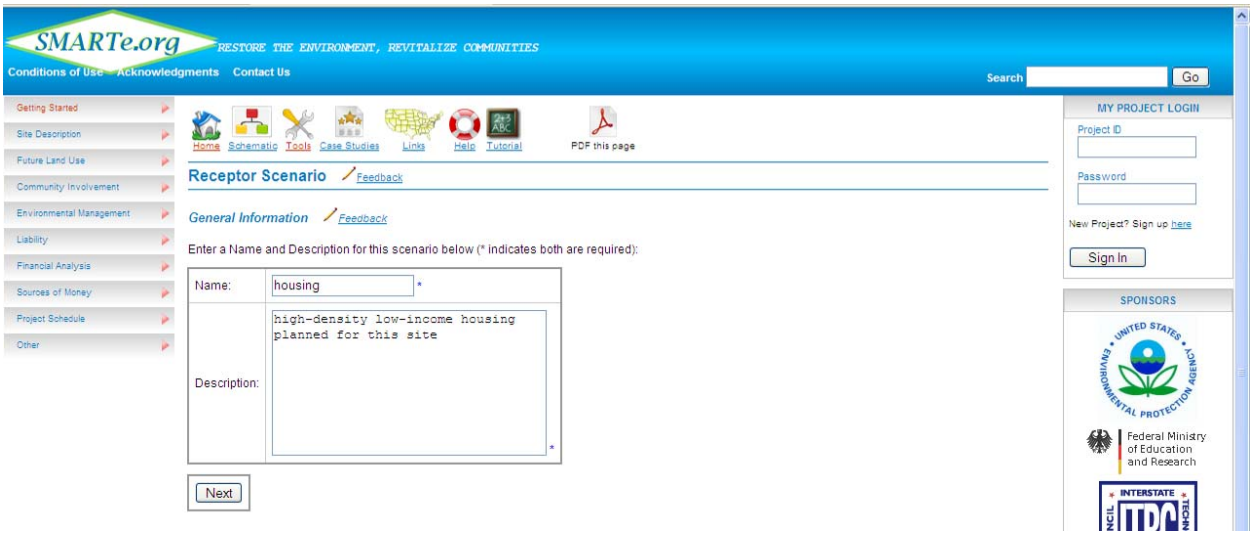
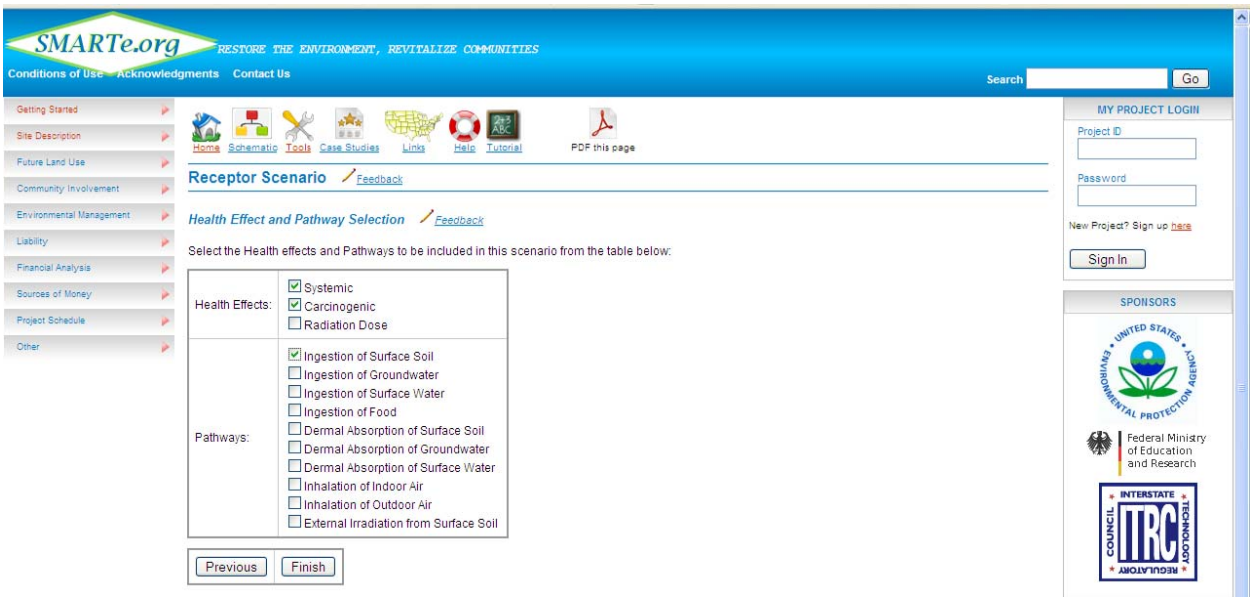
Human Health Risk Assessment Calculator

The SMARTe human health risk assessment calculator can be accessed either via the tools menu, via the Environmental Management section, or via My Projects within SMARTe. The tool is introduced with this caution: "It is recommended that this tool should be used by a qualified human health risk assessor from your project team."

