National Environmental Science Program

Sustainable Community and Waste Hub research plan 2026 – Attachment B project plans

Contents

Project IP3.05.02-Analytical Techniques for Fast-Tracking Chemical Screening of Products and Articles

Project type: • Hub research project	
Project status: • New project submitted for approval	
Cross-cutting initiative:	No
Project start date: TBD (Upon DCCEEW approval)	**Project end date**: 31/12/2026
Project leader details:	Name: Dr. Ian ZAMMIT, Dr. Xianyu (Fisher) WANG, Dr. Grace DAVIES, Dr. Brett HAMILTON, Dr. Ryan SHIELS Dr. Elvis OKOFFO, a/Prof. Sarit KASERZON Prof. Derek MUIR Prof. Jochen MUELLER, Prof. Kevin THOMAS Organisation: Queensland Alliance for Environmental Health Sciences at The University of Queensland

Project summary

This project aims to evaluate fast, affordable, and scalable ways to detect persistent organic pollutants and related chemicals of concern in everyday articles and products both in use as well as entering waste streams. This will be done by firstly reviewing published methods, testing promising techniques, and applying the best ones to a selected range of products and articles, including those headed for disposal. The main outcomes will be open protocols and an *Analyte–Matrix Compatibility Chart* illustrating which methods are fit-for-purpose across different chemical and product/article combinations. This research is important because it provides the Australian Government the means to improve chemical safety, meet international obligations, and support national goals for waste reduction and a circular economy.

Pathway to impact

Outcomes
This project will deliver an evaluation of analytical/sample preparation methodologies (termed Fast-Tracking methodologies – FTM herein) suitable for high-throughput screening and rapid exclusion-based assessment of consumer products and articles, including waste, for chemicals of concern. The practical outcome will include a literature-based framework that enables researchers, regulators, and other stakeholders to select appropriate screening tools based on specificity, applicability, and reliability in relation to the chemicals of interest in the item being assessed. By improving the speed and cost-effectives of chemical assessments, the project will support more informed decision-making in product and article safety, as well as waste management. The resulting selected analytical methods will be applied to a few common product and article categories to demonstrate the practical utility in high-throughput screening and/or rapid exclusion-based prioritisation methods. these shortlisted methods will be compared with extraction-based targeted quantitative chemical analysis, focusing on Stockholm Convention-listed persistent organic pollutants and other prioritised chemicals of concern. The comparison will consider minimum limits of detection (LOD) of 50 mg/kg and evaluate differences in false positives and false negatives across methods with different LODs.

Research-user	Engagement and communication	Impact on management action	Outputs
Dr. Glen WALKER - Principal Regulatory Scientist and team	• Team meetings at least once every 2 months • Regular email communication relative to progress towards milestones	• Protocols developed will guide testing of consumer products and articles (e.g. cosmetics, plastics) to enable better informed and safer use. • Results will support Australia's obligations under the Stockholm Convention. • Findings will inform DCCEEW on higher-throughput methods for detecting chemicals of high concern.	• Standard operating procedures for sample handling and preparation for each FTM tested at Step 2 or higher • Estimation of cost of analysis for each FTM - covering instrumental and labour costs • Final Report detailing screening methods and chemical concentration/presence in articles and products

Research-user	Engagement and communication	Impact on management action	Outputs
Additional outputs • Literature review (Step 2 – page 9) published in a peer reviewed scientific journal • Publicly accessible *Analyte–Matrix Compatibility Chart* • Scientific publication(s) detailing the presence and or concentration of chemicals of interest in articles and products			

Project description

Project description

This project addresses the challenge of identifying and quantifying chemicals of concern in consumer products and articles in a rapid, cost-effective, and scalable manner that can be routinely implemented. These methods are collectively referred to as Fast-Tracking Methodologies (FTM) herein.

