

**FIRE EMISSIONS TRACKING SYSTEM WHITE PAPER**  
**Rev – July 31, 2006**

**INTRODUCTION**

This White Paper presents to the Fire Emissions Joint Forum (FEJF) of the Western Regional Air Partnership (WRAP) a summary of the current products and proposed next steps pertaining to the Fire Emissions Tracking System (FETS) for the WRAP. This White Paper includes:

- A restatement of the purpose and objectives of the FETS.
- The status of the Fire Tracking System (FTS) Evaluation Project.
- The conclusions of the FTS Evaluation Project.
- The proposed next-steps to evolve the conclusions of the FTS Evaluation Project to an operable FETS for the WRAP.
- Recommendations for the technical and contracting approaches to develop an operable FETS for the WRAP, including a proposal to develop a commodity-based FETS.

The WRAP and the FTS Task Team endorse this proposal for the following reasons.

This approach is expected to:

- o have a high probability of success,
- o be ready on-schedule and accepting data uploads by January 2007,
- o fall within WRAP budget constraints,
- o efficiently accommodate data exchanges from currently operational FTSs,
- o seamlessly integrate fire emissions data with other technical data and SIP tools in the WRAP's Technical Support System (TSS), and
- o will streamline regional coordination.

The purpose of this White Paper is to provide the FEJF sufficient information to develop consensus on the technical and contract approaches to develop an operable FETS for the WRAP.

**PURPOSE AND OBJECTIVES OF THE FETS**

In April 2003, the WRAP approved by consensus the WRAP Policy on Fire Tracking Systems. The salient aspects of the WRAP Policy on Fire Tracking Systems are presented here.

The EPA's Regional Haze Rule (Rule) requires states to develop implementation plans (SIPs) for addressing regional haze in the Nation's 156 mandatory Class I areas. Additionally, the Rule requires effective management of fire sources. The Rule provides two pathways for western states to follow as they implement the requirements of the Rule: 1) develop their regional haze implementation plans per the nationally applicable

provisions of Section 308, or 2) Transport Region States may choose to incorporate the Grand Canyon Visibility Transport Commission (GCVTC) Recommendations into their regional haze implementation plans under Section 309 of the Rule.

The WRAP Policy on Fire Tracking Systems advances the position that it is necessary to track fire activity information in the WRAP region using a fire tracking system, which will also provide the essential information required to create fire emissions inventories. The WRAP Policy on Fire Tracking Systems identifies seven critical components of a fire tracking system that represent the minimum spatial and temporal fire activity information necessary to consistently calculate emissions and uniformly assess impacts to regional haze, thereby meeting the requirements of the Rule. These seven elements are:

1. Date of Burn
2. Burn Location
3. Area of Burn
4. Fuel Type
5. Pre-Burn Fuel Loading
6. Type of Burn
7. “Anthropogenic” or “Natural” Classification

In addition, a fire tracking system should include additional components as needed to account for the application of Emission Reduction Techniques (ERT) and to support the development and implementation of annual emission goals (AEG). The FTS Task Team regards the ERT functions of the FETS to be critical for smoke management and regional haze planning purposes.

Sections 308 and 309 of the Rule specifically require an emissions inventory and tracking system for fire events. The FTS and WRAP emissions inventory system are regional approaches to the data gathering and tracking initiatives, which are specifically encouraged in the Rule. Therefore, by following the recommendations, the WRAP is advancing the WRAP FTS Policy for states and tribes under both Sections 308 and 309, thus meeting the requirements of the Rule.

It is intended that the FETS be a platform for consistently tracking fire activity and fire emissions across all jurisdictions within the WRAP. Data from the FETS which will be made available to States/Tribes for use in Regional Haze planning include but are not necessarily limited to:

- Real time reviews of planned Rx fires to support ESMP decision making and facilitate regional coordination between ESMP programs.
- Output of fire emissions data for state or regional modeling purposes.
- Output of annual fire emissions data for NEI reporting purposes.
- “Seed data” for the Calculation Tool to build planning emission inventories (projections).
- Information on the application of ERTs to support demonstration of meeting Annual Emission Goal commitments.

