![Sonoma Technology, Inc. logo - STi - Air Quality Research and Innovative Solutions]

To: Mr. John Cissel, Program Manager, Joint Fire Science Program

From: Ms. Tami Funk

Re: Software Test Assessment for the Interagency Fuels Treatment Decision Support System
        Proof-of-Concept System

        This technical memorandum describes the testing and quality assurance procedures, tools,
and information gathering techniques used to test the Interagency Fuels Treatment Decision
Support System Proof-of-Concept (IFT-DSS POC) Versions 0.1.0, 0.2.0, and 0.3.0.

IFT-DSS POC TEST PROCESS

        The overall process used for testing IFT-DSS POC software involved both internal
testing and external testing. Internal testing was conducted to ensure that the software adheres to
design specifications, meets functional requirements, meets stability and performance
requirements, and produces accurate information. External user acceptance testing was
conducted to ensure that the IFT-DSS POC meets the functionality and usability needs of users.

        STI's internal IFT-DSS POC testing involved unit, integration, and system testing; quality
control of system output; and quality assurance of system components. As of May 2010,
approximately 30 active users are in the external test group; group members interact with IFT-
DSS POC and provide feedback about the system to the STI development team.

Internal Testing

        The individuals who performed internal software testing of IFT-DSS POC have diverse
backgrounds; they include the IFT-DSS POC software engineering team, STI's quality assurance
team, and STI subject matter experts and analysts.

        The following types of tests were performed by the IFT-DSS POC software engineering
team:

- Unit (or module) testing verifies that all software components with an input and/or an
  output operate correctly.

- Integration testing ensures that no conflicts exist between two or more components
  designed to work together.

- System testing confirms that the complete system meets all software requirements.

The quality control testing conducted by STI's subject matter experts involved creating sample use cases, assembling real-world input data for each test case, and testing the validity of IFT-DSS POC output data against independent versions of the FlamMap and Consume 3.0 software applications. FlamMap model output was tested by comparing FlamMap outputs run through IFT-DSS POC to those produced by the desktop version of FlamMap for the same input data and parameters. IFT-DSS POC runs the natural fuel consumption modules of Consume by connecting to the BlueSky Playground via a web-service call, so BlueSky Playground output was used to test the output from the Consume model.

Software quality assurance analysts (SQAAs) performed quality assurance testing on each version of the IFT-DSS POC software (0.1.0, 0.2.0, and 0.3.0) to ensure that the software and user community requirements for IFT-DSS POC were met throughout the software development process. System testing was performed for non-functional components such as usability, stability, multiuser, scalability, and reliability. Regression testing was applied to ensure that defects found in earlier versions of the software were no longer present in subsequent versions.

Appendix A includes an overview of the high-level use cases for users, system administrators, and model authors. Appendix B illustrates several example use cases used to quality control and quality assure IFT-DSS POC.

External Testing

The IFT-DSS POC user community provided feedback about the defects they found, the system's ease of use, and functions they would like to see implemented in the system. This information was gathered through a feedback form on the IFT-DSS POC website; the form data was collected by STI's JIRA issue and project management software and then reviewed by Stacy Drury (the user feedback liaison to the project) and the entire project team. After gaining additional information from project team members, the feedback was broken into actionable items, catalogued, assigned a priority, and given an indicator identifying the version of the software in which it would be implemented. A report of user feedback and results was generated before the launch of each new IFT-DSS POC version. **Figure 1** illustrates the process for managing user feedback.

After each version of IFT-DSS POC passed internal testing, it was uploaded to the external IFT-DSS POC website (http://iftdss.sonomatech.com). Mr. Drury notified the user community of the availability of each new release and responded personally to all user feedback. Appendix C summarizes the user feedback received as of May 21, 2010, and indicates the status of each item.

