



HPAC as a Biosafety Modeling Tool

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HPAC Features

Hazard Prediction & Assessment Capability (HPAC)
On-Line Help
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Defense Threat Reduction Agency (DTRA)

Welcome to HPAC

Hazard Prediction and Assessment Capability (HPAC) is a counter proliferation, counterforce tool that predicts the effects of hazardous material releases into the atmosphere and its collateral effects on civilian and military populations. HPAC assists warfighters in destroying targets containing weapons of mass destruction (WMD) and responding to hazardous agent releases. It employs integrated source terms, high-resolution weather forecasts and particulate transport algorithms to rapidly model hazard areas and human collateral effects.

HPAC estimates the NBC hazards associated with releases from either facilities or weapons. HPAC predicts NBC hazards from incidents such as the following:

- Nuclear Facility Accidents (Chernobyl, Ukraine)
- Nuclear Weapon Explosions (Hiroshima, Japan)
- Nuclear Weapon Incident/Accident, "Broken Arrow" (Palomares, Spain)
- Radiological Weapon Incident
- Chemical Facility Damage (Bhopal, India)
- Biological Facility Damage (Sverdlovsk, Russia)
- Chemical Weapons (Kamasiyha, Iraq)
- Biological Weapons (Yokosuka, Japan (alleged use by Aum Shin Rikyo))

HPAC was designed to be used by two types of users, operational and analytical:

Weather edited: NONE
Map Scale: 25000.0
37.91016N, 105.38936W

HPAC 5 - Mozilla Firefox

File Edit View History Bookmarks Tools Help

file:///D:/HPAC5/help/WebHelp/HPAC_SSR.htm

Most Visited Getting Started Latest Headlines Bioinformatics Inquiry Bioinformatics ... Nucleus BLAST: Basic Local Ali...

HPAC 5

Contents Index Search

Obscuration
Existing HPAC Overlays
Incident Models
Incident Models - Introduction
Chemical and Biological Facilities (CBFAC)
Getting Started in CBFAC
Damage Category
Quick Calculation
Detailed Model
Advanced Model
Pre-calculated Source Term
Defining the Target
Defining the Weapon
Calculating the Expulsion
What the Output Numbers Mean
What the Output Graphics Mean
Using the Customize tabs
Customizing the Quick Calculation
Customizing the Detailed Model
Customizing the Advanced Model
Examples of CBFAC Usage
Rough Estimate for a Confined T...
Quick Calculation of a Generic Co...
Quick Calculation of a Specific Co...
Customized Calculation of a Con...
Quick Calculation of an Unconfine...
Customized Calculation of an Un...
Detailed Calculation of a Confine...
A More Complex Incident
Running the Analyst Mode - STEF
CBFAC Model References
IFAC
Industrial Facilities (IFAC)
Edit Dialog
How IFAC Works
Getting Started in IFAC
Choosing an IFAC Model
Damage Category Model
Quick Calculation
Defining the Target

Incident Models - Introduction

This section describes how to define a hazardous source using an incident model. HPAC lets you describe an incident in terms of *Where*, *What*, and *When*. One of HPAC's integrated incident models then calculates the associated NBC material release. HPAC includes the following incident models (also called source term models):

- Chemical/Biological Facility Damage (CBFAC)
- Industrial FACilities (IFAC)
- Industrial Transportation (ITRANS)
- Nuclear Facility Release (NFAC)
- Chemical/Biological Weapon (CBWPN)
- Nuclear Weapon (NWPN) SE
- Nuclear Weapon (NWPN) - (HPAC Special Release only)
- Nuclear Effects Module (NFX) - (HPAC Special Release only)
- Nuclear Weapon Incident/Accident (NWI)
- Missile Intercept (MINT)
- Radiological Weapon Incident (RWPIN)
- Smoke (SMOKE) - (HPAC Special Release only)
- Analytical Incident

With the exception of the Nuclear Weapon Explosion, Nuclear Facility Accident and Analytical incident models, most incident models reuse the **Where** and **When** (tab) dialogs previously described in **Program Operation**.

The What Tab

The following summary of information shows you how to work your way to the **What** dialog. Steps 1-4 below apply to all incident models. Subsequent steps will vary somewhat for the Nuclear Weapon Explosion, Nuclear...

Weather edited NONE Map Scale: 25000.0 49.72656N, 103.89658W

3730 A network cable is unplugged.

start HPAC 5.0 Service Pac... Document - WordPad HPAC 5 - Mozilla Firefox 4:31 PM

Transport Model - SCIPUFF

The screenshot shows a Windows XP desktop environment. The primary focus is a Mozilla Firefox browser window titled "HPAC 5 - Mozilla Firefox". The address bar shows the file path: `file:///D:/HPAC5/help/WebHelp/HPAC_SSR.htm`. The browser's content area displays the "Atmospheric Transport" section of the HPAC 5 help documentation. The left sidebar of the browser shows a table of contents with "Atmospheric Transport" selected. The main text area contains the following information:

Atmospheric Transport

HPAC's atmospheric transport model is called SCIPUFF. It is an advanced Lagrangian, Gaussian puff model that uses second-order turbulence closure techniques to relate the dispersion rates to measurable turbulent velocity statistics. The closure model provides a prediction of the statistical variance in the concentration field, which can be used to estimate the uncertainty in the dispersion prediction resulting from the inherent uncertainty in the wind field.

The standard Gaussian puff representation has been generalized in SCIPUFF to include a complete moment-tensor description, i.e., including the off-diagonal moments, which provides an accurate treatment of wind shear distortion. In the presence of inhomogeneous velocity fields, the shear distortions and turbulent dispersion increase the size of an individual puff so that the local conditions at the puff centroid are no longer an accurate representation for the entire puff. SCIPUFF employs a splitting algorithm, which divides a puff into two smaller puffs when the size exceeds a given criterion. The criterion is based on the resolution of the velocity field, and the algorithm is applied for each of the coordinate directions separately. The splitting procedure is designed to maintain all the puff moments while reducing the overall size and the off-diagonal moments.