## FIRE TRACKING SYSTEM (FTS) EVALUATION PROJECT.

The Fire Tracking System Task Team (FTS Task Team) initiated the development of the FETS by contracting Air Sciences Inc. and EC/R to evaluate existing fire tracking systems for their suitability to serve as the WRAP's FETS. The primary objectives for the FETS review were to:

- Identify an existing FTS system (if any), that, with few or minor modifications, will satisfy the WRAP's requirements for an FTS.
- Review web-based and historical systems (e.g., wildfire systems).
- Evaluate existing FTSs placing primary emphasis on real-time data import and export capabilities.
- Evaluate existing FTSs from the perspective of an FTS user.
- Evaluate existing FTSs and provide:
  - An assessment of the feasibility of each FTS to function as the WRAP's FETS.
  - A short list of FTSs (likely candidates for the WRAP's FETS) which were assessed for the feasibility, necessity and cost of technical modifications.
  - An analysis of the modifications necessary for each short-listed system to meet the WRAP's technical and usage needs for an FETS.
  - An estimate of resources needed to modify each short-listed FTS in order to meet the WRAP's technical and usage requirements for a successful FETS.
  - Recommendations to the FEJF as to the best approach for developing an operable FETS within the budget constraints of the WRAP and schedule constraints of WRAP states and Tribes.

The information gathering and assessment portions of the FTS Evaluation Project have been completed. These findings and recommendations of the project were presented at the FEJF meeting in Albuquerque, NM on March 7, 2006 and are further discussed in the subsequent section of this White Paper. The documentation is soon to be posted at the FEJF's FTS web page.

## CONCLUSIONS OF THE FETS EVALUATION PROJECT

The conclusions to the FTS Evaluation Project were developed as answers to a series of questions listed in the Workplan for the project. (See the FTS Evaluation Report for the details of the analysis and the conclusions.) The questions and associated answers are provided below:

1. What existing FTS would work best "as-is" for the WRAP's FETS?

MT/ID FTS. The MT/ID FTS is a currently functioning system that supports burn managers in the states of Montana and Idaho. The system uses an SQL Server database that can meet the needs of the WRAP region, and the user interface is fully functional.

2. What existing FTS would require the least amount of modification to work well as the WRAP FETS?

NM FTS. By upgrading the Access database to SQL Server, the New Mexico FTS becomes a system capable of meeting current and future WRAP needs. The Project Team has estimated that 120 labor hours would be required to do this upgrade. NM FTS already supports limited emissions estimation (PM<sub>10</sub>), and it generates maps of burn locations. These features are not supported in the existing versions of the MT/ID FTS and USDA FTS, and would require approximately 140 labor hours to fully implement in the NM FTS.

3. What combination of existing FTS, technical modifications, and exceptional features from other FTS would comprise a WRAP FETS with the most complete set of features and capabilities?

Modified version of the MT/ID FTS (assuming the current manager proceeds with the planned interactive GIS upgrade). The MT/ID FTS has the advantage over using the New Mexico FTS because it already uses an SQL Server database. The Project Team preferred the MT/ID FTS over the USDA FTS because the preferred interactive GIS system is already being designed for the MT/ID FTS, and the USDA FTS is not yet in production mode (at the time that the FTS Evaluation Project was being executed).

4. What are the benefits of building the WRAP's FETS from an existing FTS?

Each FTS already incorporates many of the essential features. Two of the current systems will include the preferred GIS capability. Furthermore, the time and money already spent could be considered a down-payment on building the WRAP's FTS.

5. Is there a better but alternate way for the WRAP to proceed with building the WRAP FTS?

Yes. The FTS Task Team, its contractor, and the WRAP have agreed that a commodity-based FETS approach would be the most timely, efficient, cost-effective, method to build an operable, stable, and user-friendly FETS. This FETS would be accessible to any of the WRAP states and Tribes and would efficiently accommodate data exchanges from any state/tribal FTS currently in operation.

