

**DRAFT
WORK PLAN**

**SOIL EROSION/SURFACE WATER SEDIMENT
TRANSPORT MODELING FOR THE ACTINIDE
MIGRATION STUDY
AT THE ROCKY FLATS ENVIRONMENTAL
TECHNOLOGY SITE**

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PURPOSE

The purpose of this work plan is to provide a framework for conducting soil erosion and surface water sediment transport modeling on the Rocky Flats Environmental Technology Site (Site) to support actinide transport modeling for the Actinide Migration Study (AMS). The AMS is investigating the mobility of plutonium, americium, and uranium in the Site environment. The goal of the AMS is to answer the following questions in the order of urgency shown.

1. Urgent: What are the important actinide migration sources and migration processes that account for recent surface water quality standard exceedances?
2. Near Term: What will be the impacts of actinide migration on planned remedial actions? To what level do sources need to be cleaned up to protect surface water from exceeding action levels for actinides?
3. Long Term: How will actinide migration affect surface water quality after Site closure? In other words, will soil Action Levels be sufficiently protective of surface water over the long term?
4. Long Term: What is the long term off-site actinide migration, and will it impact downstream areas (e.g. accumulation)?

These questions will be answered by determining what factors significantly effect actinide transport in media of concern and mathematical modeling of those actinide transport processes identified as important contributors to actinides migration in the Site environment. Current information suggests that actinide transport in sediments by overland flow (soil erosion) and in channeled surface water is an important factor contributing to potential exceedences of surface water standards in both the short- and long term. The most efficient method for assessing contributions of soils and sediments to surface water loads of actinides is through the use of existing models.

SCOPE

The Water Erosion Prediction Project (WEPP) Hillslope Profile and Watershed Model will be used to estimate the quantities of sediments transported to and by surface water via the environmental pathways as listed below.

- Runoff / Diffuse Overland Flow
- Surface Water Flow (Channeled)

The WEPP Model will estimate sediment delivery to channels within the Walnut and Woman Creek Watersheds and may be sufficient to estimate the downstream movement of sediments within the channels. If it is determined that the WEPP Model channel flow component does not have the necessary degree of resolution, the sediment delivery results will be coupled with a yet to be determined surface water transport model to estimate sediment movement with in the watershed channels. The amounts of plutonium and

americium associated with the sediments will be estimated based on available data detailing their associations with soil particle sizes and phases. The results will be used to estimate the effects on surface water quality in order to address the above questions.

The Model

The WEPP watershed erosion model, developed by the United States Department of Agriculture (USDA) and the United States Department of the Interior and other cooperators, is a new generation of process-oriented, computer implemented erosion prediction technology based on modern hydrologic and erosion science. The WEPP model is a continuous simulation computer program which predicts soil loss and sediment deposition from overland flow on hillslopes, soil loss and deposition from concentrated flow in small channels, and sediment deposition in empoundments. The model includes a stochastic weather generator to provide daily weather information using local meteorological data, a hydrology component based on a modified Green-Ampt infiltration equation and solutions of the kinematic wave equations, a daily water balance component, and a plant growth and residue decomposition component. The model computes spatial and temporal distributions of soil loss and deposition. It also estimates when and where on a hillslope or watershed that erosion and deposition are occurring.

Data Sources and Description

Data for this modeling effort will come from the following Site programs.

- Meteorology: Climatological Data.
- Ecology: Vegetation and Cover Data.
- Surface Water: Precipitation, Surface Water Flow/Discharge, Total Suspended Solids, and Actinide Activity Data.
- Geographical Information Systems (GIS): Integration of Topographic, Vegetation, Soils, and Watershed Drainage Data.
- Past Operable Unit Characterizations and RI/RFI Reports: Soils and Actinide Distribution Data.
- Special Projects/Studies: Particle Size/Phase Association of Actinides

Study Area

The study area includes the Woman and Walnut Creek drainage basins; the SID drainage (contained in the Woman Creek watershed) will be used for initial calibration of the model. The study area is limited to the Site property, but estimates of actinide loading to off-Site watershed reaches will be made in order to assess downstream impacts.

Data Compilation

The data used for this study will come from sources outlined above. Radian Corporation will provide Site meteorological data in the format required by the model. PRT will compile the necessary Site specific vegetation and cover data for the watersheds. RMRS will gather and provide the soil and actinide data, and provide GIS services to facilitate the development of the model and presentation of the results.

Schedule

The schedule for the Watershed Modeling Project for FY 1998 is shown in Figure 1.

Deliverables

Results of the analysis will be published in a succinct interpretive report for each watershed. The report will discuss the models used, data sources, modeling methodology, validation and calibration results, modeling results, and implications for long-term surface water quality and off-Site transport of actinides.

- Average sediment deliveries and actinide loads for each drainage for various time intervals including: monthly / seasonal, annual, and extreme event-related periods will be presented.
- Sediment source and deposition areas within each drainage will be identified and will be mapped.
- Amounts, sources and causes of off-site movement of actinides will be discussed.