



# Geo-Targeted Alerting System
# Project Plan

**February 25, 2009**

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This Project Plan is in reference to Inter-Agency Agreement number HSFEMA-08-X-0326 Task Order T001.

## 1. Introduction

The Geo-Targeted Alerting System (GTAS) Project is a joint effort between the Federal Emergency Management Agency (FEMA), the National Oceanic and Atmospheric Administration (NOAA). As part of the Integrated Public Alert and Warning System (IPAWS), GTAS is a FEMA supported pilot project to identify future requirements that may be used to deploy a life-threat warning system nationwide. The basis for this project is to provide advanced capabilities to state and local government Emergency Operations Centers (EOC) to enhance public safety in the event of an atmospheric toxic release or severe weather events.

The release of biological, chemical or radiological agents into the atmosphere in a major metropolitan area could potentially kill hundreds of people in a matter of hours. Likewise, hazardous weather such as hurricanes, flash-floods and convective weather events can threaten life and property. To help address public safety it is necessary to rapidly predict the dispersion of a toxic release and other environmental hazards and provide targeted warnings with specific safety information.

FEMA serves as the Federal Executive Branch's Lead Agency for Continuity of Operations (COOP) and Contingency Programs. In this regard it is critical to establish the operation and maintenance of effective emergency communications and warning systems for public safety. FEMA' IPAWS and other Contingency Programs are designed to provide Americans with critical and timely hazard alerts and warning information that saves lives and property during emergencies and natural disasters. Established under FEMA' National Continuity Programs Office, IPAWS reflects the governments ultimate goal of providing alert and warning messaging in a coordinated manner over as many platforms as possible to ensure the widest dissemination of vital information to the public.

As part of IPAWS, this Pilot Project will determine ***how*** state and local government emergency management agencies will use advanced high-resolution weather and toxic plume information to warn the public of life threatening environmental hazards. The Pilot will be used to explore emergency notification techniques for specific geo-targeted areas and define public warning requirements for future deployments across the U.S.

The Project will be resourced by FEMA and operated by two NOAA line offices and participating respective state and local EOC'. The two NOAA line offices include:

1. NWS
    a. Weather Forecast Offices (WFO');
2. Office of Atmospheric Research (OAR)
    a. Global Systems Division (GSD);
    b. Air Resources Laboratory (ARL).

**2. Project Scope and Objectives**

Both NOAA and FEMA will coordinate on the development, testing and deployment of GTAS capabilities including toxic plume applications, hazardous weather products and alerting capability for geo-targeted areas where life-threatening situations exist. Specific objectives include:

1. Incorporate Atmospheric Release Advisory Committee (ARAC) toxic plume products into GTAS;
2. Integrate the Meteorological Assimilation and Data Ingest System (MADIS) into the GTAS processing and display system;
3. Include a 4-km regional area meteorological gridded area domain with a nested 2-km gridded weather analysis and prediction system to initialize the toxic plume model and to give emergency managers near-term high-impact public hazard data;
4. Deploy and demonstrate GTAS capabilities in three to five NWS Regional Headquarters, WFOs and their respective state EOCs;
5. Identify and deploy additional locations in collaboration with NOAA and FEMA IPAWS Program Management Office (these locations are intended to be located at GTAS development locations;
6. Demonstrate how NWS WFO' can support state and local government EOCs in the event of a toxic plume release or severe weather event including message generating dissemination systems to support the IPAWS initiative;

These objectives will be addressed by using GSD' FX-Collaborate (FXC) data servers and interactive client display systems. FXC data systems will be developed in GSD' Information Systems Branch (ISB) prototyping environment which will allow for rapid software changes that may be necessary to accommodate varied EOC operations. FXC servers will be deployed to those NWS Regional Headquarters that take part in the Project. FXC client applications will be deployed to one or more selected state EOC' and their respective NWS WFO'. Forecasters will collaboratively provide real-time weather and toxic plume guidance to emergency managers. Likewise, emergency managers will be able to routinely call up AWIPS weather products and toxic plume guidance from the FXC data servers.