A splitting algorithm can easily produce exponential growth in the number of puffs unless overlapping puffs are merged. SCIPUFF provides an efficient merging algorithm, based on an adaptive multi-grid scheme. Briefly, each puff is allocated to a particular grid box in a multi-level grid, where each increase in the grid level reduces the grid size by a factor of two. The grid itself is only refined where it is required, so that relatively fine grids can be used with minimum storage. Multiple puffs in a single grid box are described by a linked list, and the check for merging is only applied to puffs within neighboring grid cells. The actual merging criterion is based on the overlap integral between puffs, but the multi-grid allocation technique greatly reduces the number of puff-pairs that need to be checked at each time step.

As a further enhancement for efficiency and ease of use, SCIPUFF uses an adaptive time stepping scheme, in which each puff determines its own time step. The step length is determined by the turbulence time scale, advection velocity, shear distortion rates, and other physical processes, so that the step length increases as puffs grow larger and time scales increase. The model can accommodate short steps for puffs near the release location, while using longer steps for older puffs.

The desktop background is blue. The taskbar at the bottom shows the Start button, several open applications (HPAC 5.0 Service Pac..., Document - WordPad, HPAC 5 - Mozilla Firefox), and the system tray with the time 4:22 PM. A network status icon in the system tray has a tooltip that reads "3730 A network cable is unplugged." The HPAC 5 application window has a status bar at the bottom with the text "Weather edited", "NONE", "Map Scale: 25000.0", and coordinates "46.26953N, 103.87494W".

Urban Dispersal - Gaussian Puff (sequential)

The screenshot displays the HPAC 5 software interface. The main window is Mozilla Firefox, showing the help page for the Urban Dispersion Model (UDM). The page title is "Urban Dispersion Model (UDM)". The text describes the UDM as a fast deterministic model that accurately calculates the dispersion of airborne contaminants within urban environments. It adopts a Gaussian puff approach, where a plume is represented by a sequence of puffs. For example, an instantaneous release is modeled initially as a single puff that moves downwind, whereas continuous releases and moving sources are effectively modeled as a succession of timed puffs (of varying size if necessary).

Below the text is a 3D visualization of a cityscape with a large, white, swirling plume of contaminants rising from the center of the city, illustrating the Gaussian puff model's output.

The interface also shows a table of contents on the left side of the browser window, listing various topics related to the HPAC 5 software, including WMD Us, NBC Rel, ITRANS, and Nuclear Effects Nfx.

At the bottom of the browser window, there is a status bar with the text "Weather edited", "NONE", "Map Scale: 25000.0", and "46.19141N, 103.89658W".

The Windows taskbar at the bottom shows the Start button, several open applications (HPAC 5.0 Service Pac..., Document - WordPad, HPAC 5 - Mozilla Firefox), and the system clock showing 4:34 PM.

Micro SWIFT/SPRAY Urban Dispersal

MSS within HPAC

MSS is fully integrated into HPAC, with interfaces providing MSS with source definition from HPACTool, larger scale meteorology from SWIM, urban structures data from the [Geographic and Environmental Database Information System \(GEDIS\)](#), and user choices from the HPAC GUI (urban button). MSS then creates a nested high resolution inner subdomain, centered on the source location, wherein MSS wind and T/D calculations are performed in order to produce 3D concentration and dosage fields which are saved for HPAC output. Particles/concentrations leaving the MSS subdomain are converted to puffs in a more coarsely gridded buffer region surrounding the MSS domain and then passed to SCIPUFF for further T/D calculations at the larger scale. To display the MSS high resolution concentration and dosage fields graphically within the urban subdomain, MSS has been interfaced with the HPAC plotting capability. Sample results for an MSS/HPAC calculation for Oklahoma City are shown in the following picture.

Weather edited: NONE
Map Scale: 25000.0
43.02734N, 103.81004W
3730
A network cable is unplugged.

start HPAC 5.0 Service Pac... Document - WordPad HPAC 5 - Mozilla Firefox 4:33 PM

GEDIS Urban Database

The screenshot displays a Windows XP desktop environment. The primary focus is a Mozilla Firefox browser window titled "HPAC 5 - Mozilla Firefox". The browser's address bar shows the file path "file:///D:/HPAC5/help/WebHelp/HPAC_SSR.htm". The page content is organized into a left-hand navigation menu and a main content area.

Navigation Menu:

- Contents Index Search
- Customizing the Quick Calculation
- Layout Tab
- Hazardous Materials Tab
- Warhead Tab
- Weather Tab
- Examples of IFAC Usage
- Urban
 - What's New in Urban
 - Getting Started in Urban
 - Urban Incident Models
 - URBAN GEDIS
 - How Urban Works
 - Edit Dialog
 - Micro SWIFTSPRAY (MSS)
 - MSS Properties Dialog
 - Visualizing Urban Data
 - Urban Overview
 - Urban Dispersion Model (UDM)
 - Urban UDM Properties Dialog
 - Urban Wind Model (UWM)
 - UWM Properties Dialog
- ITRANS
 - Industrial Transportation (ITRANS)
 - Edit Dialog
 - How ITRANS Works
 - Getting Started in ITRANS
 - Choosing an ITRANS Model
 - Damage Category Model
 - Quick Calculation
 - Defining the Transportation
 - Defining the Incident
 - Calculating the Expulsion
 - Using the Customize tabs
 - Customizing the Quick Calculation
 - Hazardous Materials Tab
 - Incident Tab
 - Weather Tab
 - Examples of ITRANS Usage
- Nuclear Effects Nfx
- Agent Tab

Main Content Area:

Buildings

The GEDIS Urban Database contains complex 3D building data that has been processed to meet the requirements of client applications. For the benefit of the HPAC dispersion and meteorological models, the following processing steps are applied:

1. Removal of objects with small footprints, such as lampposts that would have minimal affect on dispersion results.
2. Simplification of complex buildings to optimize the database for query speed whilst retaining an appropriate level of dispersion modelling accuracy.
3. Construction of composite buildings by merging overlapping building footprints. Both higher building sections and enclosed spaces are modelled as additional building parts.

