



**SPILL TOOL**

**USER GUIDE**



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## 1. DESCRIPTION

**Name:** SPILL Tool

**Developer:** Environmental Hydraulics Institute of Cantabria "IHCantabria"

**Contact:** puentea@unican.es

**Year first available:** 2015

**Hardware required:** ArcGIS 10.1 for Desktop system requirements

**Software required:** Python 2.4 or later; ArcGIS 10.1; FWTools (<http://fwtools.maptools.org/>)

**ArcGIS extensions required:** Spatial Analyst 10.1 ©1999-2012 Esri Inc.

**Program languages:** Python

**Toolbox size:** 191 KB

**Availability: Download:** <http://marport.ihcantabria.es/en/descargas/>

**Cost:** Free.

Spill Tool is a user-friendly toolbox using Python and ArcGIS scripting library. The SPILL Tool provides as a result a raster output of probabilistic potential affected area of a specific scenario (spill type and met-ocean condition). Four main processes are considered: 1) oil spill initial area process; 2) spreading process; 3) transport process; and, 4) turbulent diffusion process. These processes are activated depending on the considered scenario.

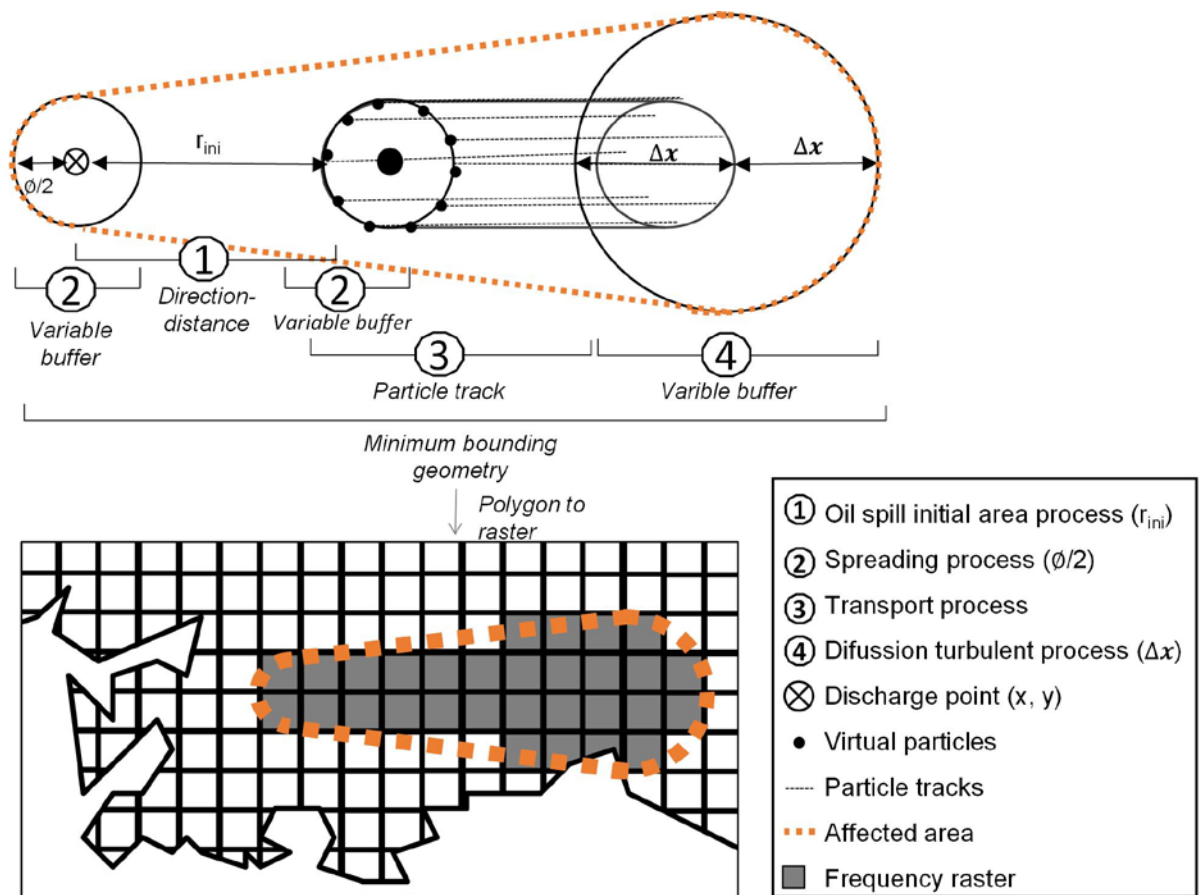


Figure 1. Graphical representation of processes considered by SPILL Tool.