Documentation will identify user feedback, system usage information, performance data, user workload information and FXC maintenance requirements.

GTAS data systems will be deployed at three to five NWS WFO' their respective state EOC' and one or more city or county EOC. The locations selected will represent areas that may be under threat of a biological, chemical or radiological release or by severe weather, each of which may require emergency mitigation plans by state and local governments. Specific deployment locations will be determined jointly by FEMA and NOAA. In the event of a toxic release or hazardous weather event emergency managers will have instant access to toxic plume dispersion and weather information. At each location systems will have interactive warning generation and connectivity to Emergency Telephone Notification (ETN) system providers. Additional test systems will be deployed

at FEMA Headquarters and NOAA Headquarters. The planned timeline for the project will run for one year from the date of award with possible extension for additional years/deployments if needed and agreed to by FEMA and NOAA.

**3. Roles and Responsibilities**

**NOAA** will provide:

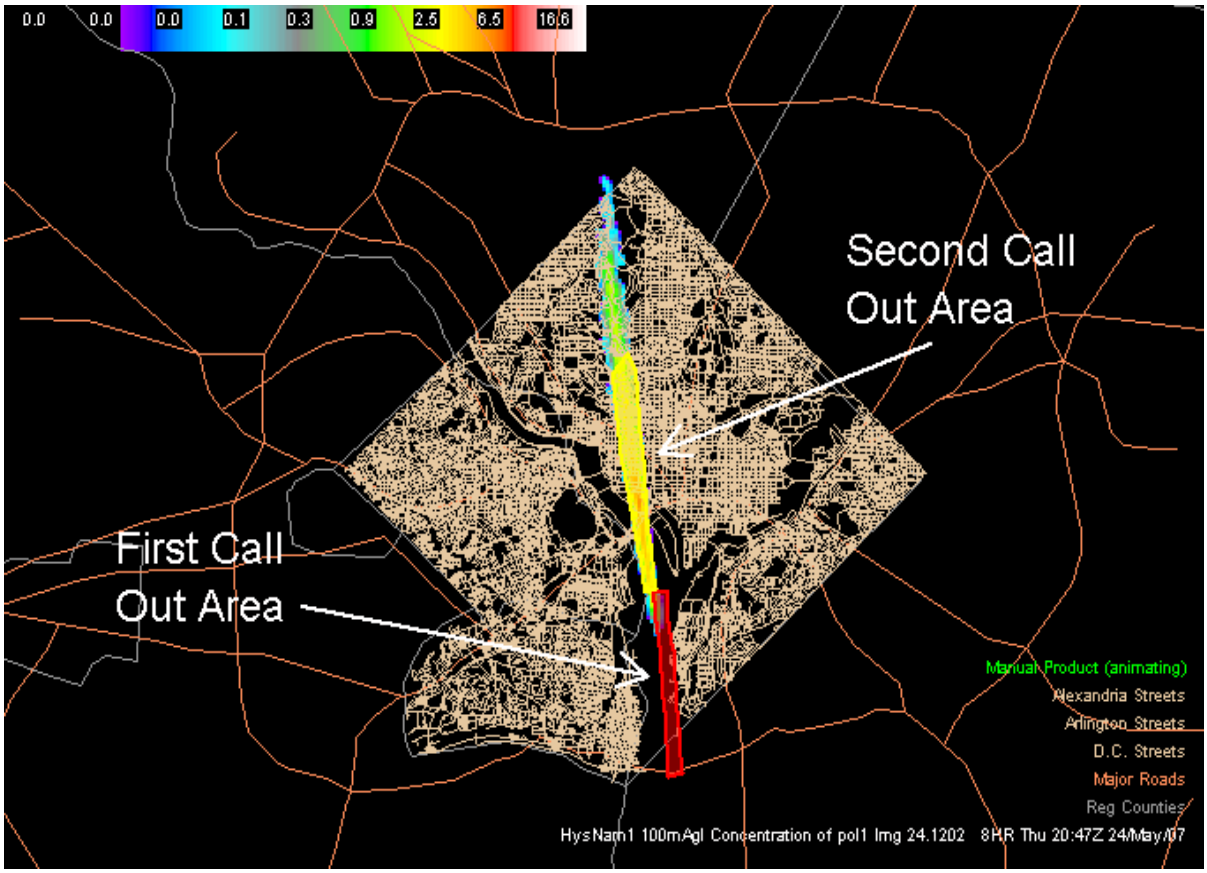
1. Development of the GTAS client application and data servers;
2. Selection agreed to jointly with FEMA of deployment locations;
3. Deployment of GTAS into NOAA operational facilities and state EOCs;
4. Test and evaluation of the workstation functions and system usage;
5. Routine status reports of the projects progress outlined in the Inter-Agency Agreement;
6. Periodic Project Reviews
7. System documentation.