IFT-DSS User Feedback Process

Internal Issue is entered into JIRA

External User Submits New Feedback

Feedback Inserted into JIRA

Stacy Notified via Email, Reviews Feedback in JIRA, and Responds to User

Stacy Adds Additional Information or Closes Issue if it is a Duplicate

Technical Lead Makes a Time Assessment and Adds any Additional Information

Additional Information Required? —No

Yes

QA or Other Team Members Review Issue and Add Additional Information into JIRA

Summary Report of all New Feedback is Generated

Summary Report Reviewed by Brad & STI to Determine Priority

Technical Lead Updates Issue Priority and Assigns it to a Developer

Developer Implements an Issue and Marks it as Resolved in JIRA

QA Verifies Correct Implementation of Issue

Correctly Implemented? —Yes

No

QA Reopens Issue and Adds Additional Information

QA Closes Issue in JIRA & Stacy Notifies the User that it has been Resolved.

More Issues in JIRA for this Release?

Yes

No

When a Release is made available to External Testers Release Notes are Generated

Summary Report of all Work for the Next Release is Generated
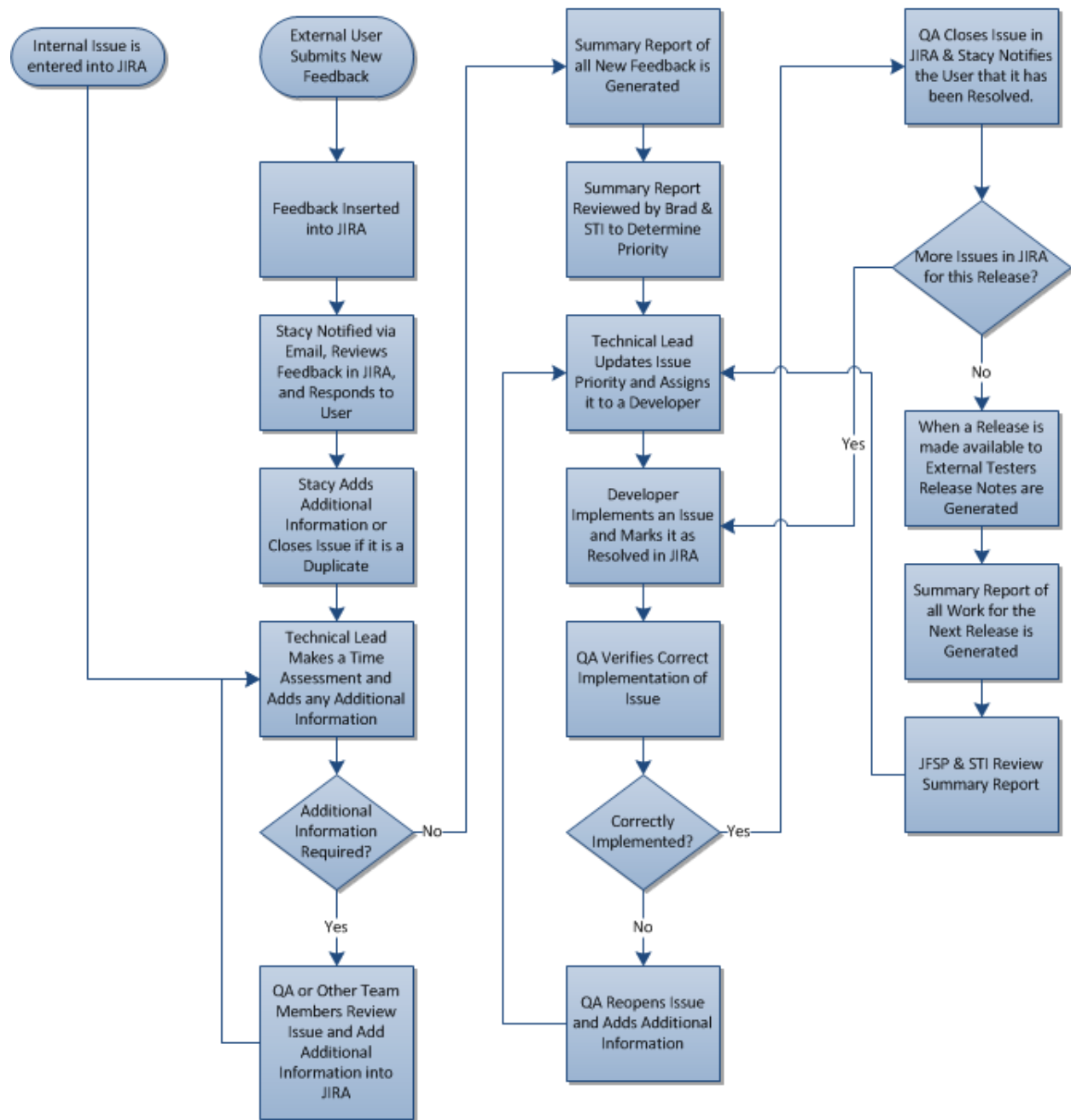
JFSP & STI Review Summary Report

