 1: Identification	At the project’s commencement, project team to identify what materials will be left over at its completion. A table with estimated quantities of each material is to be provided by the project to VicTrack (Asset Engineering Manager)	At earliest possible stage
Step 2: Materials offered to applicable RTO	Surplus materials offered to applicable Rail Operator (from the asset the material comes from). Given four weeks to respond before offer is progressed	4 weeks to respond
Step 3: Materials offered to other RTOs	Surplus materials offered to other applicable Rail Operators. Given four weeks to respond before offer is progressed	4 weeks to respond
Step 4: Materials offered to VicTrack Freight	Surplus materials offered to VicTrack Freight via VicTrack’s Asset Engineering Manager. Given four weeks to respond before offer is progressed	4 weeks to respond
Step 5: Materials offered to Tourist and Heritage Sector	Surplus materials offered to sector via VicTrack’s Tourist and Heritage Registrar. Given four weeks to respond before project progresses	4 weeks to respond
Step 6: Scrapping unwanted rail/track jewellery	VicTrack (Asset Engineering Manager) is to be advised if surplus materials remain after Step 2–5. VicTrack then advises the project what they can do with the materials.	Possible outcomes: <ul style="list-style-type: none"> ▪ Old unusable rail and track jewellery – VicTrack scrap merchant to liaise with project to collect materials. VicTrack, scrap merchant and project to collaborate to coordinate removal/logistics etc. Projects must not directly scrap materials ▪ Old concrete/timber sleepers – disposed of by project in accordance with regulations. Not to be publicly offered ▪ Old unwanted Ballast/soil – disposed of by project in accordance with regulations
Step 7: Disposal of unwanted materials	Materials are VicTrack-owned assets and process must be closely followed	

Notes:

1. Evidence required to demonstrate hierarchy has been followed appropriately.
2. Projects may need to facilitate site visits with relevant parties to establish suitability of materials for reuse.
3. Parties get one opportunity to make a claim for specific materials.

4.4.2 Transport Services – Rail Asset Disposal Strategy

In June 2020, DoT Transport Services endorsed the use of a Rail Asset Disposal Strategy, which aims to provide direction to Transport Services staff, stakeholders and RTOs regarding the disposal of rail infrastructure and OCMS assets that are owned by the State. The process was formerly managed using a combination of the VicTrack procedure and RTO practice notes. The strategy provides guidance in relation to the existing franchise agreements and rail infrastructure lease in six key stages outlined in *Figure 4*.

For further details on approach refer to the original strategy, agreements and relevant RTO procedures.

Figure 4 – Transport Services – Rail Asset Disposal Strategy

1 Determine asset ownership	Required to determine relevant disposal procedure and identify relevant commercial arrangements
2 Determine if approval of asset disposal is required (by Transport Services)	Business as Usual (BAU) Asset Disposal
	Non-BAU Asset Disposal
	Protected Categories of Assets: <ul style="list-style-type: none"> ▪ Primary Assets – An asset that is essential to the operation of all or any part of a franchise business ▪ Serviceable Assets – asset with remaining useful life that may be economically redeployed on the public transport network or transferred to an approved third party ▪ Salvageable Asset – A life expired asset that may generate a financial benefit for the state when disposed.
3 Asset disposal notification form	Form aims to facilitate the maintenance of Transport Services databases and record systems, and to inform Transport Services of what asset(s) are being disposed of associated reason
4 Asset disposal approval plan	Purpose of the plan is to facilitate both the technical and financial approval for the disposal of the asset
5 Management of change	Update of Transport Services asset register, databases and record systems to reflect the changes to the assets
6 Asset disposal methodology – listed in order of precedence	<ul style="list-style-type: none"> ▪ Appendix 1 – Protected Asset Categories ▪ Appendix 2 – Infrastructure and OCMS, Asset Disposal Process ▪ EPA – Waste Management Hierarchy.
	Other disposal considerations

Note: Strategy may vary slightly depending on asset type (i.e. infrastructure, OCMS and rolling stock spares)

4.5 Applications for Reuse

Refer to *Table 4* for material type / product that existing RTO standard and specifications allow for reuse in its primary form. Potential secondary reuse applications are encouraged to be investigated in conjunction with RTOs approvals processes. The tables also note other reuse activities that do occur but aren't currently documented in existing standards and specifications. Application of these are based on relevant compliance and approvals being obtained.

Reuse should consistently keep products, components, and materials at their highest utility and value. This can commonly be achieved through reuse in their original (primary) intended application (i.e. avoid 'downcycling'). This should be considered in a WoL context and infrastructure design life requirements.

Refer to *Table 6* for reuse in light rail (tram) track infrastructure applications.

Table 4 - Reusable material types/products within existing standards and specifications

Material application	Material type / product	Standards and specifications allowing for reuse in primary form			Supplementary notes
		MTM	V/Line	ARTC	
Track	Rails	<input checked="" type="checkbox"/> L1-CHE-STD-001 MTMI 3.30 – All chapters	<input checked="" type="checkbox"/> NIST-2650	<input checked="" type="checkbox"/> Section 1 (CoP)	<ul style="list-style-type: none"> Partially worn rail may be considered for reuse Caution required for close inspection of elements each time they are removed from the track and prior to re-use Consideration is also required for appropriate material handling and storage Subject to approval by MTM: <ul style="list-style-type: none"> Reuse of rail as guard rails (L1-CHE-INS-060): Serviceable 53 kg/m or 60kg/m rail may be used within stabling sidings Reuse of rails for replacement of rail defects (refer note 1 for requirements) Released rail used for mainline use as closure rails for welding (provided it has been ultrasonically tested and is clear of defects)
	Turnouts and special trackwork (incl. bearers)	<input checked="" type="checkbox"/> L1-CHE-SPE-230	<input checked="" type="checkbox"/> NIST-2651 NIST-2660	<input checked="" type="checkbox"/> Section 3 (CoP) ETC-03-01	<ul style="list-style-type: none"> V/Line permits the reuse of existing turnouts where serviceable life remains (or refurbished) and the reuse of rail to manufacture turnouts providing the rail profile meets requirements of the design specification ARTC permit the relocation of existing turnouts, where serviceable life remains MTM require all materials to be new, unless otherwise specified or approved
Sleepers and components	Timber	<input checked="" type="checkbox"/> L1-CHE-STD-001	<input checked="" type="checkbox"/> NIST-2651	<input checked="" type="checkbox"/> Section 2 (CoP)	<ul style="list-style-type: none"> Reuse of sleepers and components typically relates to cyclic or routine maintenance activities, not new construction activities
	Concrete	<input checked="" type="checkbox"/> L1-CHE-STD-001 L1-CHE-SPE-316	<input checked="" type="checkbox"/> NIST-2651	<input checked="" type="checkbox"/> Section 2 (CoP)	<ul style="list-style-type: none"> Condition assessment is required to confirm serviceability of sleepers and components Although not documented in standard, MTM may permit the reuse of timber sleepers within sections of track adjacent to works where timber exists. The timber must be inspected by MTM and accepted as acceptable within the area
	Steel	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> NIST-2651	<input checked="" type="checkbox"/> Section 2 (CoP)	<ul style="list-style-type: none"> Subject to acceptance by MTM, serviceable sleepers which are not suitable for mainline services may be used within stabling Sidings
	Anchors, dogspikes, sleeper plates and resilient rail fastening assemblies	<input checked="" type="checkbox"/> MTMI 3.30 Chapters 1-6, 7, 8 L1-CHE-SPE-315	<input checked="" type="checkbox"/> NIST-2651	<input checked="" type="checkbox"/> Section 2 (CoP)	<ul style="list-style-type: none"> Steel sleepers are not approved on the MTM network, with the exception of steel hollow bearers for cable management (refer to Approved Products Register) MTMI documents not currently publicly available