**FEMA** will be responsible for:

1. Funding resources for Inter-Agency Agreement number HSFEMA-08-X-0326 Task Order T001;
2. Selection with NOAA of installation sites;
3. Coordination of the Project with selected state government EOC'.

**4. GTAS Information Systems**

The FXC workstation is the primary GTAS information system. FXC has been developed using Java's Remote Method Invocation to enable remote users to synchronize their displays for effective collaboration. The workstation will display meteorological data and plume dispersion products on national, regional and local city scales. This allows emergency managers to interactively draw and annotate on the screen to create geo-targeted warning areas. Warning area coordinates can be sent to ETN providers and other dissemination systems procured by state governments. The GTAS workstation will contain real-time collaboration capability so that state and county EOC' can exchange data, graphics, images and warning areas for shared situational awareness. Additionally, it allows sharing of local datasets between sites, and allows forecasters to give real-time briefings to emergency mangers. Incremental software releases can be downloaded as needed. Communications between client systems may be over a private network or the Internet. An example of the GTAS FXC display showing a plume release with two user drawn warning areas for ETN dissemination is shown below (the street map used below is only an example. A complete street map background will be used for GTAS deployment sites).




**5. FXC Security**

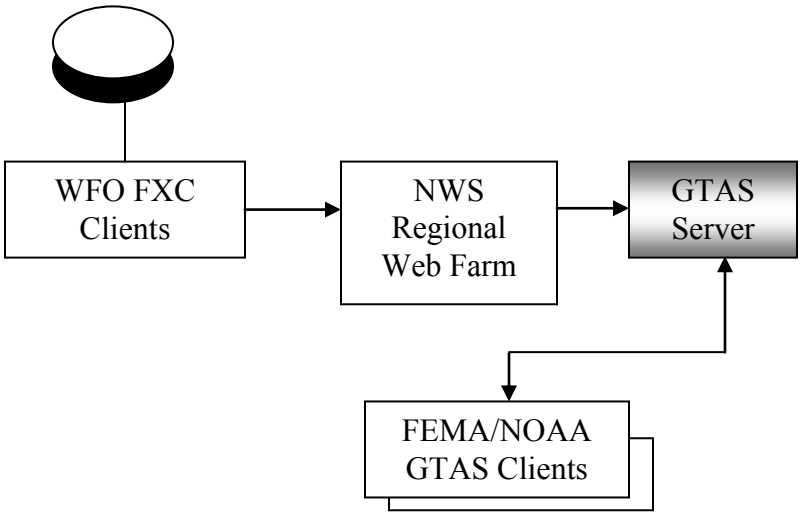
Firewalls, proxy servers, and network address translation have become an essential part of network security. Typically, firewalls allow outgoing traffic but restrict incoming communications. To support access to internet sites, many firewalls open a port for http protocol communications to external servers on the internet. This allows internal sites to contact an external server and have the server respond over the established communications channel. FXC uses its own socket-to-socket communications implementation. In order to establish communications between the client and server, one or more ports need to be opened in the firewall for tcp/ip communications between FXC GTAS clients at the NWS WFOs and GTAS servers at each NWS Region. The startup scripts for the client and server allow the user to specify which port, or range of ports, to use.

It is worth noting that security requirements at NOAA's operational facilities continue to evolve as cyber threats change. GTAS security will need to continually be upgraded to make certain that state and local EOCs communications are maintained.

