

ChemCentre Supporting the Safe and Sustainable Reuse of Delithiated Beta Spodumene (DBS)



About ChemCentre

ChemCentre is Western Australia's leading chemistry and forensic science organisation, providing independent scientific expertise to government, industry and the community. Through research, innovation and trusted scientific advice, ChemCentre helps address complex environmental, health and industrial challenges facing Western Australia.



Key stakeholders can access updates and have access to current information via the ChemCentre website. Scan the QR code for more information.

Building a Circular Economy for Western Australia

Western Australia is a global leader in lithium production. As the industry grows, so too does the opportunity to find sustainable uses for by-products generated during lithium refining. One such material is delithiated beta spodumene (DBS), a mineral by-product produced during the manufacture of lithium hydroxide.

ChemCentre is leading a collaborative, science-based program to support government and industry in understanding whether DBS can be safely and responsibly used in infrastructure and construction applications. The work is being undertaken on behalf of the Department of the Department of Energy and Economic Development (DEED) as part of the Lithium Industry Support Program (LISP) and in collaboration with a range of Western Australian government agencies, industry stakeholders and technical experts.

The overall objective is to provide Western Australia with the evidence, guidance and standards required to support informed decision-making regarding DBS, while protecting human health and the environment.

Why This Work Matters

DBS has potential applications in Road construction materials, Manufactured sand, 'Fill' and geotechnical applications, supplementary cementitious materials in concrete and other engineered infrastructure products

If appropriate and safe uses can be established, DBS may help reduce reliance on virgin construction materials while supporting resource recovery and circular economy outcomes across Western Australia. However, its use requires robust scientific assessment, risk evaluation and regulatory oversight.

Phase 1

Establishing the Scientific Foundation

The first phase of the program funded by the Department of Water & Environmental regulation (DWER) focused on understanding DBS, identifying risks, engaging stakeholders and developing an evidence-based pathway for future standards development. Phase 1 was designed to provide government and industry with a practical basis for interim decision-making while identifying key knowledge gaps requiring further research.

Key Activities

Scientific Characterisation

ChemCentre undertook extensive review and analysis of DBS properties, including:

- Physical and chemical characterisation
- Assessment of material variability between sources
- Evaluation of constituents of potential concern
- Review of leaching behaviour and environmental performance

The work drew upon historical and new data supplied from Western Australian lithium refineries and existing infrastructure trials.

Risk Assessment

Phase 1 included:

- Human health risk screening
- Environmental risk assessment
- Development of conceptual site models
- Assessment of potential exposure pathways
- Evaluation of environmental suitability under different use scenarios

This work was used to identify where DBS may be appropriate for consideration and where additional evidence would be required.

Stakeholder Engagement

ChemCentre coordinated extensive engagement with:

- DWER
- Department of Health
- Main Roads Western Australia
- Department of Energy and Economic Diversification
- Lithium producers
- Concrete and construction manufacturers
- Infrastructure stakeholders

Stakeholder workshops and advisory panels helped identify regulatory requirements, industry needs and practical pathways for implementation.

Interim Guidance Development

A key Phase 1 outcome was development of a framework to support regulatory discussion and interim assessment of DBS applications.

This included:

- Material classification approaches
- Application-based use categories
- Screening criteria
- Sampling and testing protocols
- Environmental suitability guidance
- Traceability and governance requirements

Importantly, Phase 1 did **not** approve the use of DBS. Instead, it established a scientific framework through which robust evidence can be generated and evaluated to inform future decision-making regarding the use of DBS. Areas that require further investigation were identified in the Phase 1 work.

Phase 1 Outcomes

Phase 1 delivered:

- A comprehensive literature review
- Interim environmental suitability guidance
- Human health and environmental risk assessment reports
- Stakeholder engagement records
- DBS classification approaches
- Data inventories
- A long-term standards roadmap and implementation pathway

Together, these outputs provided an integrated evidence base to support future standards development.

Phase 2

Advancing Towards Standards and Implementation

Following the successful completion of Phase 1, the Western Australian Government funded a larger, multi-year Phase 2 research and implementation program, which commenced on 1 July 2026, and which builds directly on the scientific foundation established during Phase 1. This phase is funded through the Western Australian Government's Lithium Industry Support Program.

Purpose of Phase 2.

Phase 2 aims to move beyond screening-level assessments and generate the detailed scientific evidence required to support long-term standards, regulatory frameworks and potential infrastructure applications. This will include targeted research activity coordinated by the Minerals Research Institute of Western Australia (MRIWA).

The program focuses on answering critical questions such as:

- How does DBS behave in real-world applications?
- What controls are needed to manage risk?
- What standards are required for consistent use?
- Under what circumstances could DBS be safely incorporated into infrastructure materials?

Major Research Streams

Theme

A

Environmental Assessment

ChemCentre is leading development of:

- DBS environmental assessment criteria
- Leaching and attenuation methodologies
- Comparative assessment of conventional materials
- Long-term monitoring and evaluation frameworks
- Product-specific environmental assessment approaches

These activities will help regulators and industry better understand environmental performance under realistic use conditions.

Theme

B

Human Health Assessment

Phase 2 includes further work to:

- Define priority exposure pathways
- Develop lifecycle risk assessment frameworks
- Evaluate worker and community exposure scenarios
- Integrate human health considerations into future standards

This work will build upon the screening and conceptual assessments completed during Phase 1.

Major Research Streams continued >

Phase

2

Advancing Towards Standards and Implementation *continued*

Major Research Streams continued

Theme

C

Product Qualification and Validation

A major focus of Phase 2 is evaluating DBS in specific product and infrastructure applications.

Activities include:

- Product development and validation
- Material-specific characterisation
- Performance testing
- Development of supplier data sheets
- Evaluation of product consistency and variability

The program will examine both bound and unbound applications to support evidence-based decision making.

How can I find out more?

The ChemCentre DBS program is being led by ChemCentre and will include a Project Advisory Group (PAG) chaired by ChemCentre CEO Paul Nicholls and reporting to the Jobs & Environment Delivery Steering Committee (JEDSC) that includes the Directors-General of DEED and DWER.

A Technical Advisory Group (TAG) will be chaired by ChemCentre Manager Research & Innovation, Dr John Moursounidis and will report to the PAG.

The TAG will also be able to establish sub-committees to address specific circularity pathways and may co-opt industry associations, researchers and companies as required.

Theme

D

Standards Development

ChemCentre is working with government and industry partners to establish a pathway towards long-term standards and specifications.

The objective is to provide:

- Transparent assessment frameworks
- Consistent classification approaches
- Risk-based decision criteria
- Clear governance arrangements
- Evidence-based implementation pathways

This work will support future regulatory and policy decisions concerning DBS and other similar industrial by-products.

Looking Ahead

ChemCentre's DBS program represents one of the most significant collaborative circular economy research initiatives currently underway in Western Australia.

Through rigorous science, stakeholder collaboration and evidence-based assessment, the program seeks to provide government, industry and the community with the information needed to evaluate DBS reuse opportunities while maintaining strong protection of human health and the environment.

Phase 1 has established the scientific and regulatory foundation. Phase 2 is now focused on generating the detailed evidence required to support future standards, guidance and implementation pathways that could enable safe, sustainable and responsible use of DBS in Western Australian infrastructure.