Material application	Material type / product	Standards and specifications allowing for reuse in primary form			Supplementary notes
		MTM	V/Line	ARTC	
Track formation	Ballast [2]	<input checked="" type="checkbox"/> MTMI 3.30 Chapters 1-6, 12	<input checked="" type="checkbox"/> NIST-2654	<input checked="" type="checkbox"/> ETG-04-01	<ul style="list-style-type: none"> ▪ Opportunity for reuse of ballast subject to approved placement locations and appropriate proof of performance, durability and residual life ▪ Reclaim and reuse of ballast is an emerging market within main line operations and has typically only been adopted in low-risk environments (refer note 2) ▪ Ballast reuse accepted during certain maintenance activities (e.g. resleepering) subject to removing fouled ballast and appropriate material handling and storage (to avoid fouling) ▪ ARTC and V/Line provide ballast reuse requirements for maintenance and construction activities Refer to <i>Section 7</i> Emerging Materials for further details
	Fill material [3]	<input checked="" type="checkbox"/> L1-CHE-STD-029 L1-CHE-SPE-178	<input checked="" type="checkbox"/> NIST-2659 SAPR-68	<input checked="" type="checkbox"/> ETC-08-02 ETC-08-03 ETC-08-04	<ul style="list-style-type: none"> ▪ Subject to compliance with VicTrack’s Soil Reuse Guideline (PR-GL 004) and relevant endorsement ▪ Subject to compliance with relevant EPA guidance ▪ Redundant material from a previous track formation may be re-used as general fill material providing the material meets the relevant performance requirements ▪ Fill materials classed as ‘unsuitable’ could be used provided that appropriate treatment is undertaken and the materials are re-classified as suitable
CSR	Conduits and equipment	<input checked="" type="checkbox"/> L1-CHE-STD-043 L1-CHE-SPE-070	<input checked="" type="checkbox"/> NIST-012.2	None identified	<ul style="list-style-type: none"> ▪ Existing VicTrack infrastructure may be permitted as approved, where it is suitable for the intended use and conforms to specifications. Reference to be made to relevant VicTrack standards, including TS-SP 013 and TS-ST 043 ▪ No existing cabling or equipment shall be re-used unless approved by the Infrastructure Manager as per V/Line standards ▪ Existing in service asbestos type pits, trunking and associated enclosures shall not be utilised for new works as per MTM standards

Notes:

1. MTM conditions for reuse of rails for replacement of rail defects are outlined below and shall be in accordance with the MTMI Welded Track Management Manual, including:
 - a) The serviceable rail must be ultrasonically tested to ensure no rail defects exist in the rail
 - b) Where serviceable rail is proposed to be used, the details of use shall be included within the “Permit to Disturb Track Form” for acceptance by MTM
 - c) The serviceable rail may only be of the same or greater profile to the section being replaced
2. Although not documented in standards, MTM have approved ballast reuse in low risk sites. A waiver may be required for approval and is subject to any site-specific controls that may be required. Example sites include: Kananook sidings and as a partial fill material in the approach embankments for the Bell to Moreland viaduct structure.
3. Appendix A of VicTrack’s Soil Reuse Guideline (PR-GL 004) describes the process for soil reuse on VicTrack assets and the relevant stages where VicTrack require consultation.

4.6 Allowable areas of application for recycled materials

Refer to tables below for material type/products with the potential for recycled material applications.

The tables also note other recycling activities that do occur but aren't currently documented in existing standards and specifications. Application of these are based on relevant compliance and approvals being obtained.

Table 5a – Allowable areas of application for recycled materials – Track

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications			
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC	
Track	Rails	Yes	✓	✗	✗	✗	✗	✗	✗	✗	✗	L1-CHE-INS-060 MTMI 3.30 Chapters 1-16	NIST-2650 NIST-2703 NIST-2704	Section 1 (CoP)
	Turnouts and special trackwork (incl. bearers) [2]	Yes	✓	✗	✗	✗	✗	✓	✓	✗	L1-CHE-SPE-230 [1]	NIST-2651 NIST-2660	Section 3 (CoP) ETC-03-01 ETG-02-01	
	Rail seal	Yes	✗	✗	✗	✓	✗	✗	✗	✗	✗	None identified	None identified	None identified

Notes:

1. Recycled Composite bearers may be type approved if they meet the requirements of Part 5 - Chapter 30 of the 2010 AREMA Manual for Railway Engineering as a replacement for timber bearers (refer to L1-CHE-SPE-230 Cl. 8.5.5).
2. Refer to Section 8.3.1 for details on composite bearers.

Table 5b – Allowable areas of application for recycled materials – Sleepers & Components

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications			
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC	
Sleepers and components	Timber [1]	Yes	✘	✘	✘	✘	✘	✘	✘	✘	✘	None identified	NIST-2651	Section 2 (CoP) ETA-02-01 ETG-02-01
	Concrete [1,2]	Yes	✘	✘	✘	✘	✘	✔	✘	✘	L1-CHE-SPE-316	NIST-2651	Section 2 (CoP) ETD-02-05	
	Steel [1]	Yes	✔	✘	✘	✘	✘	✘	✘	✘	None identified	NIST-2651	Section 2 (CoP) ETC-02-03	
	Composite	Yes	✘	✘	✘	✘	✘	✘	✔ [3]	✘	Refer to Section 8.3.1 for further details and to the respective RTO's type approval registers for currently approved products			
	Anchors, dogspikes, sleeper plates and resilient rail fastening assemblies	Yes	✔	✘	✘	✘	✘	✘	✘	✘	L1-CHE-SPE-230 L1-CHE-SPE-315	NIST-2651 (CI 8.3)	Section 2 (CoP)	

Notes:

1. Serviceability requirements for sleepers shall be followed for respective RTO Standards and Specification.
2. Concrete sleepers may contain approximately 25% fly ash in concrete mix. Limits vary with product/concrete supply. Recycled steel is not used in pre-stressing of concrete sleepers.
3. Composite sleepers may contain 80-85% post-consumer recycled plastics. Confirm actual recycled content with product manufacturer.

Table 5c – Allowable areas of application for recycled materials – Track formation

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications		
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC
Track formation	Ballast	N/A	Refer to reuse Table 4								L1-CH-SPE-064	NIST-2654	Section 4 (CoP) ETA-04-01 ETG-04-01
	Drainage blanket (excl. geo-synthetic) [1]	N/A	☒	☒	☒	☒	☑	☒	☒	☑	L1-CHE-STD-029 L1-CHE-STD-030	NIST-2659	ETC-08-02 ETC-08-03
	Capping layer [2]	N/A	☒	☒	☒	☒	☑	☒	☒	☒	L1-CHE-STD-029 L1-CHE-SPE-178	NIST-2659	ETC-08-02 ETC-08-03
	Structural fill [3]	N/A	☒	☒	☒	☒	☒	☒	☒	[4]	L1-CHE-STD-029 L1-CHE-SPE-178	NIST-2659	ETC-08-02 ETC-08-03 ETC-08-04
	General fill [3]	N/A	☒	☒	☒	☒	☒	☒	☒	☒	☑ [4]	L1-CHE-STD-029 L1-CHE-SPE-178	NIST-2659

Notes:

1. RTO standards and specifications do not specifically identify ballast use as drainage blanket, however, may be useable if blended with appropriate materials to comply with specification requirements.
2. Capping layer material can be a blended product. The combined material shall satisfy the requirements of relevant specifications. Application of recycled materials as capping, such as crushed concrete, glass fines, recycled brick and recycled plastic is an emerging market, refer to Section 7.
3. Site won material is typically reused within the rail corridor following assessment of contamination, blending and material compliance testing and approvals. Refer to reuse Table 4.
4. Refer to Table 4 for relevant requirements for the reuse of ballast as partial fill.