Below the text, a 3D rendering of a city block is shown, featuring several multi-story buildings with varying heights and architectural styles, rendered in a perspective view.

The browser window also shows a status bar at the bottom with the text "Weather edited", "NONE", "Map Scale: 25000.0", and coordinates "45.48828N, 103.85331W".

The desktop taskbar at the bottom includes the Start button, several open applications (HPAC 5.0 Service Pac..., Document - WordPad, HPAC 5 - Mozilla Firefox), and the system tray showing the time as 4:33 PM.

Biological Agent Toxicity and Infectivity

Biological Agent Toxicity

The biological agents included in HPAC include anthrax, botulinum, and staphylococcus enterotoxin B. Biological agents may produce either predominantly lethal or incapacitating effects. The lethality of the agent is the relative ease with which it causes death in a susceptible population, and depends on such factors as virulence and pathogenicity. Virulence is the relative severity of the disease produced by the agent. Pathogenicity is the capability of an infectious agent to cause disease once the required dose level has been achieved. Biological agents, such as anthrax and botulinum, normally have lethal effects.

The incapacitating agents usually do not kill healthy adults, but could cause death in high doses or in susceptible populations. The virulence of these non-lethal agents is much lower than the virulence of lethal agents. An example of a typical incapacitating agent is staphylococcus enterotoxin B, which is often implicated in food poisoning. Still, exposure to this agent in a tactical environment could result in massive doses that cause death.

Toxicity

Toxicity is a measure of the quantity of a substance required to achieve a given effect. The median lethal dose describes the degree of toxicity of a substance. HPAC uses dosage levels as an effects-contour level to express the range of a hazard area. The dose is the amount of the biological agent that the body takes in or absorbs.

Biological agents are inherently more toxic than chemical agents on a weight-for-weight basis and can potentially provide broader coverage per pound of payload than chemical agents. They are also potentially more effective because most are naturally occurring pathogens, like bacteria, viruses, fungi, and toxins. Biological agents are self-replicating and have specific physiologically targeted effects. In contrast, chemical agents are manufactured chemicals that disrupt physiological pathways in a general way.

Surface Dose

For biological agents, various LCT and ICT contours are available. These default contours are intended for quick, approximate estimates of hazard effects. HPAC also allows definition of contours specific to the user's application. Since the respiratory route is the most likely to cause casualties, doses of biological agents are quantified in terms of concentration time (CT), similar to chemical vapor or aerosols.

LCT-xx is the dosage of a biological agent that is lethal to xx% of exposed, unprotected personnel.

Other HPAC default contours include ECT-yy or ICT-yy contours which represent dosages that are Effective or Infective to yy% of exposed, unprotected personnel.

Weather edited: **NONE** Map Scale: 25000.0 37.81250N, 104.65379W

Plume Dynamics

HPAC Animation

HPAC does not create animation files but instead creates a set of image files that many standard animation software packages can turn into animation files. The selected plot is generated at each of the specified times. Each plot is sequentially added to the existing HPAC map display and an image file is created of the resulting display.

HPAC also allows the user to view or playback previously generated animations. An animation consists of a header file which lists the images files and the set of image files themselves. The header file is a simple ASCII file (default name *filename.alg*) containing a list of the image files, one per line, in the format Export: *imagefile* where *imagefile* is the name of the image file without a path specification. All other lines are ignored by the **Animation Viewer**. Images are replayed in the order specified in the header file. The header file and image files must reside in the same directory.

HPAC Animation

Start Stop First Previous Next Last Load... Delete

U238TN(Integrated Dose)
NWPN Radiation Dose
22-Apr-04 17:15:39Z (3.999722 hr)

	cGy (rad)
LD90/60	620.0
LD50/60	410.0
50% Vomiting	240.0
Combat Emer Risk	125.0
Combat Mod Risk	100.0
Combat Negl Risk	75.0

0 10 20 30
Frames per second

01:05
Frame

Exit

Map Scale: 25000.0 46.87500N, 103.89658W

Other Features

The screenshot displays the HPAC 5 software interface. The main window is a Mozilla Firefox browser showing a help page titled "Examples of ITRANS Usage". The page content includes:

Examples of ITRANS Usage

Rough Estimate for a HazMat Truck

Scenario: You want to get a very rough estimate of the worst-case downwind collateral effects of a terrorist attack against a HazMat truck. The only thing you know about the truck or its contents is that the material being transported is sulfur dioxide. The type of attack expected is with a few pounds of high explosive.

Approach: Use the Damage Category model.

An "Industrial Transportation Edit" dialog box is open, showing configuration for a truck named "ITrans". The dialog includes the following fields and options:

- Name:** ITrans
- Model:** Damage Category (selected), Quick Calculation
- Input:** Hazardous Materials: SULFOXDE_LIQ, ERG ID: 1079, Mode: Road, Vehicle: MC 331 (11,500 Gallons), Percent Full: 99%
- Info:** Hazmat source release computed.
- Damage:** Radio buttons for Light, Moderate, Severe, Total. The "Severe" option is selected.
- Options:** Compute button.
- Example:** A diagram of an MC-331 High Pressure Tank.
- Expulsion:** Results for Viable Airborne and Viable Pooled releases.

Category	Sub-category	Value
Viable Airborne	Total Expelled (kg)	18,900
	Vapor (kg)	10,800
	Aerosol (kg)	8,130
Viable Pooled	Pool Mass (kg)	17,000
	Destroyed Release	
Decomposed (kg)		
Burned (kg)		

The bottom status bar shows "Weather edited", "NONE", "Map Scale: 25000.0", and coordinates "45.00000N, 103.83167W". The taskbar at the bottom shows the Start button and open applications: HPAC 5.0 Service Pac..., Document - WordPad, and HPAC 5 - Mozilla Firefox. The system clock shows 4:35 PM.

Spills

The screenshot displays the HPAC 5 software interface within a Mozilla Firefox browser window. The browser address bar shows the file path: `file:///D:/HPAC5/help/Webhelp/HPAC_SSR.htm`. The main content area is titled "Liquid Pool Parameters Tab" and contains the following text:

The **Liquid Pool Parameters Tab** is used to set properties specific to a *liquid pool release*.