**6. GTAS Hardware Architecture**

FXC server hardware runs on a Dell Precision 530 PC with 2 Gigs of memory, 1.7 GHZ Zion Processor(s). The server runs the Redhat Enterprise Linux operating system. FXC client workstations can be either Linux or a Windows Operating System.

Diagram of GTAS/FXC Network




**7. Concept of Operations**

Collaborative briefings will take place as agreed to between the local WFO and their respective state and local government EOC's. When emergency managers display hazardous weather or toxic plume graphics and images, the EOC will determine if a life threatening condition exists and draw geo-targeted warning areas with and coordinate public safety instructions. Emergency managers can disseminate warning area coordinates to ETNs by clicking the "911" icon on the user interface.

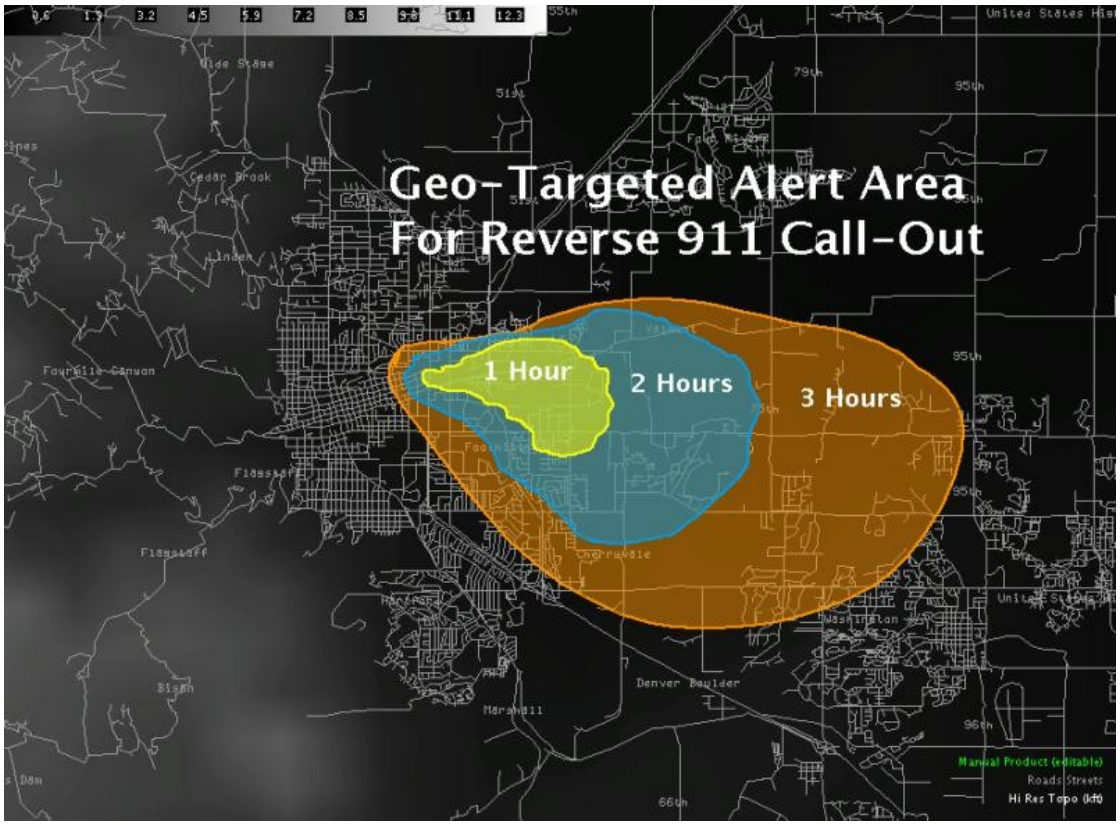
The AWIPS database will be used to generate advanced gridded state atmospheric variables every hour. These data sets include:

- Temperature
- Dewpoint
- Relative Humidity
- Wind (speed/direction)
- Weather Type
- Precipitation
- Snowfall Accumulation

- Wind Chill
- Sea Surface Wave Height
- Hurricane landfall probabilities
- Severe weather warnings and advisories
- Hazardous Weather Outlook – twice daily
- 500-meter plume dispersion output
- High-resolution numerical model output consisting of a 4-km regional area with a nested 2-km metropolitan area covering GTAS deployment sites.