Table 5d – Allowable areas of application for recycled materials – Geocomposites, textiles, geogrids and ballast mats

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications			
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC	
Geo-composites, textiles, geogrids and ballast mats	Geosynthetics	Yes	☒	☒	☒	☒	☒	☒	☒	☑	☒	L1-CHE-STD-029 L1-CHE-STD-030 L1-CHE-SPE-178	NIST-2659 NIST-2616	ETC-08-02 ETC-08-03 ETC-08-04 Section 9 (CoP)

Notes:

1. All track geocomposites (including ballast mats) used in track formation require type approval. Type approvals may not be required outside of track formation.
2. Drainage geocomposites do not typically require type approval.
3. Geotextiles can be manufactured with 100% post-consumer recycled plastics. Confirm actual recycled content with product manufacturer.

Table 5e – Allowable areas of application for recycled materials – Subsurface Drainage

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications		
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC
Subsurface drainage	Drainage pipes and headwalls	Yes	✗	✗	✓	✗	✗	✓ [3]	✓ [2]	✗	L1-CHE-STD-029 L1-CHE-STD-030	NIST-2659 NIST-2616	None identified
	Granular fill materials (pipe bedding) [1]	No	✗	✗	✓	✗	✗	✗	✗	✗	L1-CHE-SPE-313 L1-CHE-STD-030	NIST-2659	None identified
	Pits, lids, grates and ballast cages	Yes	✓	✗	✓	✗	✗	✓ [3]	✓ [2]	✗	L1-CHE-STD-029 L1-CHE-STD-030	NIST-2659 NIST-2616	None identified

Notes:

1. Recycled glass sand for use as pipe bedding:
 - a) Material certification required prior to use.
 - b) MTM approved Specification: L1-CHE-SPE-313 – MTM Recycled Glass Specification.
 - c) V/Line adopted current status as per: RPV. (2018). Recycled Glass Sand – Compatibility Review for Application in V/Line Infrastructure Lease.
 - d) ARTC adoption to be further investigated following recent adoption from other RTOs.
2. Plastic drainage pits and pipes can contain high percentages of post-consumer recycled plastics (up to 100% depending on product and application). Confirm actual recycled content with product manufacturer and appropriate application with respect to pipe strength classification. 3. Concrete drainage pits and pipes can utilise up to 45% usage of SCM. Confirm actual recycled content with product manufacturer.

Table 5f – Allowable areas of application for recycled materials – Combined Services Route

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications			
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC	
Combined Services Route (CSR)	Ground level troughing [1]	Yes	✓	✗	✗	✗	✗	✗	✗	✓	✗	L1-CHE-STD-043 L1-CHE-SPE-070	NIST-012.2	None identified
	Conduits (below ground) [2]	No	✓	✗	✗	✗	✗	✗	✗	✓	✗	L1-CHE-STD-043 L1-CHE-SPE-070	NIST-012.2	ETG-17-01
	Granular fill materials (pipe bedding) [3]	No	✗	✗	✓	✗	✗	✗	✗	✗	✗	L1-CHE-SPE-313 L1-CHE-STD-043 (Cl. 6.15)	None identified	None identified
	Pits and lids [2,4]	Yes	✓	✗	✗	✗	✗	✗	✓	✓	✗	L1-CHE-STD-043 L1-CHE-SPE-070	NIST-012.2	ETG-17-01
	Other (clips, hollow sleepers, cable trays, protection tamps) [5]	Yes	✓	✗	✗	✗	✗	✗	✗	✓	✗	L1-CHE-STD-043 L1-CHE-SPE-070	NIST-012.2	None identified

- Notes:
1. Ground Level Troughing (GLTs) are typically plastic systems used for temporary utility diversions.
 2. Underground utility services and pipelines within railway boundaries require approval and are to comply with AS4799 - Installation of underground utility services and pipelines within railway boundaries.
 3. RPV. (2018). Recycled Glass Sand for use as pipe bedding:
 - a) Material certification required prior to use.
 - b) MTM approved Specification: L1-CHE-SPE-313 - MTM Recycled Glass Specification.
 - c) V/Line adopted current status as per: Recycled Glass Sand – Compatibility Review for Application in V/Line Infrastructure Lease.
 - d) ARTC adoption to be further investigated following recent adoption from other RTOs.
 4. Pits may be proprietary products or concrete cast in situ.
 5. A variety of CSR ancillary items have Type Approval for use within the railway corridor. Refer to the relevant Type Approval register for products.
 6. Reference to be made to relevant VicTrack standards, including TS-SP 013 and TS-ST 043.

Table 5g – Allowable areas of application for recycled materials – Utility protection

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications		
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC
Utility protection		No	✓	✗	✗	✗	✗	✓	✗	✗	L1-CHE-STD-030 L1-CHE-STD-043 L1-CHE-SPE-070	NIST-012.2	ETG-17-01

Notes:
 1. Applications include: Reinforced concrete protection slabs, concrete pipe encasement and sleeving of utilities.
 2. Other pipe materials not specifically addressed in relevant standards and specifications are subject to the approval of the RTO.

Table 5h – Allowable areas of application for recycled materials – Fencing

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications			
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC	
Fencing	Line side fencing and gates [1,2]	No	✓	✗	✗	✗	✗	✗	✗	✓	✗	<u>L1-CHE-STD-005</u>	<u>NIST-2662</u>	N/A to Victoria
	Train gates [3]	Yes	✓	✗	✗	✗	✗	✗	✓	✓	✗	Automatic Stabling Train Gate (ASTG) Specification and Requirements For Metropolitan Train Stabling	<u>NIST-004.13</u>	None identified
	Handrails [4]	Yes	✓	✗	✗	✗	✗	✗	✗	✓	✗	<u>L1-CHE-STD-040</u> <u>L1-CHE-STD-029</u>	<u>NIST-2662</u> <u>NIST-002.1</u>	<u>Section 9 (CoP)</u>
	Temporary safety fencing [5]	Yes	✓	✗	✗	✗	✗	✗	✗	✓	✗	<u>L1-CHE-INS-060</u>	None identified	None identified
	Foundations [6]	No	✓	✗	✓	✗	✗	✗	✓	✗	✗	<u>L1-CHE-STD-005</u>	<u>NIST-2662</u> <u>NIST-004.13</u>	N/A to Victoria

Notes:

1. Applications include: All line side fencing, such as, boundary, sidings, facilities/security.
2. RTO Standards and Standard Drawings are to be referred to for typical fencing types.
3. MTM Type Approved product has grandfather rights for the Automatic Stabling Train Gates (ASTG).
4. Applications include: Driver walkways, maintenance walkways, delineation and station/platform handrails.
5. Application to works adjacent / inside the rail track.
6. Applications include: concrete foundations and star pickets.

Table 5i – Allowable areas of application for recycled materials – Level Crossings

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications			
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC	
Level crossings	Pedestrian maze gates and crossings [1,2]	Yes	✓	✗	✗	✓	✗	✓	✗	✗	✗	L1-CHE-STD-034 Reference also to be made to relevant VicTrack Standard Drawings	NIST-2687	ESC-03-01
	Boom barriers [3]	Yes	✓	✗	✓	✗	✗	✓	✓	✗	Refer to PTV Standard Drawings STD_G0011 to 021	NIST-2687 Refer to PTV Standard Drawings STD_G0011 to 021	ESC-03-01	
	Crossing panels and Road-Rail Vehicle (RRV) access pads [4]	Yes	✓	✗	✗	✓	✗	✓	✓	✗	L1-CHE-STD-039 Refer to PTV Standard Drawing STD_R0022	NIST-2687 Refer to PTV Standard Drawing STD_R0022	ETD-16-01	

Notes:

1. Elements include: Gates, fencing, foundations, pathway and signage.
2. Consideration for Type Approved removable panels for track crossings.
3. Elements considered include: Boom arms, mast poles, foundations, signage and associated fencing.
4. Consideration for Type Approved removable panels.