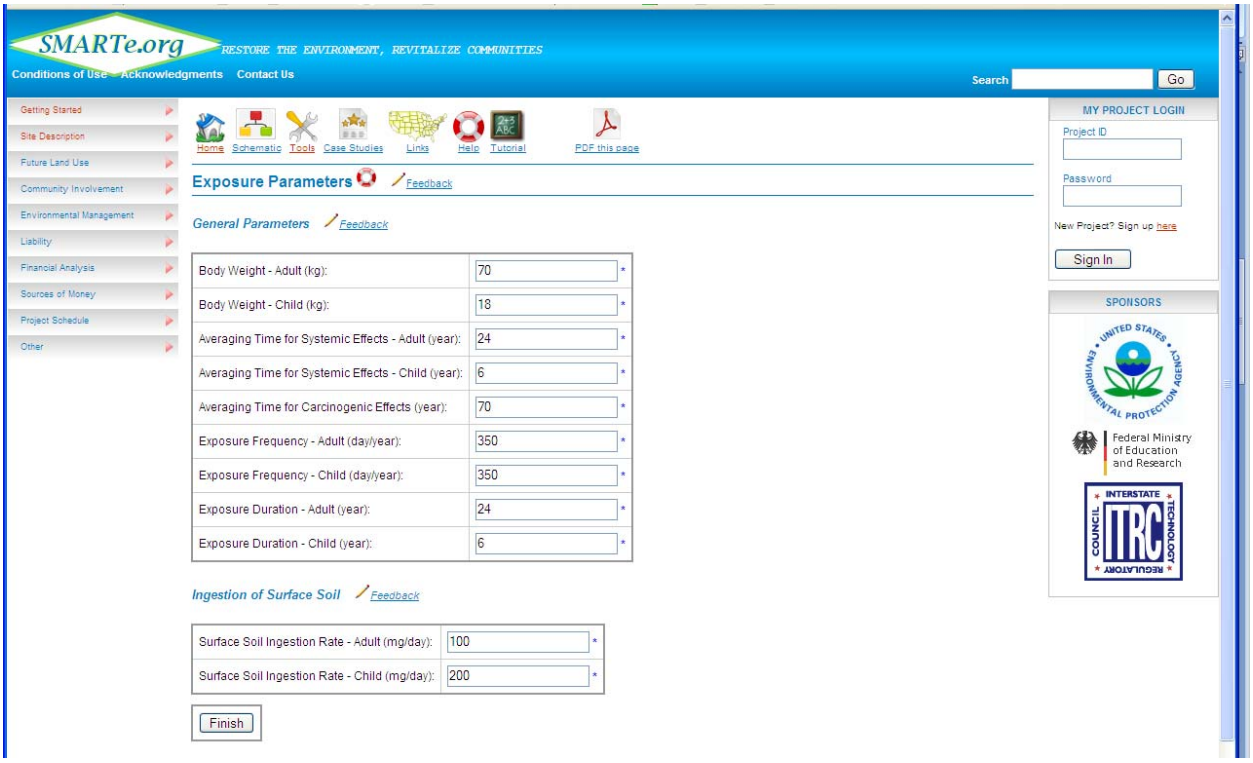
The user begins by creating a new receptor scenario with a name and description.



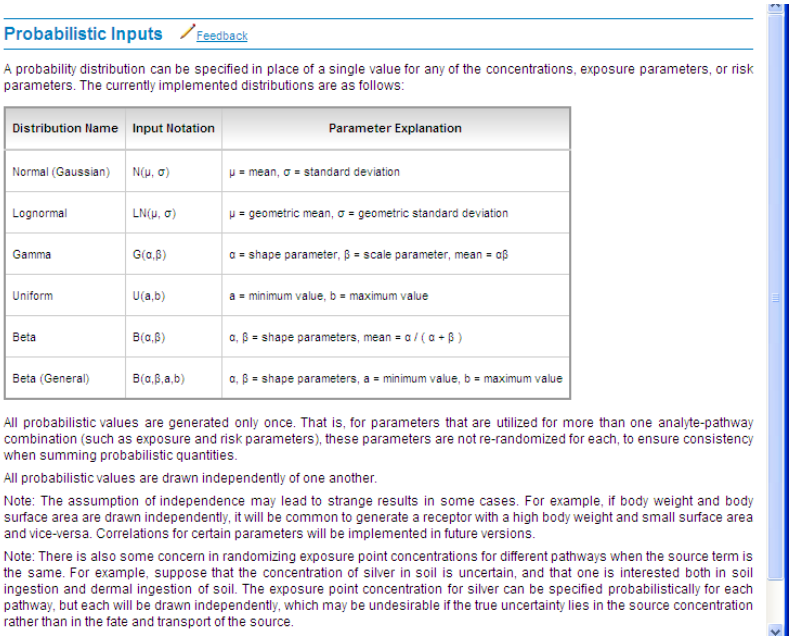
Health effects and pathways are then selected for this scenario:



The user then has the option of accepting default exposure parameters, or changing them to fit their particular scenario:



The above inputs may be entered as constants or as distributions if the user has an understanding of the uncertainty associated with their inputs. Distributional inputs allow SMARTe to perform a probabilistic risk assessment. A "tip" for entering distributional inputs is available by clicking on the lifesaver next to "Exposure Parameters" or next to the name of any pathway.



Probabilistic Inputs Feedback

A probability distribution can be specified in place of a single value for any of the concentrations, exposure parameters, or risk parameters. The currently implemented distributions are as follows:

Distribution Name	Input Notation	Parameter Explanation
Normal (Gaussian)	N(μ, σ)	μ = mean, σ = standard deviation
Lognormal	LN(μ, σ)	μ = geometric mean, σ = geometric standard deviation
Gamma	G(α,β)	α = shape parameter, β = scale parameter, mean = αβ
Uniform	U(a,b)	a = minimum value, b = maximum value
Beta	B(α,β)	α, β = shape parameters, mean = α / (α + β)
Beta (General)	B(α,β,a,b)	α, β = shape parameters, a = minimum value, b = maximum value

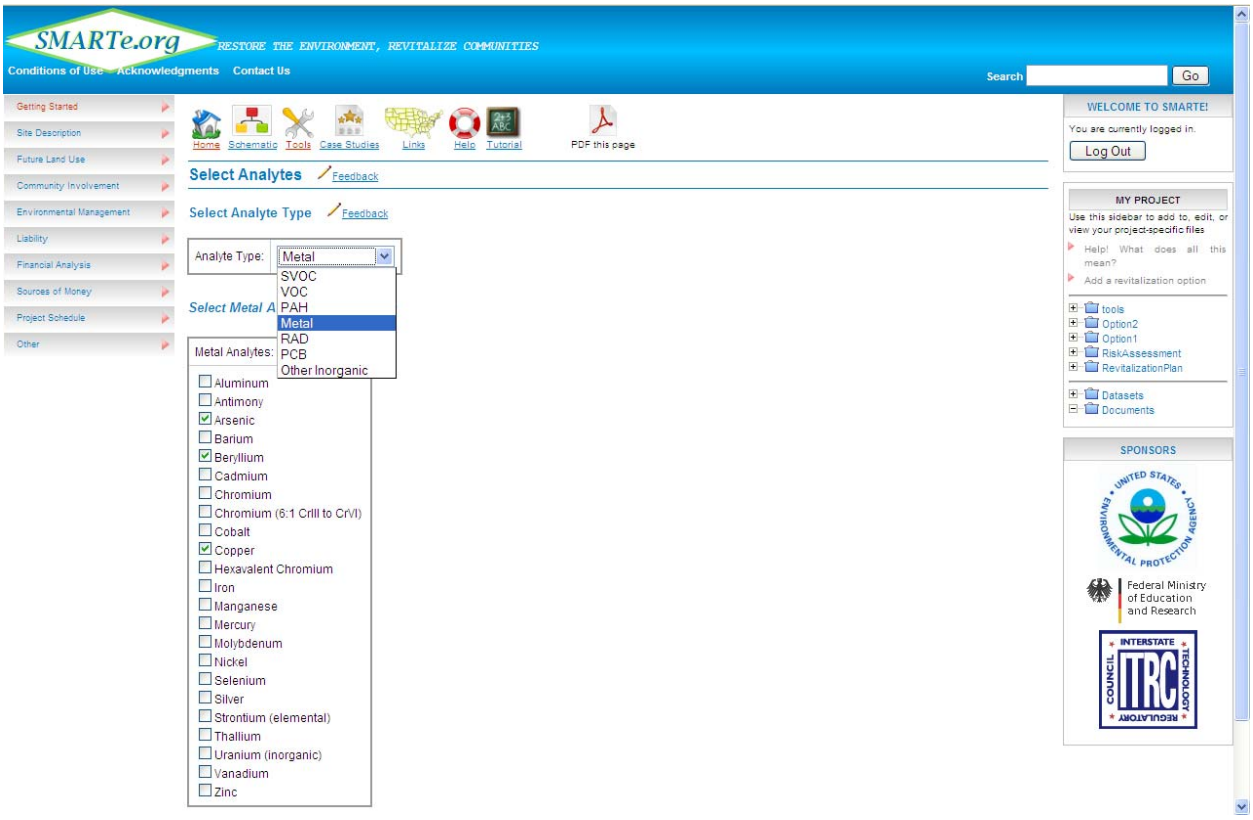
All probabilistic values are generated only once. That is, for parameters that are utilized for more than one analyte-pathway combination (such as exposure and risk parameters), these parameters are not re-randomized for each, to ensure consistency when summing probabilistic quantities.