Mass: Total mass of material to be released. Mass units are taken from the material definition.

Size Group

X: Lateral spread of the liquid pool in the X direction.

A "Release Edit" dialog box is open, showing the "Liquid Pool Params" tab. It has two sub-tabs: "Location" and "Specification". Under "Specification", there are three input fields for "Size":

- X: 1.0 m
- Y: 1.0 m
- Z: default m

Below these fields is a "Mass" input field set to 10.0 kg. At the bottom of the dialog are "OK", "Cancel", and "Help" buttons.

The background interface shows a sidebar with a "Contents" list including items like "Release Editor", "Customized Properties", "Liquid Pool Parameters Tab", and "Plot Editor". The bottom status bar of the browser shows "Weather edited", "NONE", "Map Scale: 25000.0", and coordinates "45.48828N, 103.85331W". The Windows taskbar at the bottom shows the Start button and several open applications: "HPAC 5.0 Service Pac...", "Document - WordPad", and "HPAC 5 - Mozilla Firefox". The system clock indicates the time is 4:26 PM.

Stack Release

The screenshot displays the HPAC 5 software interface. The main window is a Mozilla Firefox browser showing the help page for the "Stack Parameters Tab". The page title is "Stack Parameters Tab" and the content states: "The Stack Parameters Tab is used to set properties specific to a stack release." A "Release Edit" dialog box is open, showing the "Stack Params" tab. The dialog box has two sub-tabs: "Location" and "Specification". The "Specification" sub-tab is active and contains the following fields:

- Particle/Droplet Distribution:**
 - Distribution: Log normal
 - Mass Mean Diameter: 1.0 μm
 - Mass Sigma: 1.1
- Duration/Rate:**
 - Duration: 30.0 min
 - Mass Rate: 0.1 kg/sec
- Stack:**
 - Diameter: 1.0 m
 - Exit Temperature: 60.0 C
 - Exit Velocity: 2.0 m/sec

The dialog box has "OK", "Cancel", and "Help" buttons. The background help page has a table of contents on the left with "Stack Parameters Tab" selected. The bottom status bar shows "Weather edited", "NONE", "Map Scale: 25000.0", and coordinates "48.51562N, 103.87494W". The taskbar at the bottom shows the start button and open applications: "HPAC 5.0 Service Pac...", "Document - WordPad", and "HPAC 5 - Mozilla Firefox". The system clock shows "4:26 PM".

AEGLs, ERPGs, and TEELs

The screenshot shows the HPAC 5 software interface within a Mozilla Firefox browser window. The main content area displays the 'AEGL/ERPG/TEEL Tab' with the following text:

This tab allows the user to view, enter, and/or modify Acute Exposure Guideline Levels (AEGLs), Emergency Response Planning Guidelines (ERPGs), and Temporary Emergency Exposure Limits (TEELs), for materials. This tab has tabs along the left edge for each of these.

Traditionally, only one set of guidelines has been used in HPAC. If AEGL values exist they should be used, otherwise use ERPGs, or TEELs. The interface will only allow you to input the values in parts-per-million (ppm) since that is how most levels are defined. The equation to go from ppm to mg/m3 is:

$$\text{mg/m}^3 = (\text{ppm})(\text{molecular weight})/24.45$$

And the equation to go from mg/m3 to mg-min/m3 is:

$$\text{Mg-min/m}^3 = (\text{mg/m}^3)(\text{Defined Exposure Duration})$$

For AEGLs, the defined exposure durations can be 10-min, 30-min, 1-hr, 4-hr, and 8hr.

For ERPGs the defined exposure duration is 1-hr.

For TEELs the defined exposure duration is 15 minutes.

Viewing and Editing AEGLs

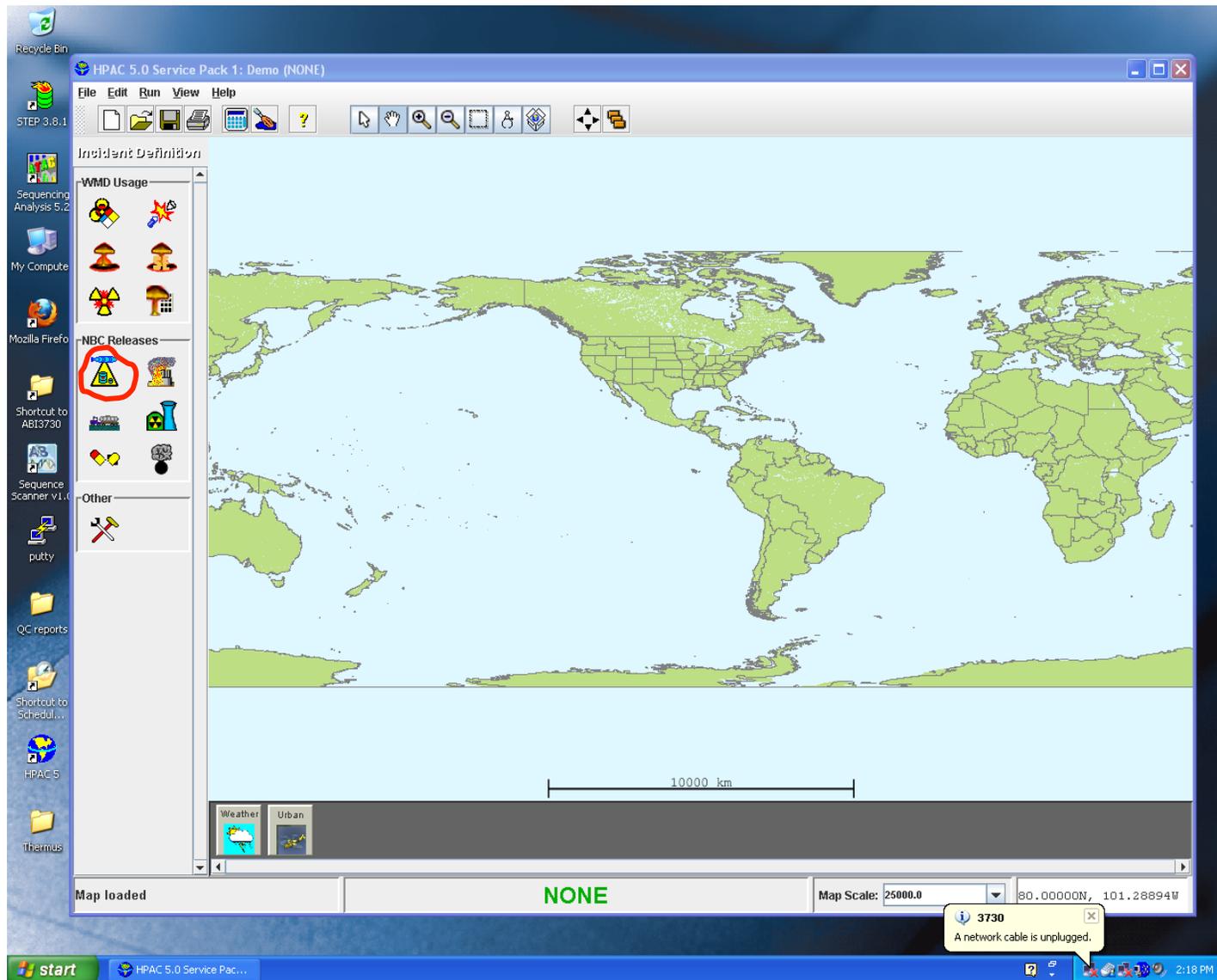
By selecting the AEGL tab on the left side of the AEGL/ERPG/TEEL Tab of the Material Editor, the user can view and edit AEGL values for the currently selected material.