Table 5j – Allowable areas of application for recycled materials – Miscellaneous

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications		
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC
Miscellaneous	Tactile Ground Surface Indicators (TGSIs) and Raised Pavement Markers (RPMs) [1,2]	Yes	☒	☒	☒	☑	☒	☒	☑	☒	L1-CHE-STD-034 L1-CHE-STD-013	NIST-2687 NIST-002.1	ETD-16-01 ESC-03-01 ETG-16-01
	Platform gap fillers [3]	Yes	☒	☒	☒	☒	☒	☒	☑	☒	L1-CHE-INS-015	None identified	None identified
	Signage [4]	Yes	☑	☒	☒	☒	☒	☒	☑	☒	L1-CHE-STD-034 L1-CHE-STD-013	NIPR-2661 NIST-2687 NIST-002.1	ESC-03-01
	Sealants [5]	Yes	☒	☒	☒	☒	☒	☒	☑	☒	None identified	None identified	None identified
	Walkway gratings [6]	Yes	☑	☒	☒	☒	☒	☒	☑	☒	L1-CHE-STD-040	NIST-2616	Section 9 (CoP)
	End of track protection (including: buffer stop, arrester bed)	Yes [7]	☑	☒	☒	☒	☒	☒	☒	☑	L1-CHE-STD-032	NIST-004.13	ETH-00-01

Notes:

1. TGSIs shall be in a contrasting colour with a minimum Luminance Contrast complying with the Disability Standards for Accessible Public Transport.
2. RPMs as per AS1428 Design for Access and Mobility.
3. All materials must be non-conductive to protect against rail to earth potentials between trains and the platform structure.
4. Applications include: permanent and temporary signage, including monument boards, level crossing signage and any other signage that is rail safety or service critical.
5. Applications include: ballast bonding and track joint sealant.
6. Applications include: Walkways on structures and grating replacement walkways for poor condition footpaths.
7. Type Approval would not be expected for arrester bed materials, however would be required for buffer stops.

Table 5k – Allowable areas of application for recycled materials – Other infrastructure

Material application	Material type/product	Requirement for Type Approval	Allowable recycled material applications								Standards and specifications			
			Steel	CC	Glass fines	CR	Slag	SCM	Plastic	Ballast	MTM	V/Line	ARTC	
Structures	Cladding and barriers	Yes	✓	✗	✗	✗	✗	✗	✗	✓	✗	L1-CHE-STD-040	NIST-2616	Section 9 (CoP)
	Concrete [1]	Refer to roads guide												
Pavements – formation	Refer to roads guide											ENV-BUL-01-2020 Car Parks: L1-CHE-STD-059	NIST-2687	None identified
SUP, footpaths, edgings etc	Refer to roads guide											Footpaths in Stabling Facilities: L1-CHE-STD-001 Access Tracks and Formation: L1-CHE-STD-029 L1-CHE-SPE-178	NIST-004.13	None identified
Pavement (Asphalt and Spray Seals)	Refer to roads guide											ENV-BUL-01-2020 Car Parks: L1-CHE-STD-059	None identified	None identified

Notes:

1. Special requirements associated with Super-T structures, which do not permit the use of fly ash in structural concrete due to pre-stressing requirements should be considered.

5. Yarra Trams

Yarra Trams operate the Melbourne light rail network. Due to the nature of the light rail network, material applications include aspects of road, rail and ancillary infrastructure.

As such, this section identifies opportunities for reuse and relevant reference guide sections (along with relevant Yarra Trams standards) to aid in optimising use of recycled materials and in proprietary products.

This section only applies to tram infrastructure on the tram network. For tram stop platform applications, refer to the Ancillary guide.



5.1 Standards

The primary standards relevant to the tram network track infrastructure include:

- Yarra Trams standards:
 - CE-021-ST-0035 – Infrastructure - Tram Track Design
 - CE-021-ST-0012 – Infrastructure - Tram Stop Platform Design
- Standard Drawings:
 - Accessed via the [PTV Drawing Management System \(DMS\)](#)
 - Refer to tables in subsequent sections for relevant drawing numbers

The standard drawings noted in the following sections should be reviewed in combination with the Yarra Tram standards (as housed on the Yarra Trams standards website).

5.2 Reuse

Refer to *Table 6* for material types/products that can be reused in line with existing standards and specifications. Investigation in conjunction with relevant stakeholders into other potential secondary reuse applications is encouraged.

While a standard may not specifically identify reuse as part of the material application it may not preclude this activity and should therefore be investigated as an opportunity as part of works.

5.3 Opportunities for recycled materials

Refer to *Table 7* for guidance on material types/products that can potentially be recycled for use in tram track structures.

Table 6 – Reusable material types/products within existing standards and specifications

Material Application	Material Type/Product	Standard allowing for reuse in primary form	Supplementary Notes
Tram track	Rail anchors	STD_T9008	<ul style="list-style-type: none"> ▪ Serviceable rail anchors can be reused approximately 3 times ▪ New rail anchors can be reused approximately 6–10 times
	Concrete / bluestone block edging	STD_T9060	<ul style="list-style-type: none"> ▪ Use existing where possible

Table 7 – Allowable areas of application for recycled materials – Tram track

Application	Material type / product	Reference guides reference	Yarra Trams standard drawings	Notes
Track	Rails, tie bars	Table 5a	STD_T9010, STD_T9060, STD_T9002, STD_9003	<ul style="list-style-type: none"> Other elements include tie-bars (recycled steel opportunity)
Sleepers / bearers and components	Steel beams, concrete sleepers, clips, fastenings and fixings	Table 5b	STD_T9010, STD_T9060, STD_T9005	<ul style="list-style-type: none"> Other tram elements include foot insulator rubber rail pad and anchor blocks (recycled rubber opportunity)
	Bearer supports	N/A	STD_T9010	<ul style="list-style-type: none"> Concrete packing blocks & plastic wedges (SCMs and recycled plastic opportunity)
Track structure Type 1/2/3 (track slab)	Asphalt, pavements, prime, structural concrete, steel reinforcement, compacted rock	Roads guide	STD_T9010, STD_T9060	<ul style="list-style-type: none"> Concrete track slab / foundation (50Mpa strength tramway special) Steel reinforcement includes bars or fabric
Track structure Type 7A&B (transitions)	Ballast, Crushed rock, cement-treated crushed rock	Table 5c	STD_T9011, STD_T9012, STD_T9060	<ul style="list-style-type: none"> Track structure transitions (ballasted to track slab) Refer to 'Track structure – Type 1/2/3' for road pavement
Edging	Concrete / bluestone	Roads guide	STD_T9060	<ul style="list-style-type: none"> Glass fines as a replacement to natural sand
Drainage filter fabric / geotextile	Geosynthetics	Table 5d	STD_T9010, STD_T9060, STD_T9012, STD_T9020	<ul style="list-style-type: none"> Standard drawings specify proprietary products
Subsurface drainage	Drainage pipes, bedding material, pits/lids/grates	Table 5e	STD_T9010, STD_T9060, STD_T9012, STD_T9020	<ul style="list-style-type: none"> Recycled glass sand not currently adopted by Yarra Trams standards as replacement for sand (opportunity) For drainage bedding using crushed rock refer roads guide
CSR	Conduits, bedding material	Table 5f	STD_T9010, STD_T9060	<ul style="list-style-type: none"> Recycled glass sand not currently adopted by Yarra Trams standards as replacement for sand (opportunity)

Note: Standard drawings accessed via the PTV DMS



6. Type Approvals

Standards, specifications and products used within the rail industry are governed by relevant Rail Transport Operators (RTOs).

Each RTO has procedures to manage the approval of new products, equipment or systems, and to allow for departures from existing standards and specifications.

Understanding the Type Approval and Engineering Change processes can help to introduce new products with increased recycled content into the rail industry.

There are three key processes that are consistent across RTO's:

- **Type Approval:** Relates to 'qualifying' new/custom built Rolling Stock and Infrastructure operational assets
- **Engineering Change:** Applied to authorise the introduction/modification of an asset/asset system into the rail network
- **Waiver or Derogation:** Refers to a departure from an endorsed standard/procedure applicable to maintain, upgrade, renew, build and commission Rolling Stock and Infrastructure Operational Assets.

6.1 General Procedure for Type Approval

This section highlights the overarching RTO process for obtaining Type Approval for a new product/material. There are six stages to obtaining a product or equipment type approval, as shown in *Figure 5*.