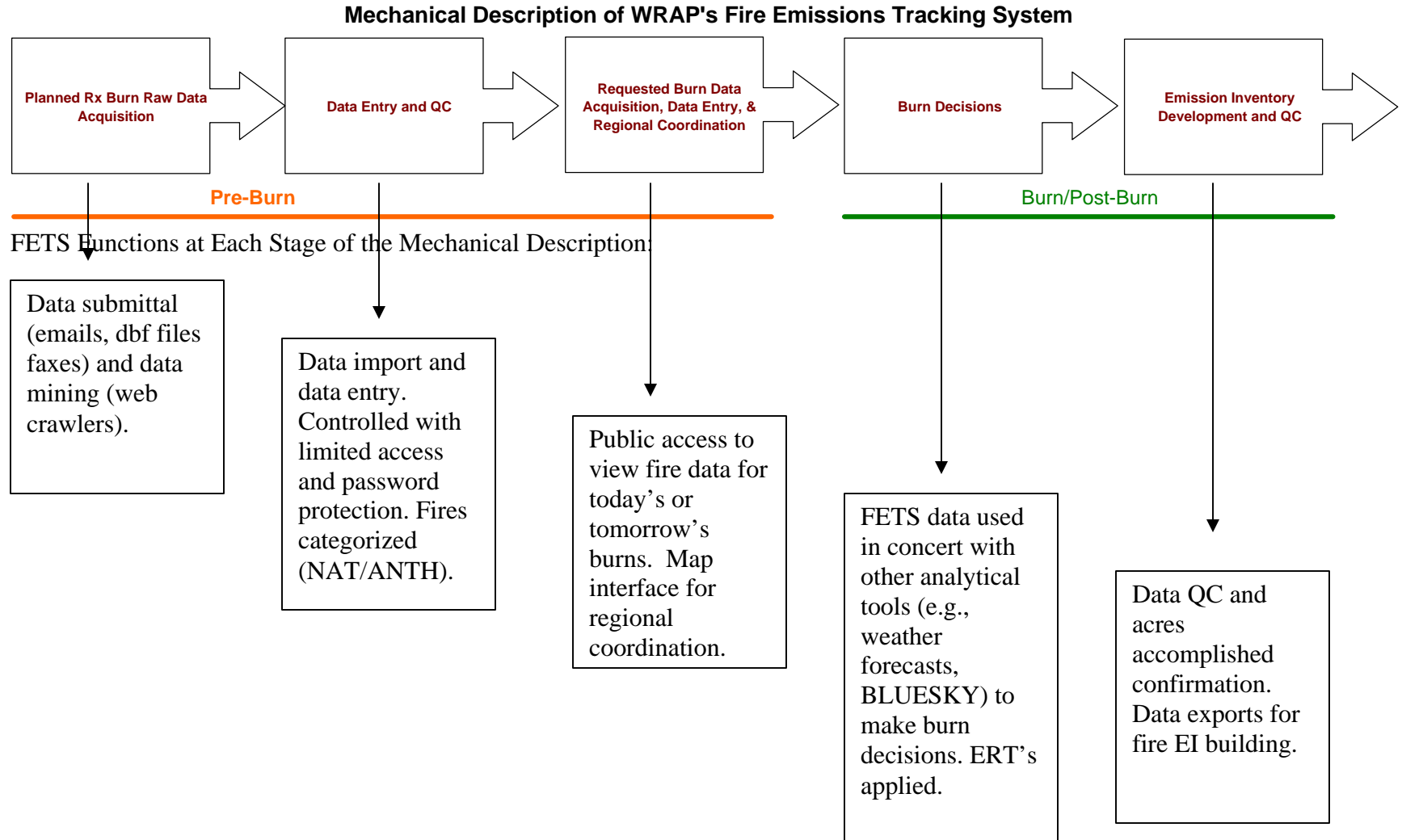
The FTS Task Team, its contractor, and the FEJF co-chair have discussed with WRAP and the WRAP's TSS team members the concept of building a "commodity" based FETS. This commodity-based FETS approach would be available to all WRAP states and Tribes and would integrate seamlessly with other regional haze SIP planning data and tools in the TSS. Moreover, this approach would be ready to accommodate fire data entry by January 2007. The FETS is expected to fit within the near- and long-term budget constraints of the WRAP.