## 2. GRAPHICAL USER INTERFACE

### 2.1. How to load up the tool?

The tool is easy to load up through the ArcToolbox of Geographical Information System software (ArcGIS 10.1 by ESRI™) and easy to operate through the autogenerated Graphical User Interface (GUI).

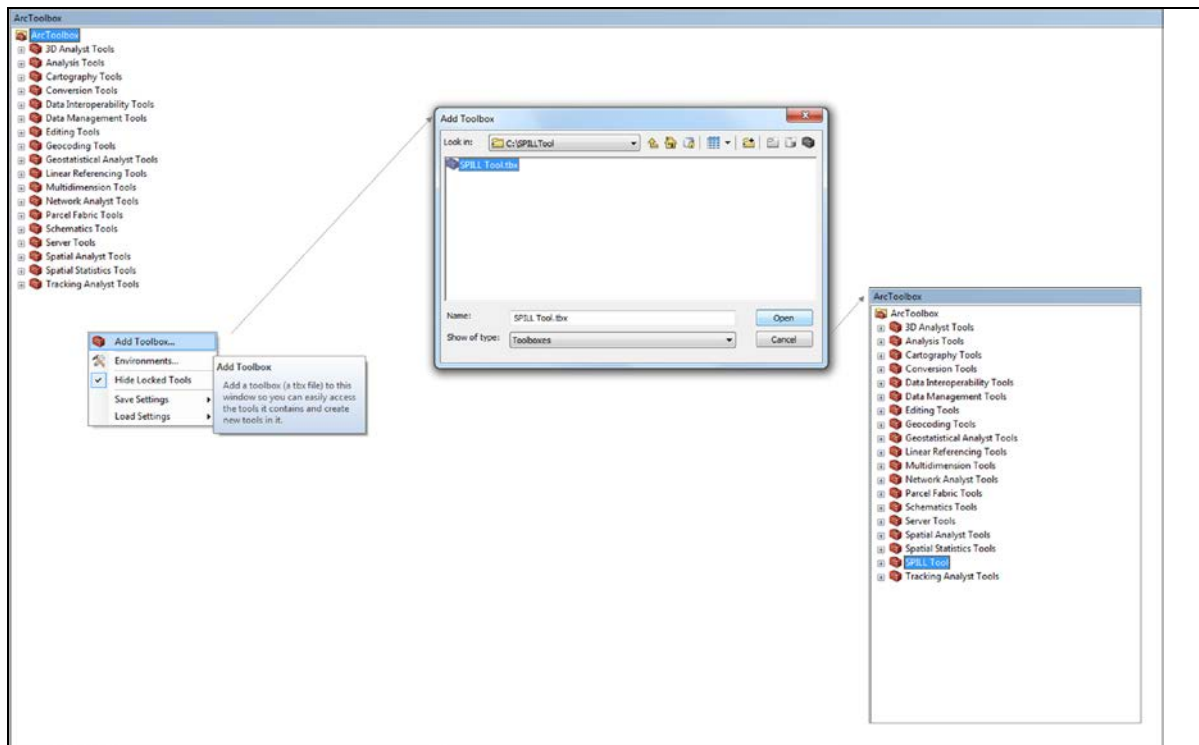


Figure 2. SPILL Tool load through the ArcToolbox of Geographical Information System software (ArcGIS 10.1 by ESRI™).

### 2.2. How is GUI appearance?

The SPILL Tool GUI is an interface that allows users to load up necessary inputs in a quick and easy way.