6.1.1 General advice for obtaining approvals for new products/equipment

- Commence early due to the time-intensive nature of the process
- Check if the product or equipment is already approved by another RTO, this may be taken as a positive assessment of the system or equipment or evidence that the product or equipment meets performance requirements
- Identify if similar or equivalent products have been trialled and approved
- If provisional type approval is granted, it is likely that a trial period is required. A trial plan should be developed in collaboration with the RTO, that outlines anticipated timeframes, inspection and testing, performance measurement, reporting requirements and the exit strategy should the trial be unsuccessful.

Note: Existing approved products and components are typically specified in preference to non-stock componentry



Figure 5 – General Procedure for Type Approval from RTOs

	1 →	2 →	3 →	4 →	5 →	6
	Request for Type Approval (or new equipment system approval)	Initial assessment to determine Type Approval category and subsequent process	Type Approval process	Management of engineering change	Engineering review and decision	Update documentation
	Request for Type Approval: <u>L4-CHE-FOR-009</u> Access Safety Critically: L1-ASY-PRO-002 Access Service Critically: L1-ASY-PRO-003	Chief Engineer and Head of Engineering to determine Type Approval process	<u>L1-CHE-PRO-004</u> Provisional Type Approval (with Trial) Full type Approval Engineering Product Approval	<u>L1-CHE-PRO-031</u> Engineering Change procedure	If successful, Type Approval Certificate (TAC) Issued Type Approval Recommendation Memorandum (TARM)	L1-CHE-PRO-004 Appendix Approved Engineering Product List – updated with approved and rejected Type Approvals
	<u>NIFO-1310.1</u> – Type Approval Checklist	Asset Management Engineering Manager <u>NIFO-1310.3</u> – Type Approval Preliminary Investigation FULL or MINOR	Provisional Type Approval with Trial Full Type Approval Including Enterprise Wide Risk Management (ERWM)	<u>SAPR-13</u> Rail Safety Management of Change	If successful, Type Approval Certificate Issued (<u>NIFO-1310.2</u>)	Type Approval Register Updated (<u>VLine Extranet</u>)
	<u>EGP-21-01</u> (9) – Proposal or Need for New Equipment & System EPG2101F-01 New Equipment Preliminary Assessment Supplier Product Information Pack (PIP) in accordance with AS7702	Endorsed by Manager Asset Planning & Investment Interstate or Programme Technical Manager Inland Rail SIGNIFICANT or MINOR	EGP-21-01 New Equipment & System Approvals SIGNIFICANT (with or without Trial) MINOR	Recommendation for Approval General Manager Technical Standards Consultation with Stakeholders as appropriate	General Manager Technical Standards Regulator Notification (notification period) as required Implement or Reject	Advice to Operational safety & Environment Review Committee (OSERC) <u>Update Type Approval Register</u>
	Request for Type Approval Form – (CE-021-FO-0024) Submit form with relevant information identified on form	Engineering Manager review Acceptance and Classification of Engineering Change Management process	CE-021-PR-0021 – Type Approval Procedure Provisional (with Trial) or Full	CE-021-PR-0020: Engineering Change Management Standards CE-021-FO-0019: Engineering Change Management Procedure	Type Certification (provisional or full)	If successful, update Approved Product List

6.2 RTO Approvals Standards and Procedures Documents

Associated approvals standards/procedures documents for each RTO are outlined in *Table 8*.

The Type Approval registers are maintained and updated by the respective RTOs. These do not currently identify if the type approved products contain recycled materials. Practitioners should validate recycled material with suppliers and the relevant RTO.

Table 8 – RTO approvals standards and procedure documents

Operator	Type Approval	Engineering Change	Waiver / Derogation	Registers
MTM	L1-CHE-PRO-004 : Type Approval Procedure	L1-CHE-PRO-031 : Engineering Change Procedure	L1-CHE-PRO-001 : Engineering Waiver Procedure	L1-CHE-PRO-004 Appendix: Engineering Approved Product Register (refer to latest version)
	L4-CHE-GDL-001 : Type Approval – Engineering Change – Waiver: Process Map			
V/Line	NIPR-1310 : Type Approval – V/Line Asset Management (Procedure)	NIPR-2000 : Technical Standards: Development, Change and Derogations SAPR-13 : Rail Safety Management of Change		Type Approved product list
		NIWI-2952 : Recording Infrastructure Asset Configuration Changes	NIFO-2000.2 : Proposal for Derogation to Technical Standards (Form)	
ARTC	EGP-21-01 : New Equipment & System Approvals	EGP-02-01 : Engineering Waiver Management EGPO201F-01 : Engineering Waiver Approval Form RSK-PR-001 : Risk Management Procedure		EGP2101R-01 : New Equipment & Systems Approval Register EGPO201R-01 : Waiver Approval Register
Yarra Trams	CE-021-PR-0021 : Type Approval Procedure	CE-021-FO-0019 : Engineering Change Procedure	CE-021-PR-0004 : Deviation from Engineering Standards	Approved Product List (Not published)

Notes:

1. Links to V/Line's standards and type approved product list require access to the V/Line Extranet.
2. Yarra Trams Engineering Management System documents are not currently available publicly.

6.3 Who is involved in Type Approval?

The primary roles of persons involved in the Type Approval process are identified and described in the RTOs' standards. The following section provides an overview of the key roles and responsibilities.

Further roles are included within the relevant RTO standards identified in *Table 8*.

Applicant/Requestor:

The proprietor or an appointed representative responsible for the design and production of the item or system. The Applicant/Requestor is responsible for completing the type approval application and provision of any product information to demonstrate product performance or to support the assessment process.

Endorser/Approver:

This is likely to be a combination of representatives from the RTO's asset engineering management or standards team as appropriate. Typically, an Engineering Manager or Subject Matter Expert (SME) will be assigned to the product application and will support the process through to acceptance or rejection.

Chief Engineer, Head of Engineering or Manager Standards sign-off is required for Type Approval Certifications for safety or service critical applications.

The applicant or requestor may also have two additional key persons or organisations involved in the process.

Project Sponsor (e.g. LXP/RPV):

Endorsement of products or materials containing recycled material by a 'Project Sponsor' can greatly support the type approval process.

Independent Testing:

New products are likely to require third-party testing to demonstrate that the product or equipment meets the relevant standards and specifications. This may include:

- Collaboration with Research institutions (such as the Australian Centre for Railway Innovation (ACRI) or Monash Institute of Railway Technology)
- Utilising NATA accredited product and material testing laboratories
- Ongoing testing and monitoring as part of project installation and operation.



6.4 Type Approval Categories

Type Approval Categories associated with new products or equipment are explained in the relevant RTO standards/procedures as outlined in *Table 8*.

Proprietors proposing products as alternatives to existing type approved products are likely to fall under the categories listed below in *Table 9*.

6.5 Anticipated timeframes

Understanding the anticipated timeframes required for product or material type approval will impact the likelihood of implementing a new product, piece of equipment or type of material on the relevant rail network.

There are currently no set timeframes, however a number of factors will affect how long it takes to obtain type approval.

6.6 Factors affecting type approval

- **Application and associated risk:** Level of risk to the asset will vary depending on application and the intended location where the product is to be used
- **Previous approval:** Has the product been approved previously by the RTO (e.g. expired approval or modifying composition of an accepted product)
- **Approved by another operator:** If the product is already approved with another RTO, this may support the application by demonstrating performance in a similar or like-for-like condition
- **Approved outside Victoria:** National or international application will support the demonstration of performance to other standards. Applicants should consider the comparable standards, climates and conditions
- **Standards and Specifications:** Do standards and specifications exist that set out performance requirements for the specific product or equipment application?
- **Performance testing regime:** Identifying a testing plan will help demonstrate proof of performance. I.e. can testing be undertaken offline in a laboratory or is in-situ testing required?

