

## Final Ecological Risk Assessment Scope of Work

The following scope of services for Windward Environmental LLC (Windward) is based on the task structure of HDR Engineering, Inc.'s (HDR) scope of services, which is included in the prime agreement between HDR and the LOTT Clean Water Alliance (LOTT) for the Reclaimed Water Infiltration Study (RWIS) Phase III, which in turn is referenced by the subcontract between Windward and HDR.

The task within which Windward is responsible for providing services is Task 3.2 (Ecological Risk Assessment). This amendment covers risk assessment activities not covered in previous contract scope and amendments.

### 3.2 Ecological Risk Assessment

**Objective:** Determine whether select chemicals of emerging concern found in Martin Way Reclaimed Water Plant effluent pose risks to wildlife utilizing McAllister and Woodland Creeks down-gradient of the Hawks Prairie Infiltration Site.

A phased approach will be used to conduct the ecological risk assessment (ERA). The first phase, residual chemical screening, determined the chemicals of potential ecological concern (COPECs) that will be evaluated in the ERA based on an assessment of their potential to pose ecological risk. The second phase, the ERA for COPECs, will include activities dependent in part on the groundwater modeling results. Groundwater modeling activities are ongoing; hence, the level of effort presented herein may need to be adjusted based on the findings of the modeling effort.

The ERA for McAllister and Woodland Creeks will start once groundwater modeling results become available.

[Section 3.2.1 not included, as those services have been completed]

#### 3.2.2 Exposure Analysis

##### a) Compile Data to be used to Estimate Exposure

The data to be used in the ERA exposure analysis include outputs from the groundwater fate and transport model. Four scenarios for the treatment of reclaimed water will be evaluated in the model:

- Class A
- Class A + RO
- Class A + UV/AOP (or some other form of advanced treatment)
- No reclaimed water (existing groundwater quality)

These scenarios will be evaluated for the Hawks Prairie Study Area.

This step also includes compiling literature-based exposure assumptions for dietary modeling, including body weights, food ingestion rates, and dietary compositions for receptors of concern.

#### **b) Calculate Exposure Estimates**

Initial exposure point concentrations (EPCs) will be based on the model-predicted groundwater concentrations of each COPEC. If the fate and transport model-predicted groundwater concentrations at the point of discharge to surface water exceed screening-level benchmarks, a dilution factor will be determined, and EPCs will be recalculated using the dilution factor applied at the point of groundwater discharge.

#### **c) Characterize Exposure Assumptions and Uncertainties**

A narrative description and evaluation of exposure assumptions and uncertainties, including a data gaps summary, will be prepared. This will be used, along with the exposure estimates in the risk characterization, to provide context that will make the risk characterization more useful for making risk management decisions.

### **3.2.3 Effects Characterization**

#### **a) Review and Evaluate the Primary Ecotoxicological Literature for Short-listed Residual Chemicals (COPECs)**

ECOTOX provides a useful compilation of effect thresholds, which were used in the screening evaluation as screening-level benchmarks. It is essential, however, for a thorough ecological risk assessment to go to the source literature to confirm and better understand the quality and proper interpretation of the effects data. The primary literature will be evaluated, and ERA toxicity reference values (TRVs) will be independently derived for the short-listed residual chemicals (i.e., COPECs) as needed. TRVs will be based on 20% adverse effect levels for reduced survival, growth, or reproduction, or on lowest-observed-effect-levels  $\geq 20\%$  if 20% adverse effect levels are not available.

#### **b) Review and Evaluate the Potential Effects Associated with Other Stressors**

Other stressors (e.g., pH, dissolved oxygen, temperature, fine sediment, fecal coliforms) are likely to affect environmental conditions at the sites evaluated in the ERA. If unacceptable risks are identified, the effects of other stressors on environmental conditions will be evaluated to determine whether residual chemical risks could be effectively managed by managing other stressors to improve environmental conditions.

#### **c) Characterize Ecotoxicological Assumptions and Uncertainties**

A narrative description and evaluation of assumptions and uncertainties in the TRVs, including a data gaps summary, will be prepared. This will be used to provide context that will make the risk characterization more useful for making risk management decisions.

### 3.2.4 Ecological Risk Characterization

The ecological risk characterization will consist of:

- 1) An evaluation of the aquatic community as a whole (i.e., aquatic plants, invertebrates, fish, and herptiles exposed to COPECs via direct water contact) for each of the two sites (McAllister and Woodland Creeks) for the different treatment scenarios. This evaluation will be conducted for the subset of COPECs that were identified based on exceedances of screening-level benchmarks. Surface water EPCs will first be compared to the benchmarks used in the residual screening step. EPCs for COPECs that exceed the screening benchmarks will then be compared to surface water TRVs. A qualitative or semi-quantitative evaluation will be conducted to provide context for the meaning of any TRV exceedances. For scoping purposes, it is assumed that a single exposure pathway (most likely direct exposure to residual chemicals in surface water) and one to two receptors will be evaluated for each site.
- 2) An evaluation of fish tissue concentrations and aquatic-dependent wildlife dietary doses for each of the two sites (McAllister and Woodland Creeks) for the different reclaimed water treatment scenarios. This evaluation will be conducted for the subset of COPECs classified as persistent and bioaccumulative. Fish tissue concentrations and wildlife dietary doses will be compared to their respective TRVs. A qualitative or semi-quantitative evaluation will be conducted to provide context for the meaning of any TRV exceedances.
- 3) An evaluation of special cases: The potential for additive effects based on similar modes of action for all residual chemicals will be discussed in the uncertainty section.
- 4) A narrative description of measures that could be taken to avoid, mitigate, or offset identified risks.

### 3.2.5 Risk Assessment Deliverables

#### a) Produce Ecological Risk Characterization Technical Memorandum

The Ecological Risk Characterization Technical Memorandum will be one of two planned ERA deliverables. It will present the exposure analysis, effects characterization methods and results, and risk characterization. It is assumed that LOTT will compile all comments and provide them simultaneously in a single document. Two rounds of editing are assumed to go from draft to final.

#### b) Produce Technical Presentation on the Ecological Risk Characterization

A slide presentation of the Ecological Risk Characterization Technical Memorandum will be prepared for the Task Force. This is the second of the two planned refined risk assessment deliverables.

#### *Deliverables:*

- 1) Technical Memorandum #2 (Ecological Risk Characterization); draft, revised draft, and final versions, as well as response to comments.

2) Presentations and handouts for meetings