This project is a priority because it directly supports the Australian Government's need for scalable, cost-effective, and scientifically robust methods to identify high concern chemicals in products and articles across their lifecycle, i.e. from import and manufacture to disposal and recycling. The Department of Climate Change, Energy, the Environment and Water (DCCEEW) requires authoritative evidence to inform national environmental standards and policy decisions, particularly in relation to persistent organic pollutants and other chemicals of concern. In the Australian context, this is especially relevant as the country is a high-income economy that relies heavily on imported products and articles, ranging from personal care items to furnishings and building materials. The outcomes of this work will help Australia meet its obligations under international agreements such as the Stockholm Convention on persistent organic pollutants, while also advancing domestic goals for safer chemical management and a circular economy. The project's emphasis on rapid and reliable screening and quantification methods addresses current limitations in regulatory oversight and supports timely, informed decision-making for chemicals and waste management.

The project will progress through three steps:

STEP 1: Desktop review and prioritisation for testing and evaluation

This step entails a literature-based review of available analytical and/or sample preparation (e.g. sample automation) methods and their applicability on a selected list of chemicals that are also to be defined within this step. This will include assessing which methods have been successfully implemented for identical or similar matrices and cataloguing the suitability of each method for different chemical classes, article or product types, and intended outcomes. The output will be presented as an *Analyte–Matrix Compatibility Chart* illustrating inter-compatibility.

FTM that we anticipate reviewing in more detail include X-ray fluorescence (XRF) which is potentially useful for halogenated compounds, including fluorinated. Liquid Extraction Surface Analysis (LESA) mass spectrometry, Desorption electrospray ionization-mass spectrometry (DESI-MS), matrix-assisted laser desorption/ionization (MALDI-MS), direct insertion probe (DIP) methods, Direct Analysis in Real Time-MS (DART-MS), Fourier Transform Infrared (FT-IR), Raman spectroscopy, Nuclear Magnetic Resonance (NMR), Solid-Phase Microextraction (SPME), automated sample extraction using robotic instruments and Thermal Desorption.

STEP 2: Initial evaluation of FTM for products and articles, and feasibility analysis for Step 3

This step focuses on preliminary analysis of selected articles and products using the shortlisted techniques, initially on simplified matrices such as standards or articles and products with a well-defined and invariable chemical composition. Where instruments are unavailable in-house, trial analytical measurements will be outsourced to commercial labs or instrument

vendors to verify performance. Results will be compared with targeted analysis following extraction after a matrix-dissolution and/or milling to ensure that most of the matrix embedded chemicals of interest are transferable to the extract. This analysis will be conducted in-house at the Queensland Alliance for Environmental Health Sciences at The University of Queensland. Method development for the matrix-dissolution and/or milling sample preparation will be developed within this step and the values from this sample extraction coupled with targeted mass spectrometric based analysis will serve as the reference value with which to compare new analytical methods. Once an analytical method is confirmed as technically suitable for a given purpose, its cost, speed, and scalability will be evaluated under an upscaled scenario. These findings will also refine the Phase I table or flow chart based on real measurements.

STEP 3: Demonstration of scalable approaches to the rapid and reliable chemical analysis of high concern chemicals in priority products and articles

This step will demonstrate the real-world applicability of selected FTM. Evaluation will focus on how effectively each technique can exclude or quantify a defined set of chemical targets across various items in different categories of articles and products. The specific categories to be investigated will be determined during the course of the project, but are expected to include automotive upholstery and plastics, as well as household articles (e.g. TULAC - Textiles, Upholstery, Leather, Apparel, and Carpet). This will involve acquiring both new items and those nearing end-of-life, such as materials sourced from refuse plants or community donations of discarded goods. Categories will be selected based on their frequency of use and disposal, reflecting their relevance in daily life and their contribution to waste streams by volume.

The final output will include open protocols detailing how to apply selected FTM for their respective chemical and matrix applicability. It will also outline the suitability of each FTM (including the non-shortlisted ones, along with data on the distribution of false positives and false negatives associated with each when available).

Is this a cross-hub project?

No

Does this project contribute to a cross-cutting initiative?

No

Indigenous consultation and engagement

Given the laboratory-based nature and regulatory drive of the work proposed, IP3.05.02 would still be considered a Category 3 Project under the NESP SCaW Hub Indigenous Partnerships Strategy, where data and outcomes generated will be communicated and shared to relevant Indigenous organisations. As information sharing is critical to ensuring accessibility of research findings and data, it is likely this component of work will consider how to best link in with identified Indigenous associations to communicate findings, further identify Indigenous waste research priorities and enable co-design of future work to address these priorities.