- **Requirement for trial period:** Duration will vary depending on application and location of the product as described in *Section 6*. Availability (for possession) and accessibility (for testing and inspection) of a trial site should also be considered.

6.7 Product trials

New equipment or products that are provisionally approved with conditions and subject to a trial period should expect additional time for full type approval.

- Trial periods are dependent on the product and should be discussed with the Approving Engineer
- Typical trial durations of 12–18 months can be expected for materials, products or equipment used in safety or service-critical applications
- A Trial Implementation Plan should set out the program expectations for this period, including anticipated timeframes, inspection and testing, performance measurement, reporting and the exit strategy should the trial be unsuccessful.

Table 9 – Type Approval Categories

MTM	V/Line	ARTC	Yarra Trams
Engineering Product Approval	Minor Type Approval Process (MTAP)	Minor Approval	–
Provisional Type Approval (Trial)	Provisional Type Approval (PTA)	Trial Type Approval	Provisional Type Approval (acceptable for trial)
Full Type Approval	Type Approval (TA) – Full	Significant Approval	Full Type Approval Path

Note: Grandfather Rights path is only applicable to existing items on the respective network and are not currently considered relevant for new and emerging products or materials containing recycled content.

7. Tourist and Heritage Railway

A number of heritage railways and tramways have been established throughout Victoria along closed lines to preserve rail history and to operate as tourist attractions.

As part of the Victorian rail industry, materials and products that are removed as part of works on primary rail networks typically cascade down, where suitable, to support the operation of the tourist and heritage railways and minimise waste within the industry.

The tourist and heritage railway is controlled by VicTrack, who leases assets to tourist and heritage railway operators.

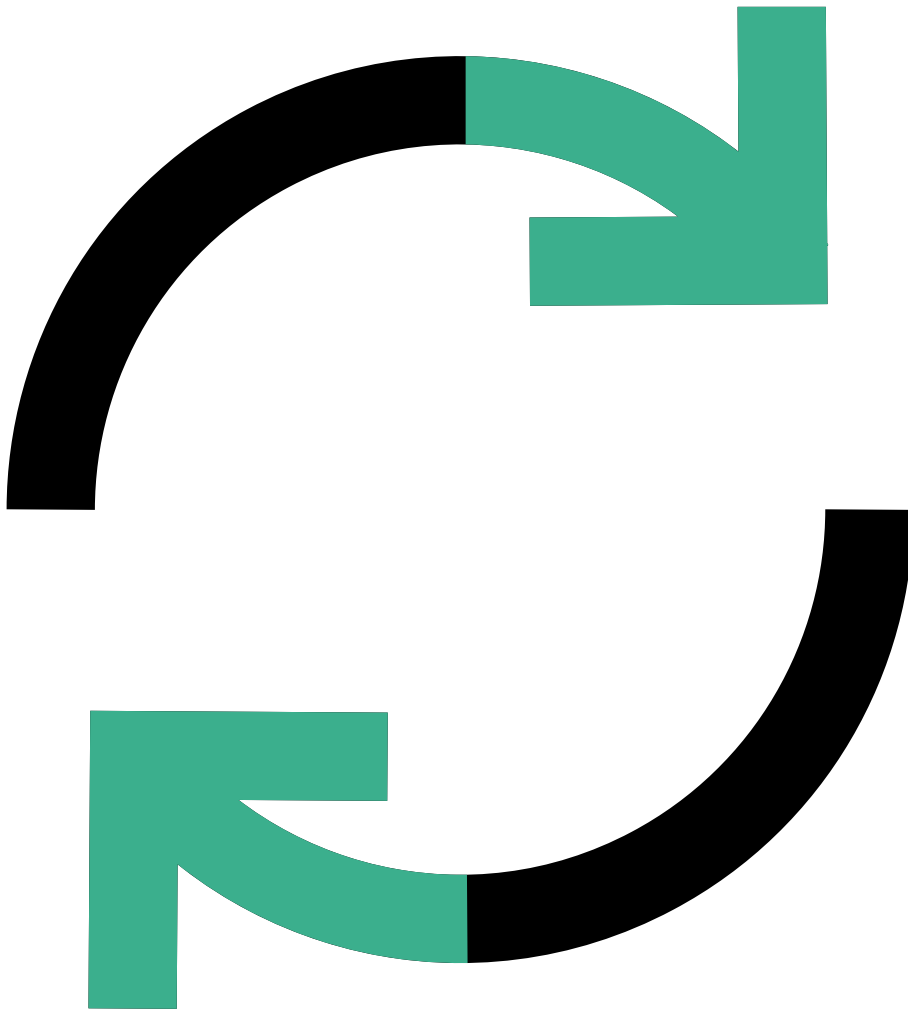
7.1 Office of the National Rail Safety Regulator

The Office of the National Rail Safety Regulator (ONRSR) has developed a number of Safety Management System (SMS) modules to assist smaller less-complex operators (including tourist and heritage) when developing or reviewing their SMSs.

These modules allow operators to customise and combine modules

to develop a safety management system that is specific and appropriate to the scope and nature of their operations and their accreditation.

The individual tourist and heritage railways can modify the template requirements to suit their operations and use this as an opportunity to increase the use of reused or recycled materials and components in upgrade works.



7.2 Reuse and recycling opportunities

Opportunities to maximise the reuse of serviceable products and the use of recycled materials from the primary railway networks, in tourist and heritage railways, includes but is not limited to:

- **Rails** – predominately use 30kg–40kg/m rail but upgrade based on availability
- **Sleepers** – concrete, timber, steel and composites
- **Sleeper components** – fastenings, dog spikes, sleeper plates and anchors
- **Ballast** – as available and pending affordability of transport.

These opportunities should be considered in line with the VicTrack and DoT Transport Services Asset Disposal procedure and strategy respectively, as outlined in *Section 4.4*.



8. Emerging Materials

The potential for reuse and inclusion of recycled materials is actively being pursued in the rail industry.

Research, development and trials are being undertaken to better understand their possible uses in rail construction and to determine future opportunities and additional materials for use.

This section highlights some examples of emerging materials that have the potential for uptake and could be considered for rail infrastructure projects in Victoria, including on a trial basis. Refer to the road guide for emerging materials applicable to the road industry.

8.1 Ballast

The use of recycled ballast could potentially lead to significant benefits for the rail circular economy, including a reduction in use of virgin supplies, transport costs and associated emissions.

Ballast reuse is especially applicable for the temporary track arrangements required for construction works. Ballast reclaimed from existing track conditions, due to operational and maintenance use, is known to contain various contaminants including heavy metals, hydrocarbons and potentially asbestos.

These contaminants may restrict the reuse of ballast due to the need for appropriate treatments to remove the contaminants. Under Victoria's waste management regulations ballast is required to be classified in accordance with [EPA IWRG621](#) (i.e. to remain on-site or to be disposed of at an appropriately licenced facility).

However, following appropriate screening and cleaning the resultant material has been proven to meet the performance requirements of virgin ballast (LXRP, 2018) CTD Ballast Reuse Trial Brief.

Following an appropriate cleaning and/or screening process, and subject to approval of the relevant

RTO, the following may present opportunities for ballast reuse:

- 60 and 50mm ballast for running rail
- 19mm ballast screening (outside running rail)

Lesser grade material has potential (if it adheres to relevant standards and requirements) for use in:

- Clean rock for upgrade of maintenance access tracks
- Drainage materials e.g. lining of open cut drains (considering minimum rock size)
- General fill.

As noted in *Table 4*, the appropriate handling and storage of ballast is crucial to enabling its reuse to reduce the likelihood of fouling.

Potential agreements within the rail industry for sharing cleaned ballast between RTOs may also provide benefits, including increased uptake of ballast reuse, reduced ballast to landfill and reduced transportation costs.

8.1.1 Recent trials in Victoria

A trial was undertaken on the Level Crossing Removal Project (Caulfield to Dandenong) in 2018 in collaboration with MTM, seeking to reuse up to 20,000m³ of ballast excavated during the construction phase, on the MTM network.