All probabilistic values are drawn independently of one another.

Note: The assumption of independence may lead to strange results in some cases. For example, if body weight and body surface area are drawn independently, it will be common to generate a receptor with a high body weight and small surface area and vice-versa. Correlations for certain parameters will be implemented in future versions.

Note: There is also some concern in randomizing exposure point concentrations for different pathways when the source term is the same. For example, suppose that the concentration of silver in soil is uncertain, and that one is interested both in soil ingestion and dermal ingestion of soil. The exposure point concentration for silver can be specified probabilistically for each pathway, but each will be drawn independently, which may be undesirable if the true uncertainty lies in the source concentration rather than in the fate and transport of the source.

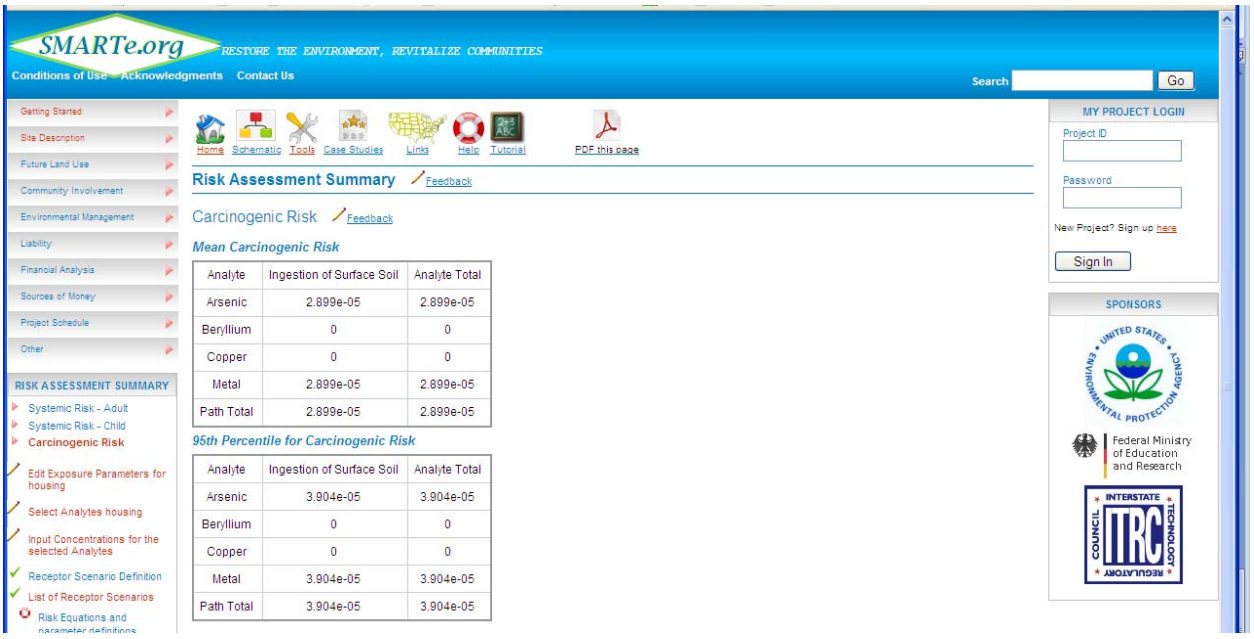
For this risk scenario, the user then identifies the analytes to be included from pull-down menus. There are lists of analytes grouped by analyte type, including VOCs, SVOCs, PAHs, Metals, Radionuclides, PCBs, and Other Inorganics:



For each pathway, a concentration must be entered for each analyte. These concentrations may be entered as constants or as distributions if the user has an understanding of the uncertainty associated with their estimate of the concentration.

When the risk calculator is run, results for each scenario are presented by potential health effects (i.e., systemic or carcinogenic). A sample results screen is shown below for a simple example with distributional inputs. This screen shows the systemic risk to an adult for this scenario.

This screen show carcinogenic risks for this scenario.



Interpretation of the results is left to the user, thus the caution that this tool be used by someone with experience in human health risk assessments.