Figure 1. Feedback from the IFT-DSS POC test user community was collected and analyzed by the development team, who responded to the testers and determined whether the feature would be incorporated in subsequent versions of the system.
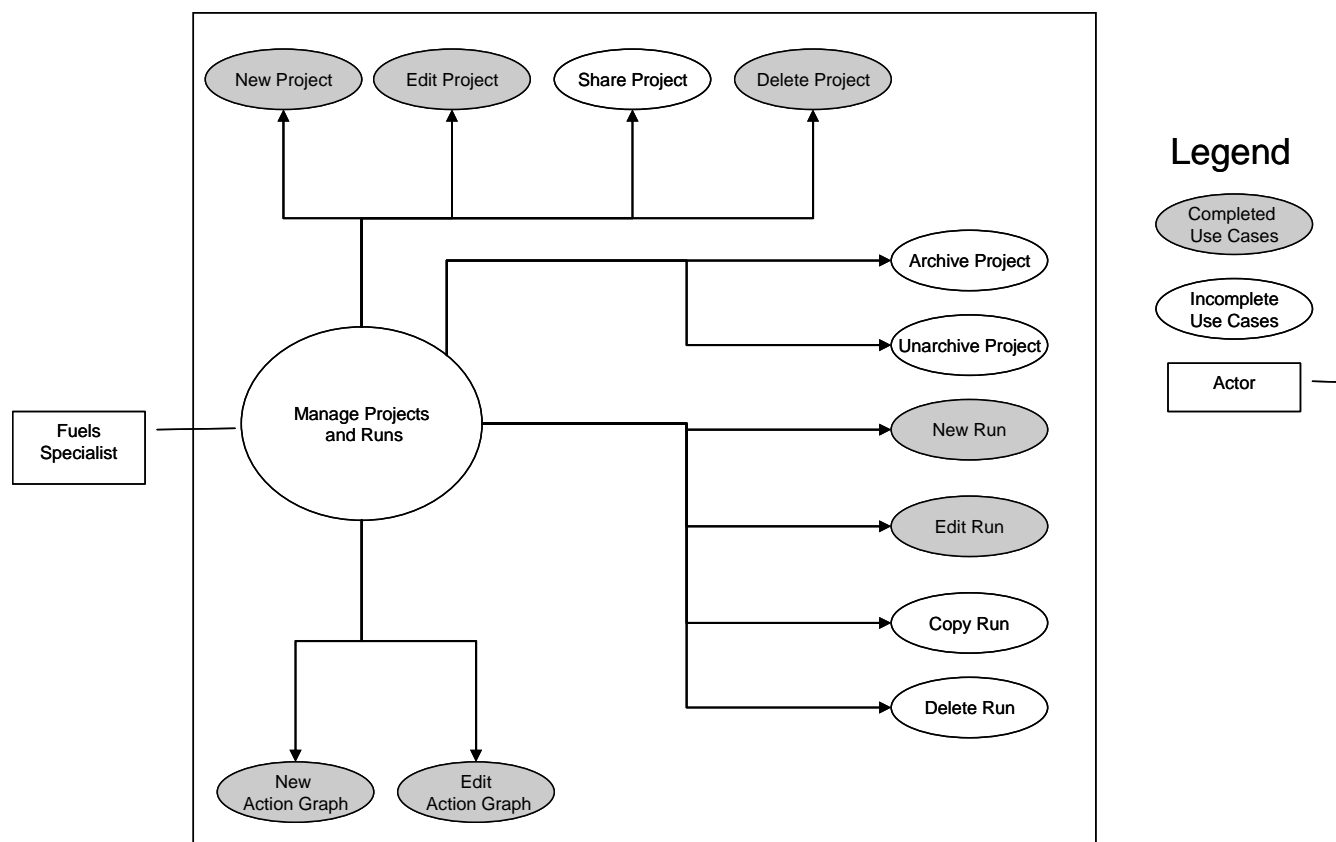
Summary of Testing Tools Used