Our current research team will complete the training related to Indigenous Cultural and Intellectual Property. All engagement, regardless of the content or intent, will be guided through the SCaW Hub Senior Indigenous Facilitator, and any traditional knowledge and intellectual property will be managed in accordance with the Indigenous Partnerships Strategy and Data Management Strategy.

The project meets the following revised Three Category approach:	**Category 1** Indigenous led ☐	**Category 2** Co-design ☐	**Category 3** Communicate ☒

Project milestones

Milestones	Due date	Responsible person
Milestone 1 – Signing of contract between hub lead and research organisations	1 Dec 2025	Kevin THOMAS
Milestone 2 – Completion of Literature Review and Draft Method Compatibility Framework	31 Mar 2026	Project lead and all project members
Milestone 3 – Acquired Products and Articles and Collected Related Metadata	30 May 2026	Project lead and all project members
Milestone 4 – Completion of Extraction and Targeted Analysis	15 Jul 2026	Project lead and all project members
Milestone 5 – Step 2 Trial Screening	15 Jul 2026	Project lead and all project members
Milestone 6 – Processing of Samples Using Novel Methods	31 Oct 2026	Project lead and all project members
Milestone 7 – Final Report and Method Compatibility Framework	30 Nov 2026	Project lead and all project members

Milestone 1 – will see the formal agreement between partners signed and the project initiated.

Milestone 2 – covers a desktop-based review of analytical methods and creation of a preliminary compatibility framework i.e. a list of FTM and their applicability for which chemicals and in which products and articles. This framework will be updated as new data is generated.

Milestone 3 – covers the purchase (and/or acquiring by other means) of selected products and articles. These will then be catalogued and relevant metadata such as material declarations, photographs, use, listed ingredients etc will be collected.

Milestone 4- Extraction/Dissolution based methods to quantify chemicals of interest using targeted analysis in these articles and products will be developed, completion will see Milestone 4 reached. Milestone 5 will see initial FTM applied for idealised samples such as Reference Materials and/or commercial plastic products with known quantities of additives.

Milestone 6 will be considered reached when these FTM are applied to a range of products and articles that have been acquired in Milestone 3.

Milestone 7 will see the final report accepted by all parties and the final method compatibility framework produced. This milestone will be reached after a round of review by DCCEEW.

Data and information management

Information gathered from the literature review will be published in a scientific journal as a review article. Targeted analytical data, expected to be completed by Milestone 4, will be provided as a CSV file in long format for easy access and machine readability. The list of products and articles, along with all relevant metadata, will form part of the final project output. Standard operating procedures for extraction and quantification will also be published with Milestone 4. The final Method Compatibility Framework will be included in the final deliverable.

DCCEEW will decide which data to make publicly available.

Project output	Data management and accessibility
Data/information product	• Research outputs will comply with NESP's expectations for public accessibility. Outputs will be under a Creative Commons Attribution licence unless DCCEEW requests otherwise for example due to data of commercial sensitivity. • Open Access journal publication(s) • Any exceptions identified during the project (e.g. commercial-in-confidence, Indigenous cultural knowledge, or sensitive environmental data) will be discussed with DCCEEW during the regular meetings and DCCEEW will have final say on data management and accessibility of these occurrences. • Data will be formatted and structured to support direct integration into DCCEEW's internal datasets. The team includes Dr. R. SHIELS, who has previously delivered QAEHS data to DCCEEW in this capacity. • Metadata will follow FAIR principles (Findable, Accessible, Interoperable, Reusable). • All outputs will be reviewed with DCCEEW prior to public release to ensure alignment with program objectives.

Location of research

The table below describes the scale at which the project will be working, and the location(s) where the majority of the project research will be conducted.

This proposal deals with laboratory based work. It will be mainly conducted in Brisbane/ Meeanjin but can include components outsourced to other laboratories. The research questions tackled within this project are of national and international relevance.

At which spatial scale is the project working	**National** ☒	**Regional** ☐	**Local** ☐
Location(s) – gazetted region /place name	**Brisbane**		
Aboriginal or Torres Strait Islander nation or traditional place name(s)	**Meeanjin**		

Project keywords

Chemicals of concern; persistent organic pollutants; products; articles; waste ; analytical methods; method screening