## FETS EVALUATION TO OPERABLE WRAP FETS – HOW DO WE GET THERE FROM HERE?

Ongoing discussions on the outcome of the FETS Evaluation Project have refined the approach of how to best implement the FTS Policy. These discussions have extended the deliverables to be provided in the FTS Evaluation Project to include:

1. A concrete set of requirements and mechanical description of the FETS (this has been developed from the “white board sketch” prepared by D. Randall, M. Fitch, and J. Russel). A simple flow chart of the mechanical description of the WRAP’s FETS is presented in Figure 1. A more complete mechanical description of the WRAP’s FETS is presented in Appendix 1.

Figure 1



2. A “cross walk” that shows the relationships between the WRAP’s FETS and the FEJF policies that support regional haze planning, including: Enhanced Smoke Management Program (ESMP); Natural/Anthropogenic Categorization; application of Emission Reduction Techniques and alternatives to burning; Annual Emissions Goals; regional coordination.

The operable FETS will provide real-time access to planned fire event data and will build comprehensive databases of all wildland fire events. Metaphorically, the FETS will be a file cabinet for fire data that will store fire and emissions data until users need to easily and quickly access the data. There will be limits to the features of the FETS, including:

- Importantly, the FETS will not provide the air quality bases to support the ad hoc decisions of the ESMP to improve haze conditions. These decisions will continue to be the responsibility of ESMP personnel as they utilize technical (e.g., data from the FETS; meteorological data forecasts), and policy (e.g., Natural/Anthropogenic categorization, regional coordination), and regulatory (e.g., application of ERTs, burn/no-burn decisions) tools to regulate emissions from planned fire events in order to improve haze conditions on the 20% worst days.
- The FETS will not include a module to estimate the air quality impacts due to emissions from fire events. Other tools (e.g., BLUESKY) will need to be relied upon by ESMP for air quality analyses. Fire event data from the FETS will be available and sufficient for SMPs to use in impact assessment tools such as BLUESKY.

A commodity-based FETS would start with the New Mexico FTS (utilizing as much as possible of the existing hardware and software resources) and upgrade it such that it meets all of the WRAP’s technical and usage specifications. Next, the upgraded N.M. FTS would be merged with the WRAP’s TSS so that all states and tribes can share fire activity/emissions data and use the data in WRAP’s TSS analytical and regional planning tools for regional haze SIP planning and preparation. The entire package would then be hosted on an existing e-commerce site (e.g., Yahoo!), where the hosting capabilities and data storage needs would be reliable and permanent. The FETS on Yahoo! would incorporate free software such as Google Earth on a web-based, multi-user interface such that any state or tribe could easily review and compare fire event/emissions data from any WRAP state/tribe, conduct data analyses and graphically visualize the results. This entire package would be fully operational and ready to accept data uploads by January 2007. The software and hardware would be maintained by TSS and/or the e-commerce site, thus relieving states and tribes from maintenance responsibilities.

The commodity-based FETS will provide a repository for states/tribes to store their fire event/emissions data and will provide a resource for other states/tribes to download the data for their own regional event coordination and SIP planning. Every participating agency would designate an appropriate party/entity to enter, manage, and QC incoming data to the FETS. The data entry system will be specifically designed to both

accommodate jurisdictions with Smoke Management Programs and those without. This interface will break down the barriers to data sharing and will streamline regional coordination. The user will also have access to TSS's numerous, user-friendly analytical and regional planning tools which will aid individual states/tribes in their regional SIP planning and preparation. Furthermore, more uniform SIP applications from WRAP members will allow the EPA to more consistently and expediently make SIP decisions.

The commodity-based WRAP FETS will be designed such that the user will not have to enter data into their own system and again into the FETS. WRAP will establish a secure data transfer protocol such that the user will either periodically transfer their data to the FETS database or the data will be periodically and securely transferred from the state/tribe database to the FETS by the FETS system. To ensure security, it is necessary to limit the avenues for data entry and manipulation. Only a smoke management program member or equivalent would be allowed to transfer fire event/emission data from the individual state/tribe database to the FETS.