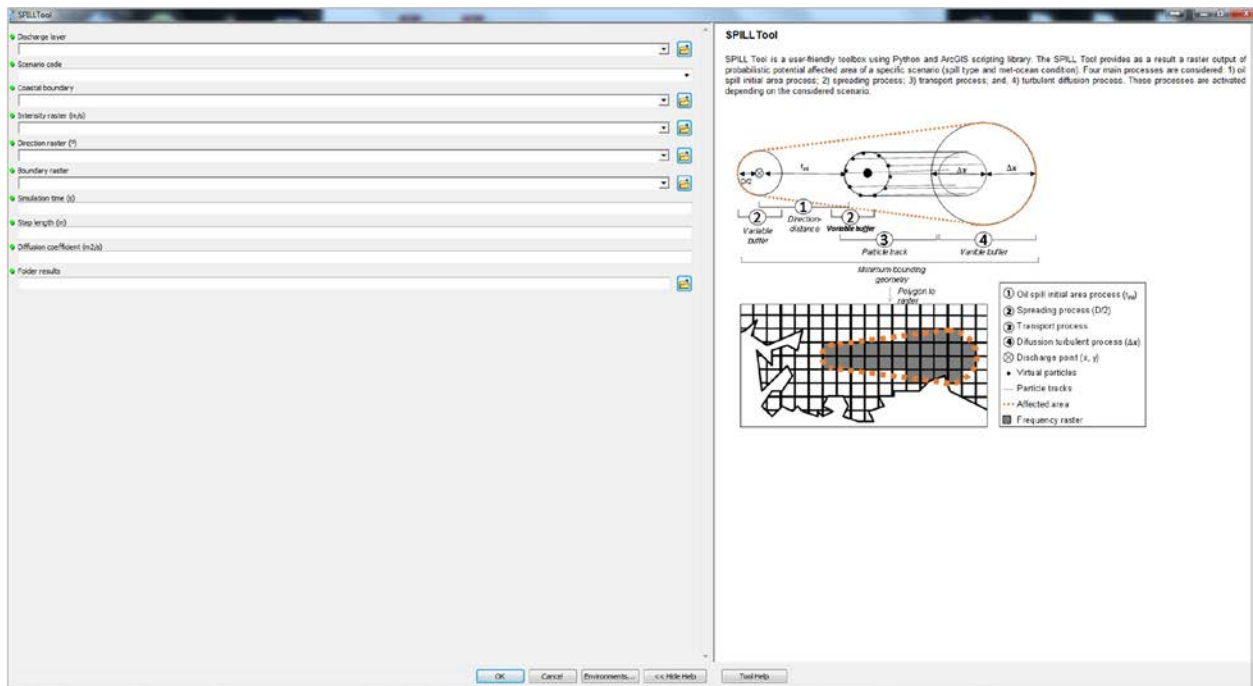


Figure 3. SPILL Tool graphical user interface appearance

### 3. USAGE

- The SPILL Tool returns a raster output of probabilistic potentially affected area of a specific oil spill scenario. This result is accessible from the Folder Results. Shapefile output of affected area it is also available on folder results as a partial result of the tool.
- The Input Discharge layer is a point feature class with type spill's characterization. The layer should contain the next fields: X (coordinate x, UTM); Y (coordinate y, UTM); Emission (Scenario code); SpillVolum (Spilled product volume, m<sup>3</sup>); OilDensity (Spilled product density, m<sup>3</sup>/kg); WaterDensi (Water density, m<sup>3</sup>/kg); WaterVisco (Water kinematic viscosity, m<sup>2</sup>/s); and, Frequency (Scenario frequency, [0-1]).
- Field names of Discharge layer must be exactly those specified above for the proper functioning of the tool. Units must be respected to obtain consistent results.
- Point locations in Discharge layer must be in water cells.
- Multiple scenarios can be introduced in the same Discharge Layer. To do this, values of attributes should be introduced in the Discharge layer for every scenario. In that case, each simulated scenario must have a specific name (Scenario code) so the tool will not have conflicts with temporary and output files.
- When create intensity raster keep in mind that they cannot store zero values. This can lead to unexpected results. See intensity raster considerations for more information.

## 4. ARCPY SYNTAX

SPILLTool\_SPILL Tool (Discharge\_layer, Scenario\_code, Coastal\_boundary, Intensity\_raster, Direction\_raster, Boundary\_raster, Simulation\_time, Step\_length, Diffusion\_coefficient, Folder\_results)

### **DISCHARGE LAYER:**

The input point feature class of discharge points must contain the following information:

- X: coordinate x (UTM).
- Y: coordinate y (UTM).
- Emission: Scenario code.
- SpillVolum: Spilled product volume (m<sup>3</sup>).
- OilDensity: Spilled product density (m<sup>3</sup>/kg).
- WaterDensi: Water density (m<sup>3</sup>/kg).
- WaterVisco: Water kinematic viscosity (m<sup>2</sup>/s).
- Frequency: Scenario frequency ([0-1]).

### **SCENARIO CODE:**

From the discharge layer select the attribute of scenario code.

### **COASTAL BOUNDARY:**

A polygon feature with the coastal boundary of the study area.

### **INTENSITY RASTER (M/S):**

An input raster where each cell value represents the magnitude of the velocity vector (average linear velocity) at the center of each cell in the study area.

### **DIRECTION RASTER (°):**

An input raster where each cell value represents the direction of the velocity vector (average linear velocity) at the center of each cell in the study area. Directions are expressed in compass coordinates, in degrees clockwise from north.

### **BOUNDARY RASTER:**

An input raster where each cell representing water in the study area gets a value of "0".