The 'Material Editor' window is shown with the 'AEGL/TEEL/ERPG' tab selected. It contains a table with the following data:

Time (min)	ppm	mg/m ³	mg-min/m ³
10	0.0012	0.006876074	0.06876074
30	0.00068	0.0038964418	0.116893254

The interface also shows a sidebar with a 'Contents' list, a status bar at the bottom with 'Weather edited', 'NONE', and 'Map Scale: 25000.0', and a taskbar at the very bottom with the Windows Start button and several open applications.

Using the Package



HPAC 5.0 Service Pack 1: Demo (NONE)

File Edit Run View Help

Incident Definition

WMD Usage

Chemical/Biological Facility Incident Edit

Name: CBFac

Where What When Notes

Model

Quick Calculation

Detailed Model

Advanced Model

Precalculated Source

Input

Target

Confinement: Confined Agent: BRUCELLOSIS Facility Type: Storage Construction Type: Light Steel

Weapon

Warhead: 2000 lb GP PGM Location: Near Target

Default Compute Weather Customize...

Info

Location: refers to weapon placement. For confined targets this is the position relative to the structure. For unconfined targets this is the weapon position relative to the agent containers.

Output

Strike Condition

Total Viable Mass Expelled (kg):

Viable Agent Vapor (kg):

Viable Agent Aerosol (kg):

Agent Decomposed (kg):

Agent Burned (kg):

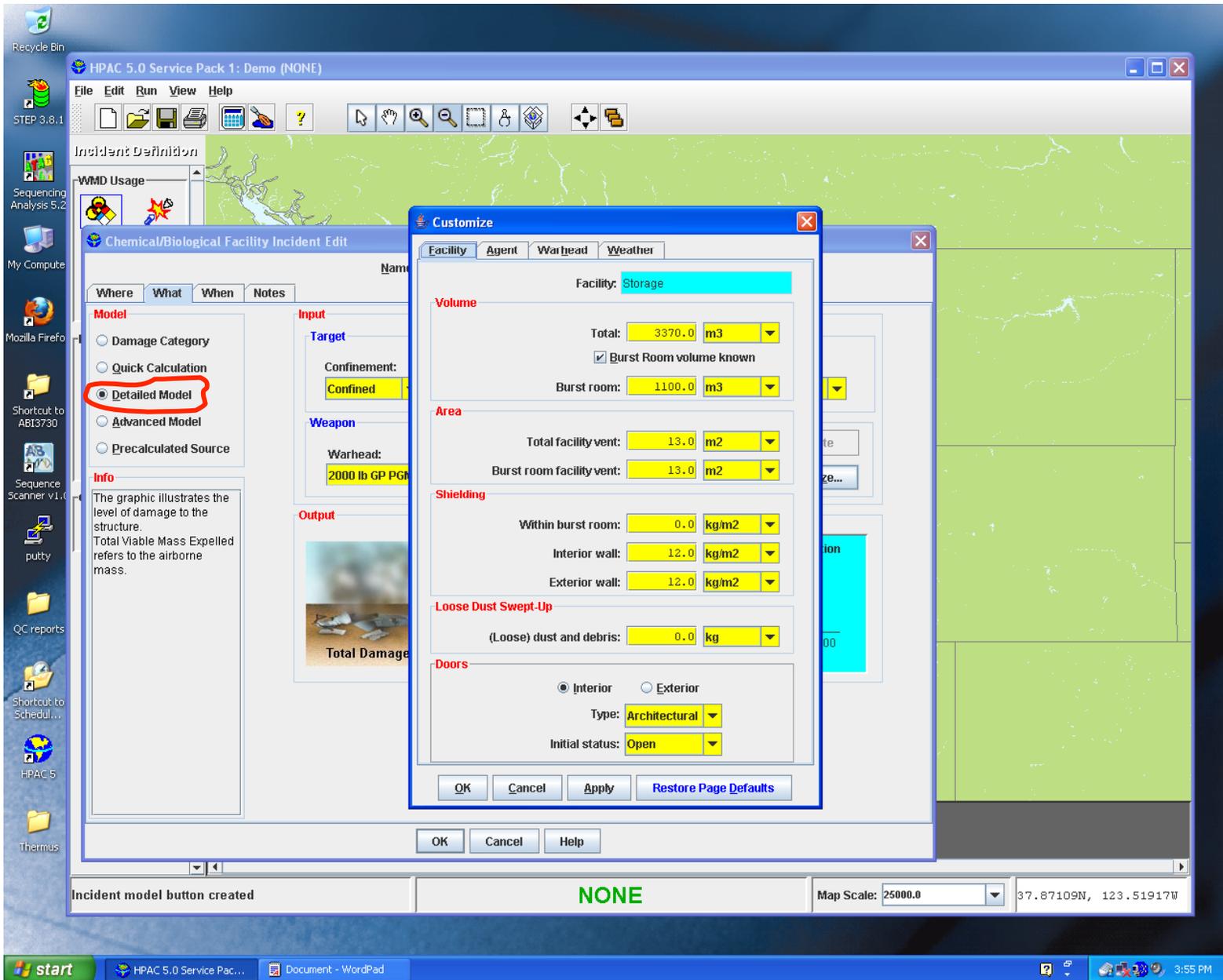
Viable Spill Mass (kg):