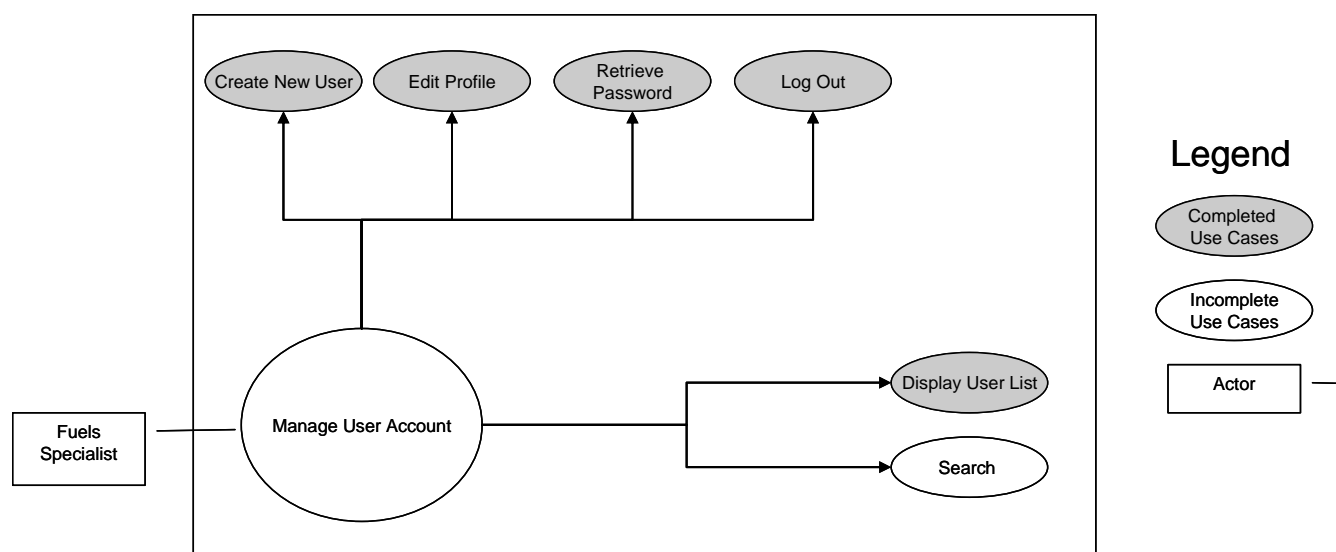Several software diagnostic tools were used in IFT-DSS POC testing:

- Website visitor information was gathered using Google Analytics, which tracked visitor usage, browser capabilities, and trends.

- The web-based user interface was tested using Microsoft Internet Explorer 6 and 8, Mozilla Firefox 3, and Google Chrome 4. According to Google Analytics, approximately 56% of site visitors used Internet Explorer, 27% used Firefox, and 17% used Chrome over the past three months.

- All IFT-DSS POC test issues and enhancements were documented and managed using JIRA, STI's internal bug tracking and project management software.

- JUnit was used to unit test the backend system components.