States and Tribes with currently operational FTS will utilize a simple data exchange protocol to upload data to the FETS (no double-entry of data will be necessary) and benefit from having real-time access to FETS data from other jurisdictions to facilitate regional haze SIP planning. Thus, the commodity-based FETS will work with other FTSs, but it will make them more complete and provide the user additional resources. The advantage to this process is that 309 states are already required to regionally coordinate and 308 states will find the commodity-based FETS a great resource, without the hassles of proprietary software.

Benefits for WRAP of Developing Commodity-based FETS include:

- This method is expected to require limited dollars in future WRAP grants relative to other methods and have positive effects on 2006-08 FEJF project funding, due to the an expected decrease in start-up and maintenance costs.
- The lessons learned in the FEJF and WRAP's fire emission inventory preparation and analysis for haze planning purposes over the past several years have shown that a move away from proprietary software-based emission inventory systems is likely to reduce development, hosting, maintenance, and system modification costs while still accomplishing critical functionality.
- A commodity-based FETS hosted within the TSS will provide states and Tribes ongoing regional technical support, as well as data access and visualization tools for their regional haze planning. The FETS would be supported by TSS, thus placing software and hardware maintenance issues in a known and tested environment. "Active" tools, such as the ERT Technical Tool, and "Static" tools, such as maps of jurisdictions that participate in regional coordination, will be integrated into the FETS and TSS to accommodate seamless access to resources critical to SMPs.

- The FTS Task Team and WRAP expect that the FEJF FETS can be on-line and fully operational for states and Tribes to upload fire event/emissions data by January 2007 (and use real-time data for regional coordination), to access TSS functions pertaining to fire emissions by July 2007, and to download 2007 fire emissions inventory data by January 2008.

## RECOMMENDATIONS – APPROACH AND CONTRACTING METHOD

1. The emphasis of the FETS will be to gather, compile, QC, and query fire activity and emissions data for wildland fire. At least initially, small fires, some agricultural burning, some (or all) burning on tribal lands, and some (or all) private non-federal rangeland burning activity will not be captured in the FETS.)
2. Planned fire data will be added to the FETS real-time or well in advance of the event.
3. Data for unplanned events (wildfire) will be obtained after the event using crawls to collect federal wildland fire data (e.g., 209 and 1202 data).
4. The FETS database will require QA/QC but will minimize the need to conduct “ground-up” data gathering.
5. The critical challenge of building a successful and operable FETS will be for SMP’s (perhaps working with the WRAP and the developers of the FETS) to optimize the collection of accurate data for planned fire events.

At this time, the WRAP recommends that the commodity-based approach be implemented to develop the FETS and that the FETS be attached to the WRAP’s Technical Support System (TSS). There are several expected advantages to this approach:

- The FETS would be built to serve the specific needs of WRAP states and Tribes as they incorporate emissions from fires into their regional haze plans and programs.
- Fire emission inventory work would be integrated into the TSS by definition – providing the opportunity for ESMPs to integrate the fire data into the rest of the regional haze emissions, monitoring, and modeling data.
- Integrating the FETS into the TSS will support the development of regional haze SIPs, including: the TSS’s support of essential technical SIP documentation will extend to the FETS and fire emissions; technical tools in the TSS that produce technical demonstrations of 309 states efforts to fulfill their Annual Emission Goals.

The proposal at this time is to facilitate the development of the WRAP’s FETS through a subcontract to Air Sciences issued by CIRA under CIRA’s contract with the WRAP for the TSS Project. Work for Air Sciences will include development of the FETS and supporting the integration of the FETS into the WRAP’s Technical Support System. A brief Scope of Work, cost estimate, and schedule for the work are presented below.

## PRELIMINARY SCOPE OF WORK AND SCHEDULE FOR FETS DEVELOPMENT PROJECT

Upon the FTS Task Team's and FEJF's approval of the proposed approach to developing the FETS, Air Sciences will prepare a detailed Workplan, cost estimate, and schedule for the project. Below is a preliminary scope of work for the project. Also, a rough estimate of costs and schedule for completing the work is provided. This information should be considered preliminary and subject to change and is provided to give the FTS Task Team and FEJF sufficient information to guide their decisions on the direction to take to develop the WRAP's FETS.