Viable Mass Distribution Not Available

mass (kg) 200 100 0 1 10 100 1,000 diameter (µm)

Incident model button created NONE Map Scale: 25000.0 37.75391N, 121.13936W

start HPAC 5.0 Service Pac... Document - WordPad 3:46 PM



Some Features Appear to Disable Full Menu

The screenshot displays the HPAC 5.0 Service Pack 1: Demo (NONE) software interface. The main window is titled "Incident Definition" and shows a map of a facility. A dialog box titled "Chemical/Biological Facility Incident Edit" is open, showing the "Advanced Model" selected. The "Agents" dropdown menu is circled in red, showing "ANTH_WET" and "(none)" options. The "Expulsion" section shows a graph of "Viable Mass Distribution" and a table of "Viable Airborne" data.

Chemical/Biological Facility Incident Edit

Name: CBFac

Where **What** **When** **Notes**

Model

- Damage Category
- Quick Calculation
- Detailed Model
- Advanced Model**
- Precalculated Source

Info

Advanced calculation: The Advanced Model has the highest level of modeling sophistication and gives you much more flexibility in defining the incident, although run times can be as long as two minutes.

Layout Damage State

W1 W2
A1a A1b
A2a A2b

Input

Target

Confinement: Confined Agents: 1 ANTH_WET Facility Type: Storage Construction Type: Light Steel

Weapon

Warheads: 1 2000 lb GP PGM Location: Inside Target
2 (none) (none)

Historical Compute
Weather Customize...

Expulsion

Agents: ANTH_DRY

Viable Airborne

Total Mass Expelled (kg):
Agent Vapor (kg):
Agent Aerosol (kg):
Viable Spilled/Poolled
Pool Mass (kg):
Destroyed Release
Agent Decomposed (kg):
Agent Burned (kg):

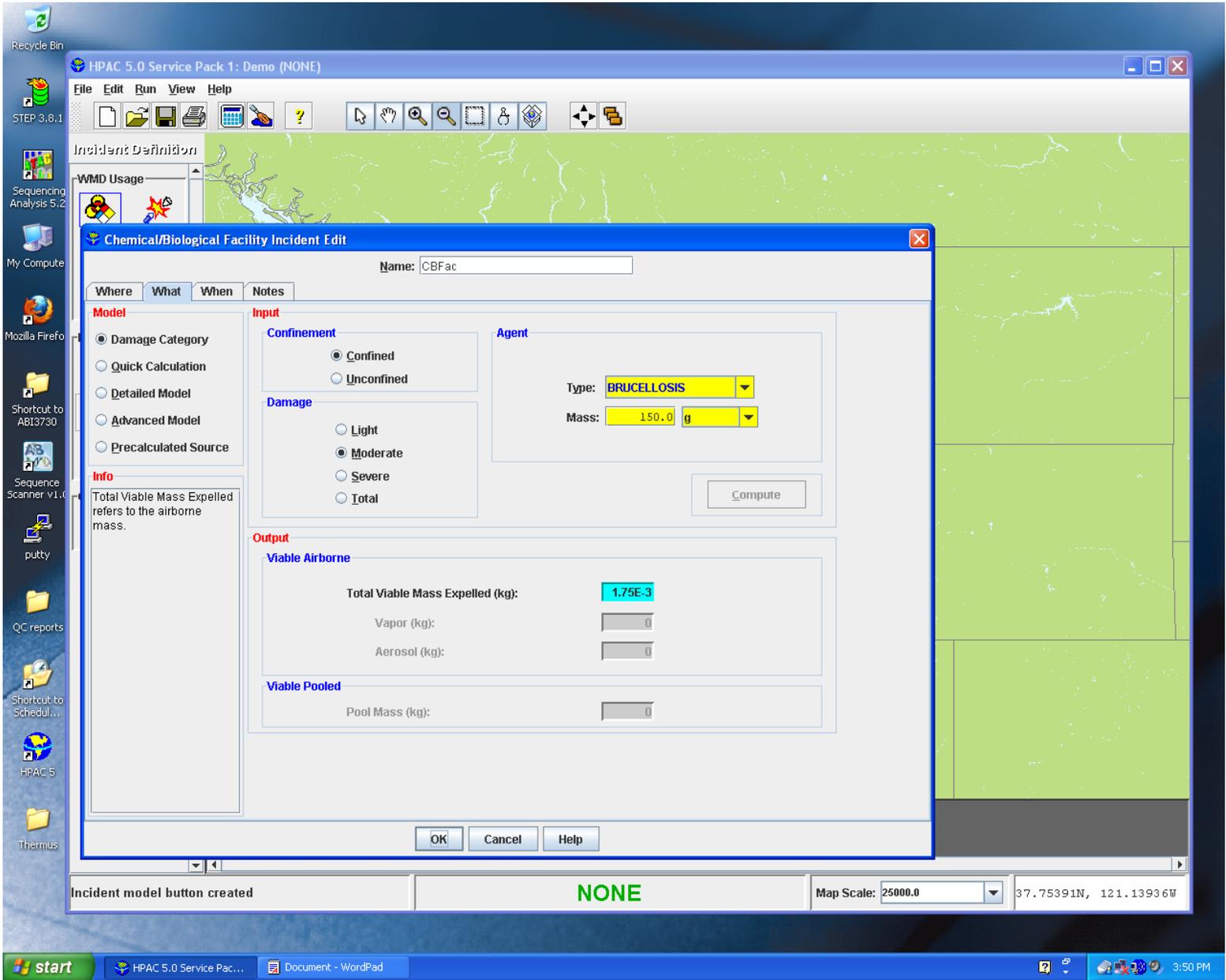
Viable Mass Distribution
Not Available

mass (kg)
300
200
100
0
1 10 100 1,000
diameter (µm)

