

# Introduction

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The U.S. Army has a continuing need to understand human and environmental health risks associated with military-relevant compounds (MRCs) and with movement off-site of range munition constituents (MCs). The U.S. Army Engineer Research and Development Center is now developing a renewed product — the Fate and Risk Evaluation System for Contaminants (FRESCO™) — that builds on and updates the Training Range Environmental Evaluation and Characterization System (TREECS™, 2008-present) and the earlier Adaptive Risk Assessment Modeling System (ARAMS™, 2000-2007) to address the Army's needs and further support the Operational Range Assessment Program.

## Understanding Risks

FRESCO™ extends ARAMS™ and TREECS™ capabilities for modeling fate and transport of MRCs and MCs to establish media concentrations for comparison to risk-based screening levels (Level 1 risk assessment). The extended capabilities are being implemented in concert with modernization of the supporting data, the codebase — including the underlying Framework for Risk Analysis in Multimedia Environmental Systems (FRAMES) modeling framework developed at the Department of Energy's Pacific Northwest National Laboratory (PNNL) — and documentation to deliver a sustainable and reliable platform for MC/MRC risk assessment for the long term.

## Current Work

Under delivery order W912HZ20F0209 (*Conduct FRESCO Framework & Model Debugging, Perform Model Evaluations and Validation*) for contract W912HZ-20-D-0004, LimnoTech is responsible for four tasks:

- TASK 1. Conduct FRESCO™ Framework, Models, and Components Debugging.
- TASK 2. Conduct FRESCO™ Framework, Models and Components Testing and Evaluation.
- TASK 3. Conduct FRESCO™ Framework, Models, and Components Validation using Existing Army Datasets.
- TASK 4. Development of a Final Report documenting FRESCO™ Framework, Models, and Components.

Deliverables for this order include updated code as well as documentation of the process and outcomes for debugging, evaluating, and validating that code. This report, which provides the required documentation, is organized into the following sections:

- Overview of code development and management.
- Components and organization
- Task 1 – Debugging
- Task 2 – Test and evaluate
- Task 3 – Validate
- Summary and next steps

# Overview of Code Development and Management

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The FRESCO development process is built around the GitHub development platform (<https://github.com/about>). GitHub repositories are used to store and version-track the source code and other components of the FRESCO system, and to organize debugging and development activity. Because of the complexity of FRESCO and its components, activities such

## Components and organization

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### Task 1 – Debugging

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### Task 2 – Test and evaluate

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### Task 3 – Validate

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### Summary and next steps

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