### Scope of Work

Air Sciences will be the technical and development lead for the FETS project. CIRA will provide technical and development oversight for the project and will integrate the FETS into the WRAP TSS. In the preparation of the Workplan for the FETS project, Air Sciences will consider and identify any other contractors that may contribute to the successful development of the FETS. As with all of the other fire-related projects executed for the FEJF, Air Sciences will work closely with the Task Team assigned to the project, will bring critical development issues to the Task Team (comprised of FEJF members and stakeholders) for review and guidance, and will prepare periodic updates on the progress of the project for the FEJF. In addition, Air Sciences will work closely with the Technical Director of the WRAP, CIRA personnel involved with the development of the WRAP's TSS, and, as necessary, other members of the TSS team.

Tasks for the FETS project include:

1. Documentation.
  - Preparation of the detailed Workplan;
  - Technical Support Document (methods, assumptions, etc.);
  - FETS Users Guide.
2. FETS Software Development (utilizing existing, commodity products to the greatest extent), including:
  - Database architecture;
  - Data retrieval and input;
  - User interface;
  - Data quality control and security;
  - Database functionality (e.g., emission calculations, accounting for implementation of Emission Reduction Techniques);
  - Queries and exports for real-time use of fire data and reporting;
  - Commodity-based (e.g., Google Earth) mapping routines;
  - Data reporting;
  - Data archiving and back-up.
3. FETS Technical Integration to TSS
  - Integrate fire emissions into emission summary tools;
  - Annual Emission Goal demonstration tool;

- Support Regional Haze SIP content pertaining to fire emissions.
- 4. FETS Support and Maintenance
  - QA/QC;
  - Data archiving and retrieval;
  - Data reports and export files for SIP and modeling applications;
  - System repair.

#### Schedule – Major Milestones

- 07/15/06 FEJF approval of approach
- 08/01/06 Signed subcontract (Air Sci/CIRA) and contract (CIRA/WGA)
- 08/15/06 Draft Project Workplan
- 11/01/06 Test Version of FETS Operational
- 01/01/07 FETS Operational/Technical Support Document & Users' Guide
- 03/01/07 TSS Fire Tools Developed

Appendix 1

**Mechanical Description of WRAP's Fire Emissions Tracking System**

	<u>Data Tag</u>	<u>FETS Function</u>	<u>Action</u>	<u>Who?</u>	<u>What?</u>	<u>When?</u>	<u>Comments</u>
Pre Burn	<b>E</b> (ntry of all planned burns)	<b>Planned Rx Burn Raw Data Acquisition</b>	Data collection & submittal (for WF, web crawler for data acquisition)	Federal Land Managers (FLM); private (timber) industry; state forests; private land owners	Planned burning events; Updates	1x per year (dbf) Real time (fax)	
	<b>L</b> (ibrary of all burns in FETS)	<b>Data Entry and QC</b>	100% of data entry and data manipulation	Smoke Management Program (SMP) personnel (State/Tribe/Local)	All submitted events and updates	Upon submittal	Password access required; Ea. SMP can only modify its own data. Ea. "L" file stored annually
	<b>R</b> (equested burns)	<b>Requested Burn Data Acquisition, Data Entry, &amp; Regional Coordination</b>	Requested burns "posted" for regional coordination and burn/no-burn decision	Burners request and SMP assigns Data Tag All can view requested burns (Regional Coord)	Burn requests	1-2 days pre-burn	
Burn/Post Burn	<b>G</b> (o/no-go ...approved burns)	<b>Burn Decisions</b>	Burn approval	SMP All can view approved burns (Regional Coord)	Approved burns	1 day before burn or day of burn	May be a challenge to accommodate "conditional burns"...approval to burn any time when conditions meet certain criteria.
	<b>A</b> (ccomplished burns)	<b>Emission Inventory Development and QC</b>	Burn confirmation	SMP (with input from burners) All can view accomplished burns (SIP planning)	Accomplished burns	Post burn	"A" file exported as emissions inventory data. May be necessary to require some maximum number of days to review "G" burns to toggle to "A" (or not).