OK Cancel Help

Incident model button created NONE Map Scale: 25000.0 37.75391N, 121.13936W

start HPAC 5.0 Service Pac... 3:45 PM



HPAC 5.0 Service Pack 1: Demo (NONE)

File Edit Run View Help

Incident Definition

WMD Usage

Chemical/Biological Facility Incident Edit

Name: CBFac

Where

What

When

Notes

Model

- Damage Category
- Quick Calculation
- Detailed Model
- Advanced Model
- Precalculated Source

Info

Total Viable Mass Expelled refers to the airborne mass.

Input

Confinement

- Confined
- Unconfined

Damage

- Light
- Moderate
- Severe
- Total

Agent

Type: BRUCELLOSIS

Mass: 150.0 g

Compute

Output

Viable Airborne

Total Viable Mass Expelled (kg): 1.75E-3

Vapor (kg): 0

Aerosol (kg): 0

Viable Pooled

Pool Mass (kg): 0

OK

Cancel

Help

Incident model button created

NONE

Map Scale: 25000.0

37.75391N, 121.13936W

start

HPAC 5.0 Service Pac... Document - WordPad

3:50 PM

HPAC 5.0 Service Pack 1: Demo (NONE)

File Edit Run View Help

Incident Definition

WMD Usage

Chemical/Biological Facility Incident Edit

Name: CBFac

Where What When Notes

Model

- Damage Category
- Quick Calculation**
- Detailed Model
- Advanced Model
- Precalculated Source

Input

Target

Confinement: **Unconfined** Agent: BRUCELLOSIS Container: User Defined Arrangement: Individual

Weapon

Warhead: 2000 lb GP PGM Location: Inside Target

Default Compute
Weather Customize...

Output

Strike Condition

Total Viable Mass Expelled (kg):
Viable Agent Vapor (kg):
Viable Agent Aerosol (kg):
Agent Decomposed (kg):
Agent Burned (kg):
Viable Spill Mass (kg):

Viable Mass Distribution Not Available

mass (kg) vs diameter (µm) graph

Incident model button created NONE Map Scale: 25000.0 37.87109N, 123.51917W

3730 A network cable is unplugged.

start HPAC 5.0 Service Pac... Document - WordPad 3:52 PM

HPAC 5.0 Service Pack 1: Demo (NONE)

File Edit Run View Help

Incident Definition

WMD Usage

Chemical/Biological Facility Incident Edit

Name: CBFac

Where What When Notes

Model

- Damage Category
- Quick Calculation
- Detailed Model
- Advanced Model
- Precalculated Source

Input

Target

Confinement: **Confined** Agent: **ANTH_WET** Facility Type: **Storage** Construction Type: **Light Steel**

Weapon

Warhead: **2000 lb GP PGM** Location: **Inside Target**

Default Weather Compute Customize...

Info

The graphic illustrates the level of damage to the structure. Total Viable Mass Expelled refers to the airborne mass.

Output

Total Damage

Total Viable Mass Expelled (kg):	4.65E-4
Viable Agent Vapor (kg):	0
Viable Agent Aerosol (kg):	0
Agent Decomposed (kg):	0
Agent Burned (kg):	9.92E-3
Viable Spill Mass (kg):	0