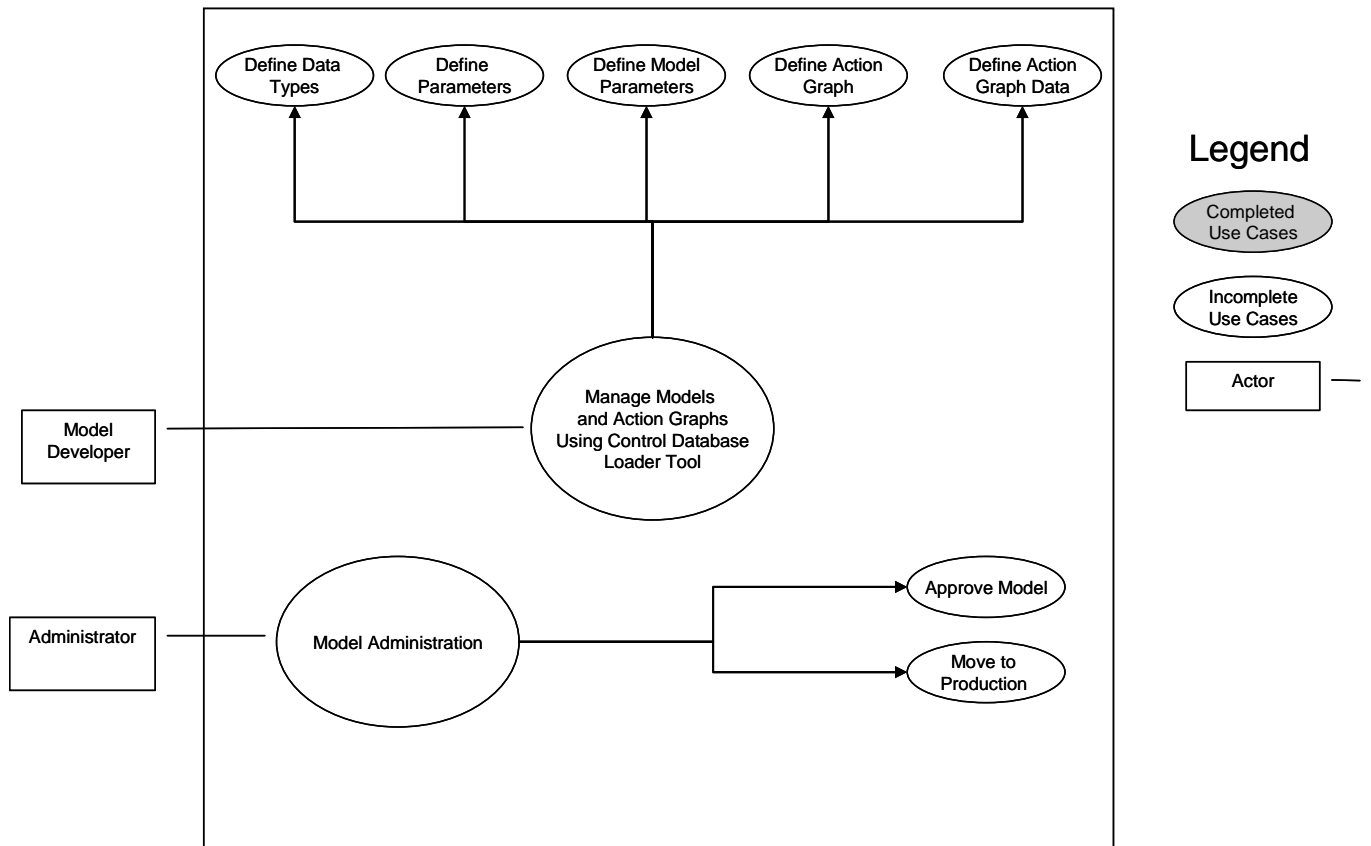# APPENDIX A: USE CASE OVERVIEWS FOR IFT-DSS POC

Use Case Overview 1 — Management of Projects and Runs

Use Case Overview 2 — User Administration

Use Case Overview 3 — Model Administration (this use case is a work in progress)

APPENDIX B: EXAMPLE USE CASES FOR TESTING IFT-DSS POC

Use Case 1 — New Run

Use Case	Add a new run to a project
Description	The user wants to add a new run to a project that has already been created
Actor	Fuels specialist
Assumptions	This could be either the first run or a subsequent run of a project the actor has already set up