### **SIMULATION TIME (S):**

The period between detection and the response to an oil spill in the study area.



**STEP LENGTH (M):**

The step length to be used for calculating the particle tracks. The default is one-half the cell size.

**DIFFUSION COEFFICIENT (M<sup>2</sup>/s):**

A proportional constant between the molar flux due to molecular diffusion and the gradient of product concentration.

**FOLDER RESULTS:**

Folder where results will be saved.

## 5. USE LIMITATIONS

- There are special cases depending on the configuration of the coastline for which specific treatment may be necessary.
- There are two ways to solve this problem, by: a) considering a fake coastal boundary; or, b) post-processing manually the polygon (vector) results obtained by the SPILL TOOL (Figure 4).

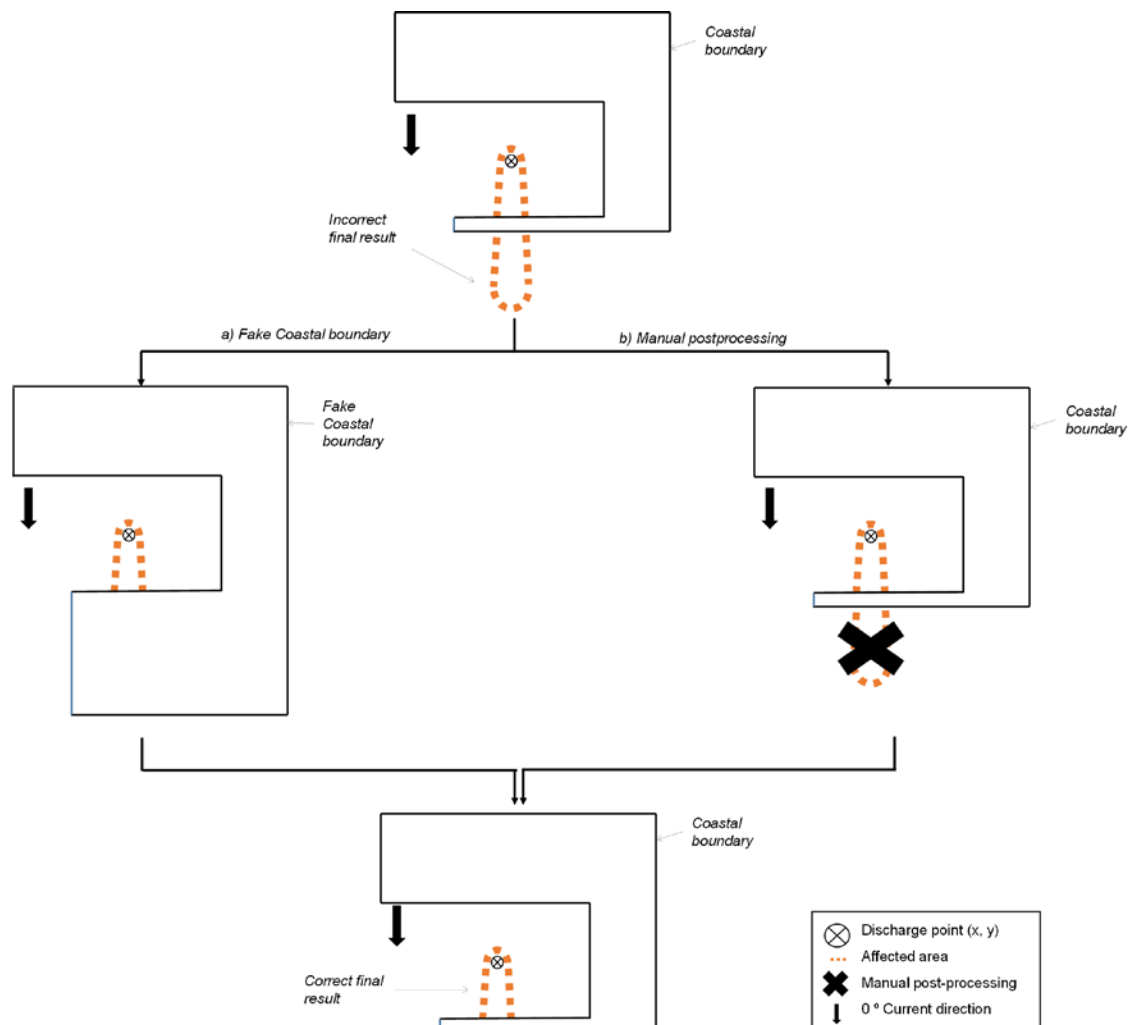


Figure 4. Proposed ways to solve SPILL Tool usage limitations.