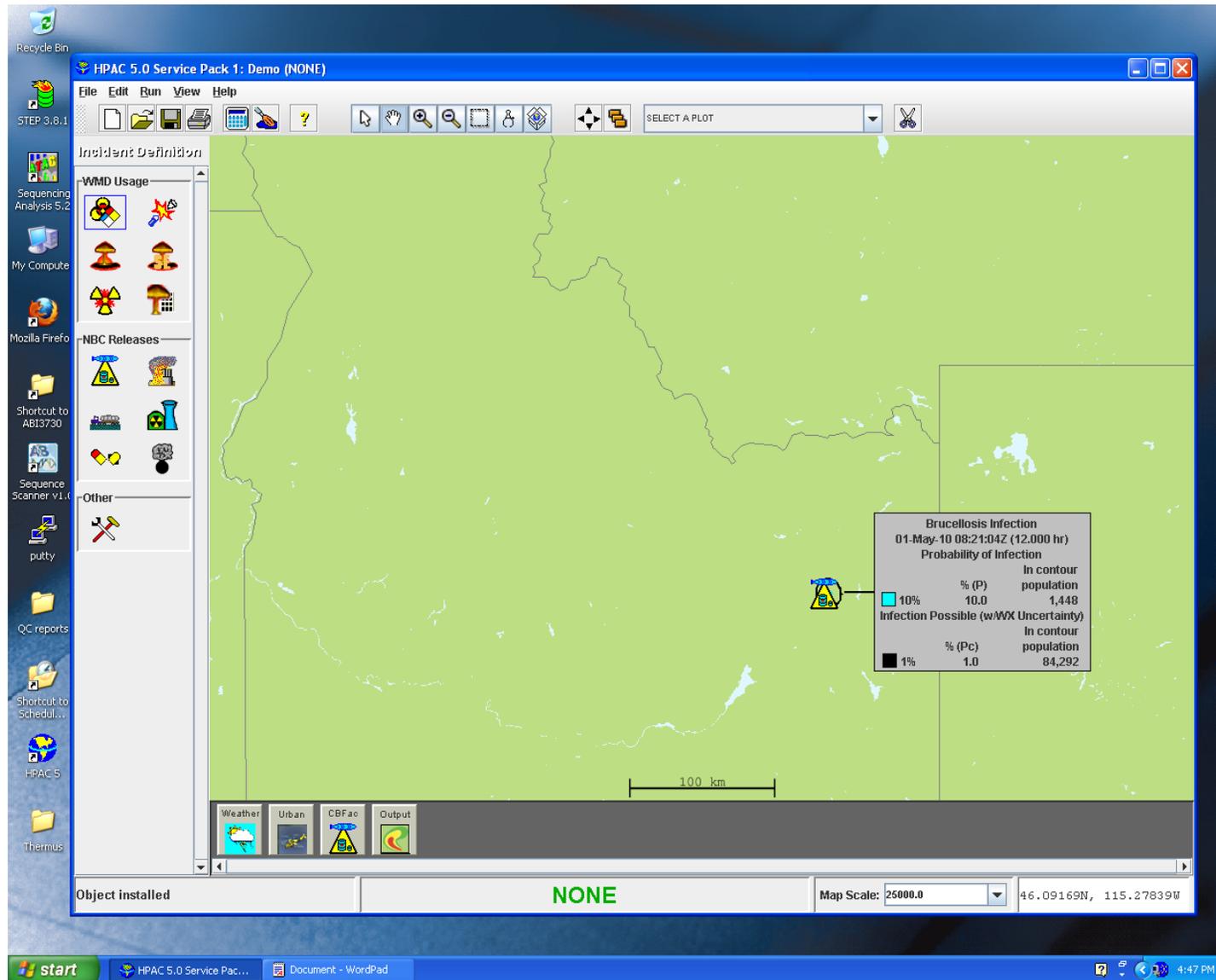
Viable Mass Distribution

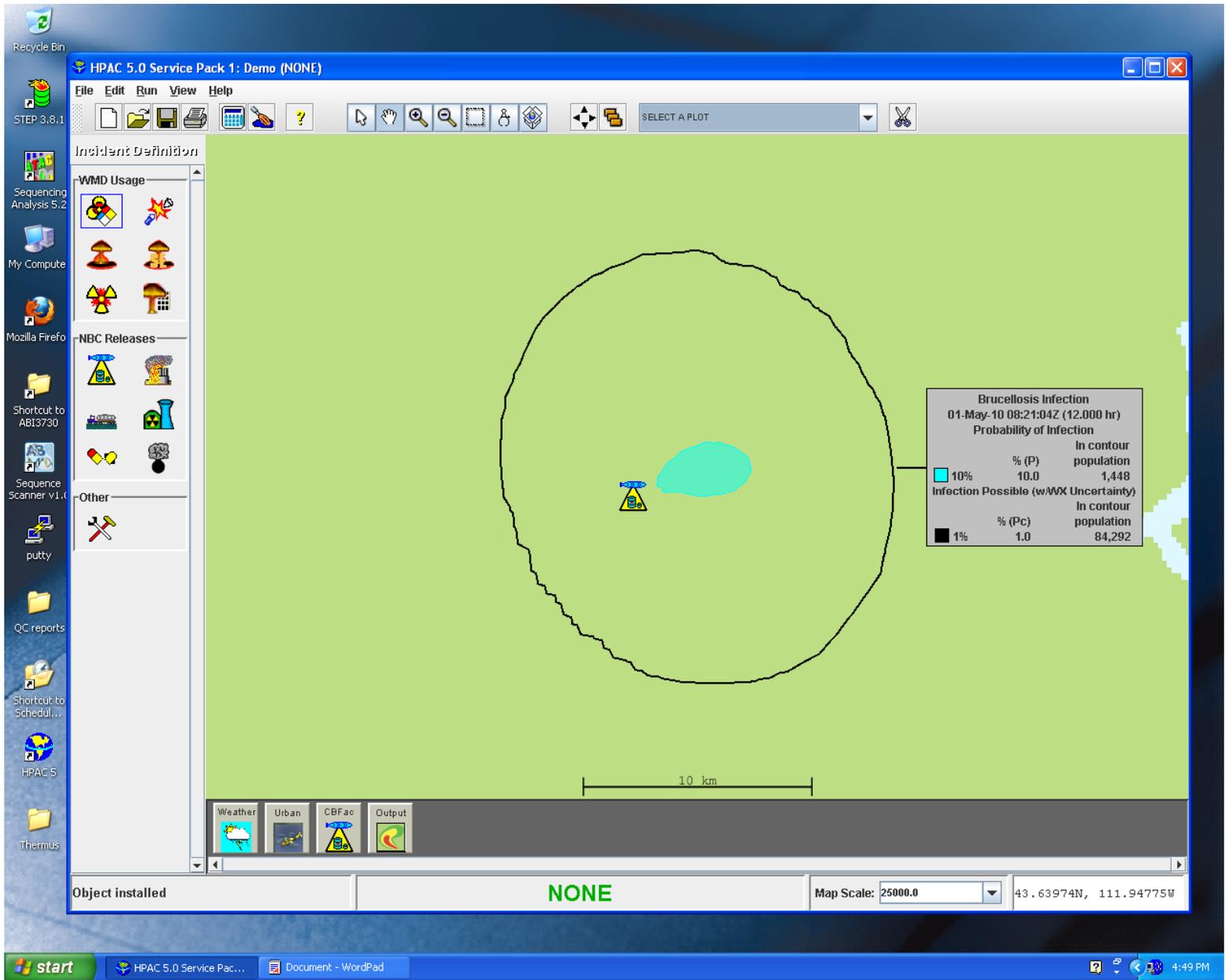
OK Cancel Help

Incident model button created **NONE** Map Scale: 25000.0 37.87109N, 123.51917W

start HPAC 5.0 Service Pac... Document - WordPad 3:58 PM

Predictions





Conclusions

- HPAC is a comprehensive, simple-to-use modeling package (from limited experience by non-expert)
- HPAC is integrated with real-time weather data (DTRA Meteorological Data Server)
- Speed of computation and ability to use the stand-alone package allow testing of many different scenarios
- Facility scenarios will be most useful to BWG users
- Urban dispersal model was not tested but may be extremely useful