Steps	1. User selects the project and chooses Manage Run OR User selects the Run tab
	2. User selects the New button
	3. The Run Details screen is displayed (see below)
	   a. If the user selected a project in step 1, then Project is displayed and cannot be changed. If no project is selected, the user must enter a project (the fields below will be disabled until a project is entered).
	   b. User enters a unique Run Name (one that has not been used previously in this project)
	   c. User selects an Objective and Scenario (must be a valid combination)
	   d. User may enter a Description and/or Location
	   e. System displays the Date created (the current date) and the Author
	   f. Date Last Run is blank
	4. User selects Save button
	5. Proceed to New Action Graph test case

Variations	Click the Cancel button in Run Details to exit without saving the run

Use Case 2 — Edit Run

Use Case	Edit an existing run in a project
Description	The user wants to edit an existing project for which at least one run has been created
Actor	Fuels specialist
Assumptions	This could be either the first run or a subsequent run of a project the actor has already set up

Steps	1. User selects the project and chooses Manage Run
	OR
	User selects the Run tab
	2. User chooses a run and clicks the Edit button
	3. The Run Details screen is displayed with the existing information
	   a. User cannot edit the Run Name, Project, Objective, Scenario, Date Created, Date Last Run, or Author
	   b. User can edit the Description and Location
	4. User selects the Save button
	5. Proceed to Edit Action Graph test case

Variations	Click the Cancel button in Run Details to exit without saving any changes

Use Case 3 — New Action Graph

Use Case	Create a new Action Graph
Description	The user wants to execute a new run
Actor	Fuels specialist
Assumptions	This is the first time the actor is executing an Action Graph for a current project with pre-existing run information
Steps	1. The screen is comprised of the Action Graph and the Data Section 2. The Action Graph is selected based on the Objective and Scenario combination chosen in the Run Details screen; it is displayed and used to execute the work 3. The node currently being worked on appears in turquoise 4. Once the information in the Data Section is complete, the user selects one of the next model input nodes (shown in yellow). The system will highlight the new node in turquoise and its Data Section is displayed. The previous node becomes gray (yellow in the current version). The user repeats these steps for all model input nodes. 5. To run a model, the user clicks the salmon output node a. The input node changes to gray (yellow in the current version), the model is executed, the model oval is changed to gray, the output node becomes turquoise, and the output data appears in the Data Section 6. Whenever a model is run, the Date Last Run is reset to the current date 7. To close the screen and exit, the user clicks an Exit button or the X. If any models have not yet been executed (shown in salmon), the system asks "are you sure?"
Variations	1. The user may import information into a node from a CSV file 2. The user may export information from the output node to a CSV file 3. After running the model, the user clicks one of the input nodes again

Use Case 4 — Edit Action Graph

Use Case	Edit an existing Action Graph
Description	The user wants to display and possibly edit/rerun a previous run
Actor	Fuels specialist
Assumptions	The user wants to examine the results of a run for an existing project and possibly rerun it
Steps	1. The screen shows the Action Graph and Data Section 2. The Action Graph node that was last executed/saved appears in turquoise. The Data Section corresponding to the highlighted node is displayed (if it is an output node, the model will not be rerun but will display details from the previous run). 3. If the user navigates to any model input node, the model output nodes "down stream" change back to salmon to indicate that they need to be rerun 4. When any model is rerun, the Date Last Run resets to the current date 5. When done, the user clicks an Exit button or the X to close the screen and exit. If any models have not yet been executed (shown in salmon), the system asks "are you sure?"
Variations	1. Import information from a CSV file into a node 2. Export information from the output node to a CSV file