The trial demonstrated two management technologies – cleaning and screening for processing ballast so that it met EPA regulations (IWRG621), MTM ballast supply specifications (L1-CHE-SPE-064) and associated Australian Standards.

In collaboration with the trial at Caulfield to Dandenong a further 11,500 tonne of recycled ballast was used for a temporary track slew at the Seaford Level Crossing Removal Project.

Further trials are being undertaken by MTM with industry to validate the quality assurance process for recycled ballast and to subsequently develop reuse requirements for the MTM ballast supply specification.

8.1.2 Applications outside Victoria

Ballast reuse processes are well established in Germany, Austria and the UK, and follow a similar process for reuse:

- Assessment of ballast contamination and residual life
- Receive or haul ballast
- Remove contaminants by cleaning or screening
- Process to meet material specification (removal of fines and fouling)
- Transport and lay ballast
- Monitor stability and displacement.

Table 10 identifies standards from other jurisdictions in Australia for the reuse of ballast. Applications are provided as examples and should be assessed and applied in accordance with the relevant Victorian standards.

Table 10 – Standards outside Victoria that allow for the use of recycled ballast

Standard	Region	Owner	Application
<u>T HR TR 00192 ST (Version 2)</u>	NSW	NSW Government, Transport Asset Standards Authority	Section 10.2 sets out the permitted uses for recycled ballast
<u>CRN CS 240</u>	NSW	John Holland Country Regional Network (CRN)	Section 8 sets out repair standards for ballast cleaning and use of recycled ballast
<u>Recycled Fill Materials for Transport Infrastructure Environmental Instruction 21.6</u>	South Australia	Department of Planning, Transport and Infrastructure (DPTI)	Section 8.3.2 sets out ballast reuse standards, including sampling and testing

8.2 Recycled materials in track formation

The current RTO's standards and specifications do not preclude the use of recycled content within track formation layers, providing compliance with the relevant Australian standards. However, the inclusion of these materials is not currently widely supported/ demonstrated throughout Victoria.

Research is currently being undertaken to explore for opportunities for blending recycled materials such as recycled glass, plastic and crushed concrete into the capping layer.

8.2.1 Applications outside Victoria

Slag aggregate use in capping and free drainage filter material is typically allowed in current standards across the states however, prescriptive standards for other recycled material is limited with the exception of Queensland.

Table 11 and Table 12 identify Queensland Rail (QR) and Department of Transport And Main Roads (TMR) standards for the use of recycled materials in the capping layer and free drainage material, respectively. Applications are provided as examples and should be assessed and applied in accordance with the relevant Victorian standards.

Table 11 – Queensland standards that allow for the use of recycled materials in capping layer

State	RTO / authority	Material specification reference	Allowable limits				References
			CC	RAP	RB	RGS	
QLD	QR	Subtype 2.3	≤100%	≤20%	≤20%	≤20%	QR-CTS-Part 6
	TMR	Subtype 2.4	≤100%	≤20%	≤45%	≤20%	MRTS05 – Section 7.2

Note: Course component material properties as required by MRTS05 (Type 2.3 and 2.4). Option for natural or recycled material blends. Testing criteria is adjusted for recycled material blends. Additional considerations include max. pH, UCS and presence of foreign material.

Table 12 – Queensland standards that allow for the use of recycled materials in free draining material

State	RTO / authority	Material specification reference	Allowable limits				References
			CC	RAP	RB	RGS	
QLD	QR	Subtype 2.3	≤100%	≤20%	≤45%	≤20%	QR-CTS-Part 6
	TMR						MRTS04 – 18.2.3
							MRTS05 – Section 7.2

Note:
High level requirements QR-CTS-Part 6. MRTS05 applies for rail pavements using unbound granular materials. Queensland Rail standards are not publicly available.



8.3 Plastics

8.3.1 Composite Rail Sleepers and Bearers

RTO's are trialling composite railway sleepers on their networks, primarily as an alternative to maintenance intensive timber sleepers.

These trials have been designed to determine the viability of the composite sleepers for use on the wider network. Trial applications in Victoria include:

- **December 2017:** Timber replacement sleepers VIC Heritage Railway
 - **July 2019:** Low profile concrete sleeper replacement at Richmond Station (MTM)
 - **August 2019:** Concrete replacement at Wyndham Vale Stabling Yard – connection road (V/Line).
- Other trial applications in Australia:
- **April 2018:** Timber replacements, interspersed with standard timber sleepers (Queensland Rail).

Composite sleepers for mainline and sidings trackwork are not included in current RTO standards and specifications, however they

have been trialled via the type approval process, which has been supplemented by relevant laboratory testing of comparable standards.

Performance review of the subsequent trial shall determine opportunities for composite sleepers across Victoria.

In March 2020, RISSB released an update to [AS 1085.22 Railway track materials: Alternative material sleepers](#), which provides requirements for the specification, manufacture and testing of alternative material sleepers for the use in railway track.

For V/Line assets, the requirements for composite sleepers and bearers have to primarily comply with NIST-2651 (under revision to incorporate composite material at time of this issue).

In the interim recently published Australian standards AS1085.22 – Alternative material sleepers takes precedence, in conjunction with ISO 12856-1-2014 Plastics – Plastic railway sleepers for railway applications.

As identified in *Section 3*, composite rail sleepers can provide increased flexibility during construction as they may be cut to suit on-site, resulting in increased opportunity for bulk product purchase for manipulation as required by each specific project, which can reduce typically long lead times.

8.3.2 Plastics in Other Applications

Recycled plastic products are also being developed for other applications including:

- Geosynthetics
- Drainage pipes/pits
- Service conduits/pits
- Fencing
- Level crossing elements (e.g. crossing panels, boom barriers etc)
- Miscellaneous (TGSIs, RPMs, signage, sealants etc).

Refer to the road and ancillary guides for other applications.

6. Disclaimer

The guideline is not intended to make any legal representations and does not commit the Victorian State Government to any future course of action. No-one should rely on these guidelines when making construction, business or investment decisions.

The Victorian State Government and its departments and agencies accept no responsibility for any use of these guidelines, including for any loss or detriment resulting from reliance on or application of these guidelines.

Appendix A – Reference Documents

A.1 VicTrack

PR-GL 003 – Environmental Management Plan – When Working on VicTrack Land

PR-GL 004 – VicTrack Soil Reuse Guideline

VT-SP-143 – VicTrack Disposal of Assets Procedure

A.2 DoT

DoT Standards are available on the [PTV Drawing Management System \(DMS\)](#)

PTV-NTS-006 Network Technical Standard – Track & Structure – Railway

PTV-NTS-007 Network Technical Standard – Track & Structure – Tramway

Department of Transport (2020) Transport Services Strategy – Rail Asset Disposal Strategy
[not publicly available]

A.3 MTM

Automatic Stabling Train Gate (ASTG) Specification and Requirements For Metropolitan Train Stabling

[ENV-BUL-01-2020](#) – Recycled Materials in Asphalt

[L1-CHE-INS-060](#) – Use of Guard Rails (Technical Note)

[L1-CHE-SPE-064](#) – Technical Specification for Ballast Supply

[L1-CHE-SPE-070](#) – High Voltage Cable Routes

[L1-CHE-SPE-178](#) – Earthworks and Formation Specification

[L1-CHE-SPE-230](#) – Turnouts and Special Trackwork Specification

[L1-CHE-SPE-313](#) – Recycled Glass Sand Specification

[L1-CHE-SPE-315](#) – Resilient Rail Fastenings Assemblies

[L1-CHE-SPE-316](#) – Concrete Sleeper

[L1-CHE-STD-001](#) – Train Stabling and Driver Facilities

[L1-CHE-STD-005](#) – Line Side Fencing

[L1-CHE-STD-013](#) – Metropolitan Railway Stations

[L1-CHE-STD-029](#) – Earthworks and formation standard
[L1-CHE-STD-030](#) – Track Drainage Standard
[L1-CHE-STD-032](#) – End of Track Protection
[L1-CHE-STD-034](#) – Criteria for Infrastructure at Railway Level Crossings – Pedestrian Crossings
[L1-CHE-STD-039](#) – Track Design and Construction
[L1-CHE-STD-040](#) – Bridge Standard
[L1-CHE-STD-043](#) – Standard for Construction of Cable Route and Signalling Civil Works
[L4-CHE-GDL-001](#): Type Approval – Engineering Change – Waiver: Process Map
[L1-CHE-INS-015](#) – Raised Boarding Pad Clearances
[L1-CHE-PRO-001](#): Engineering Waiver Procedure
[L1-CHE-PRO-004](#): Type Approval Procedure
[L1-CHE-PRO-004 Appendix](#): Engineering Approved Product Register (refer to latest version)
[L1-CHE-PRO-031](#): Engineering Change Procedure
[L1-CHE-STD-059](#) – Technical Standard for Car Parks
[L0-SQE-PRO-014](#) – Safety and Environmental Requirements for Contractors and Third Parties