APPENDIX C: SUMMARY AND STATUS OF IFT-DSS POC
USER FEEDBACK AS OF MAY 18, 2010

Summary	Description	Status	Res	Created	Fix Version/s
Help Information about Canopy Variables	Help Information about Canopy Variables	Closed	Fixed	17/Mar/10	0.2.0
Add Crown bulk density charts or lookup functions	Add Crown bulk density charts or lookup functions	Closed	Fixed	17/Mar/10	0.2.0
How is midflame windspeed derived?	How is midflame windspeed derived?	Closed	Fixed	17/Mar/10	0.2.0
What is horizontal movement versus Rate of spread?	What is horizontal movement versus Rate of spread?	Closed	Fixed	17/Mar/10	0.2.0
Export Inputs as well as Outputs	Export Inputs as well as Outputs	Closed	Fixed	17/Mar/10	0.2.0
Option to Change Units of Measure	Option to Change Units of Measure	Closed	UNRESOLVED	17/Mar/10	0.3.0
Translate Output to Shapefile	Translate Output to Shapefile	Closed	Implemented	17/Mar/10	0.3.0
Under Settings tab: What is Easting & Northing	Under Settings tab: What is Easting & Northing	Closed	Fixed	17/Mar/10	0.3.0
Replace Text box Interface w/ Map Interface	Replace Text box Interface w/ Map Interface	Closed	Implemented	17/Mar/10	0.3.0
Landscape fuel models loaded from GIS	Landscape fuel models loaded from GIS	Closed	Implemented	17/Mar/10	0.3.0
Flamemap outputs in map format	Flamemap outputs in map format	Closed	Implemented	17/Mar/10	0.3.0
No Variation in outputs when moisture inputs change	No Variation in outputs when moisture inputs change	Open	UNRESOLVED	17/Mar/10	0.4.0
Wind Speed Variable Option	Wind Speed Variable Option	Open	UNRESOLVED	17/Mar/10	0.4.0
Move Wind Speed from Settings	Move Wind Speed from Settings	Open	UNRESOLVED	17/Mar/10	0.4.0
Input data not saved when switching tabs	Input data not saved when switching tabs	Open	UNRESOLVED	17/Mar/10	0.4.0
Allow for fewer fuel models	Allow for fewer fuel models	Open	UNRESOLVED	17/Mar/10	0.4.0
Landscape fuel models should pre-populate Moisture fuel models	Landscape fuel models should pre-populate Moisture fuel models	Open	UNRESOLVED	17/Mar/10	0.4.0
Add Fuel Moisture Guidelines	Add Fuel Moisture Guidelines	Open	UNRESOLVED	17/Mar/10	0.4.0
Add More Export Formats	Add More Export Formats	Open	UNRESOLVED	17/Mar/10	0.4.0
Grey out unnecessary inputs for certain fuel models	Grey out unnecessary inputs for certain fuel models	Open	UNRESOLVED	17/Mar/10	0.4.0
Color or Shade Fuel Models on Output Screen	Color or Shade Fuel Models on Output Screen	Open	UNRESOLVED	17/Mar/10	0.4.0
Easting/Northing should not reset	Easting/Northing should not reset	Open	UNRESOLVED	17/Mar/10	0.4.0
Ability to vary wind speed	Ability to vary wind speed	Open	UNRESOLVED	17/Mar/10	0.4.0
Changing moisture inputs causes Zero's in outputs	Changing moisture inputs causes Zero's in outputs	Open	UNRESOLVED	17/Mar/10	0.4.0
Modify Project Boundary inputs	Modify Project Boundary inputs	Open	UNRESOLVED	17/Mar/10	0.4.0

Summary	Description	Status	Res	Created	Fix Version/s
US or Metric for graphs	While using the graphs for the flammap, can you provide and option to have english or metric as a unit of measure for the Y axis?	Open	UNRESOLVED	26/Apr/10	0.4.0
Define number of columns in FlamMap run	For the flammap run, moisture compartment, would it be possible to customize the number of fuel models? It would be nice to limit the number of categories to only a few.	Open	UNRESOLVED	26/Apr/10	0.4.0
Use historical wind speed and direction?	Use historical wind speed and direction?	Open	UNRESOLVED	17/Mar/10	1.0.0
Help navigating Action Graph	While navigating through the consume run, it wasn't intuitive which buttons to click in order to get the model to "run" the consume program.	Open	UNRESOLVED	26/Apr/10	1.0.0
How or where is the population of TLFM & LFM coming from?	How or where is the population of TLFM & LFM coming from?	Open	UNRESOLVED	17/Mar/10	