MTM References not available on the MTM Document portal:

MTMI 3.30 (2009) Welded Rail Management Chapter 1–6, Rev B
 MTMI 3.30 (2009) Welded Rail Management Chapter 7, Rev B
 MTMI 3.30 (2009) Welded Rail Management Chapter 8, Rev B

A.4 V/Line

Access to [V/Line Network Access Portal \(VNAP\)](#) requires a user registration to access the links provided below.

[NIFO-2000.2](#) – Proposal for Derogation to Technical Standards (Form)
[NIMG-2600](#) – Asset Management Definitions and Terminology
[NIPR-1310](#) – Type Approval – V/Line Asset Management (Procedure)

[NIPR-2000](#) – Technical Standards: Development, Change and Derogations
[NIPR-2661](#) – Procedure – Provision of Trackside Signage
[NIST-002.1](#) – Railway Station Design Standard and Guidelines
[NIST-004.13](#) – Train Stabling Facilities
[NIST-012.2](#) – Specification for Signalling Supply, Construction and Installation
[NIST-2616](#) – Railway Structures Design Requirements
[NIST-2650](#) – Rail use, laying and adjustment
[NIST-2651](#) – Sleepers and Fastenings
[NIST-2654](#) – Ballast Standard
[NIST-2659](#) – Earthworks and Drainage
[NIST-2660](#) – Turnouts and Crossings
[NIST-2662](#) – Right of Way
[NIST-2687](#) – Level Crossings
[NIST-2703](#) – Inspection and Assessment: Rail and Rail Joints (External)
[NIST-2704](#) – Inspection and Assessment: Rail (Internal)
[NIWI-2952](#) – Recording Infrastructure Asset Configuration Changes
[SAPR-13](#) – Rail Safety Management of Change
[Type Approved product list](#)
[SAPO-3](#): Environment (Policy)
[SAPR-67](#): Environmental Management of Hazardous or Prescribed Waste
[SAPR-68](#): Environmental Management of Earthworks and Soil Disturbance
[SAPR-9](#): Safety, Security, Health & Environment Risk Management Process

A.5 ARTC

[Section 1](#): Rail (CoP)

[Section 2](#): Sleepers and Fasteners (CoP)

[ETA-02-01](#) – Timber Sleeper and Turnout Specification

[ETC-02-03](#) – Steel sleepers – Usage and Installation Standard

[ETD-02-05](#) – Concrete Sleepers – Design

[Section 3](#): Points and Crossings (CoP)

[ETC-03-01](#) – Turnout Replacement

[ESC-03-01](#) – Level Crossing Equipment (Signalling)

[Section 4: Ballast \(CoP\)](#)

[ETA-04-01](#) – Ballast Specification

[ETC-08-02](#) – Railway Earthworks

[ETC-08-03](#) – Earthworks Materials Specification

[ETC-08-04](#) – Earthworks Construction Specification

[Section 9: Structures \(CoP\)](#)

[ETD-16-01](#) – Design Criteria for Pedestrian Crossings (Track & Civil)

[ETG-16-01](#) – Grade Crossings

[ETG-17-01](#) – Installation of Utility Services and Pipelines
within Railway Boundaries

[ETH-00-01](#) – Buffer Stops and Restraining Devices for Dead End Tracks

[EGP-02-01](#) – Engineering Waiver Management

[EGP0201F-01](#) – Engineering Waiver Approval Form

[EGP-21-01](#) – New Equipment & System Approvals.

[RSK-PR-001](#) – Risk Management Procedure

[EGP2101R-01](#) – New Equipment & Systems Approval Register

[EGP0201R-01](#) – Waiver Approval Register

[Environmental Policy](#)

[RSK-PR-001](#) – Risk Management Procedure

A.6 Yarra Trams

Yarra Trams Engineering Management System documents are not publicly available.

[CE-021-FO-0019](#) – Engineering Change Procedure

[CE-021-PR-0004](#) – Deviation from Engineering Standards

[CE-021-PR-0021](#) – Type Approval Procedure

[CE-021-ST-0012](#) – Infrastructure - Tram Stop Platform Design

[CE-021-ST-0035](#) – Infrastructure - Tram Track Design

VicTrack standard drawings are available on the PTV Document Management System.

[STD_T9002](#) – Rail / wheel profiles – 60kg/m, 41kg/m, Ri57/R10 & Ri57A/R10

[STD_T9003](#) – Standard tie bar

[STD_T9005](#) – Standard check plate block & assembly – 41kg rail

[STD_T9008](#) – Destressing procedure for 41kg tram rail
gauge-lock clip arrangement

[STD_T9010](#) – Typical track structures

[STD_T9011](#) – Ballast construction (track design)

[STD_T9012](#) – Ballast construction w/centre poles (track design)

[STD_T9020](#) – Track drainage trench grate arrangement

[STD_T9060](#) – Track structures transition

A.7 MRPV

LXRP. (2018). CTD Ballast Reuse Trial Brief. Victoria: Melbourne

RPV. (2018). Recycled Glass Sand. Compatibility Review for Application in V/Line Infrastructure Lease. (DOC/19/21113)

A.8 Other references

[AS 1085.22 Railway track materials: Alternative material sleepers](#)

[CRN CS 240](#) – Ballast

[EPA IWRG621](#) – Soil Hazard Categorisation and Management

[T HR TR 00192 ST \(Version 2\)](#) – Ballast

[QR-CTS-Part 6](#) – Earthworks

[Recycled Fill Materials for Transport Infrastructure Environmental Instruction 21.6](#)

[MRTS04](#) – General Earthworks

[MRTS05](#) – Unbound Pavements

Appendix B – Material Descriptions

Table B.1 – Material Descriptions

Material	Description
Ballast	Ballast is the crushed rock above the capping layer which supports the sleepers and forms part of the track
Capping (also: Sub-ballast)	Capping or sub-ballast is the upper layer of the Formation consisting of graded crushed rock or similar compacted material that provides a sealing layer to the Formation
General fill	The lower layer of the Formation below the capping layer and structural fill
Geopolymer-binder	Binder containing greater than 80% Fly Ash, Ground Granulated Blast Furnace Slag (GGB Slag) or Amorphous Silica complying with the requirements of AS 3582.1, AS 3582.2 and AS 3582.3 respectively, metakaolin and up to 20% alkaline components.
Geosynthetics	The range of polymeric products comprising eight main categories: geotextiles, geogrids, geonets, geomembranes, geosynthetic clay liners, geofoam, geocells and geocomposites
Granular Filter Material	Granular material with the grading selected so that it will allow water to pass through it, while retaining solid matter
Structural fill	The mid layer of the Formation between the capping and general fill or subgrade layer comprising of appropriately specified and compacted material.
Supplementary Cementitious Material	Fly Ash, Ground Granulated Blast Furnace Slag, or Amorphous Silica complying with the requirements of AS 3582.1, AS 3582.2 and AS 3582.3 respectively.

For other definitions refer to: V/Line - NIMG-2600 – Asset Management Infrastructure Definitions and Terminology

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