Other data such as NOAA federal surface observing network and privately owned Meteorological Assimilation and Data Ingest System (MADIS) observations will be included. The federal surface observing systems will be updated every hour. MADIS observations (which provide high spatial density) will be updated every 15 minutes. Full resolution NEXRAD radar volume scans will displayed and update the GTAS client every 10 minutes. The radar volume scans will be displayed in such a way so that non-meteorologists can easily interpret the information which will provide valuable heavy precipitation imagery. Overlaying the high-resolution radar imagery over local area map backgrounds will assist emergency managers to assess the potential for flash flood inundation. Satellite data will be updated hourly

GTAS simulations of a bio/chemical or radiological release will be conducted to obtain specific lead-time warning information for reverse-911 outbound calls and other IPAWS inter-operability dissemination systems. Conducting simulated toxic releases are important in order to learn how much time it takes to disseminate public safety information relative to the size of the warning area. These simulations will provide valuable timing data to emergency managers. More specifically, the length of a worded public warning message, the pre-determined number of attempts to redial busy signals, and the time of day of an event (daytime loads placed on the telecommunications infrastructure) all factor into the timeliness of warning dissemination. Population density within a warning area factors largely into the timeliness of warnings. Broadcasting geo-targeted warnings in Common Alerting Protocol (CAP) format will allow multiple communications systems to be used for issuing public safety information. Thus, regular simulated events of a toxic release will give emergency managers the information needed to understand and draw properly sized lead time warning areas given the relative rate of ETN outbound calling platforms and other communications systems. A GTAS display showing how an emergency manager may draw warning areas over both urban and suburban areas is shown below.




**Toxic Plume Warning Area**

Each warning area in the figure above shows different colors to illustrate the dispersion of a simulated toxic plume. Three separate reverse 911 messages could be used with specific call-for-action instructions for each area. For each warning message disseminated, a follow-up "all-clear" message is required.

The GTAS client will also be able to operate on a wireless PC laptop. This will enable emergency managers and incident commanders to have grab-and-go GTAS clients to call up relevant weather or toxic plume data, stay in constant contact with other emergency preparedness agencies and WFO forecasters, and target asset deployment while on the scene of a given event.


**9. Project Management**

The GTAS Project will be managed by GSD with guidance from NOAA's NWS and OAR Line Offices. GSD will coordinate all Project management, development, deployment, training, evaluation and documentation activities. GTAS will be deployed to each NWS Region in phases. The order of each deployment will go as follows:

1. Southern Region Headquarters - FT Worth, Texas;
    a. FT. Worth WFO
    b. Texas State EOC
    c. City of FT Worth Emergency Management;
2. Western Region Headquarters – Salt Lake City, Utah
    a. Los Angeles/Oxnard CA
    b. California State EOC
    c. Long Beach EOC
3. Central Region Headquarters – Pleasant Hill, Missouri (Kansas City, MO)
    a. Pleasant Hill WFO
    b. Missouri State EOC
    c. Kansas City, MO Office of Emergency Management
4. Eastern Region Headquarters – Upton, New York
    a. New York City WFO

b. New York State Emergency Management Office
c. New York City Office of Emergency Management
d. Washington D.C. area (specific site installation to be determined)

GSD will provide the following documentation for the Project:

1. Develop and maintain a Project Management Plan (Microsoft Word or Power Point);
2. Provide a Baseline Project Schedule (Microsoft Project);
3. Earned Value Management Report (EVM Application TBD)
4. Monthly Status Reports (Microsoft Word);
5. Risk Management Plan (Microsoft Word);
6. Risk Tracker (Microsoft Word);
7. System Design Document (Microsoft Word);
8. Implementation Plan (Microsoft Word);
9. Training Plan (Microsoft Word);
10. Application Document (Microsoft Word);.

**Timelines**

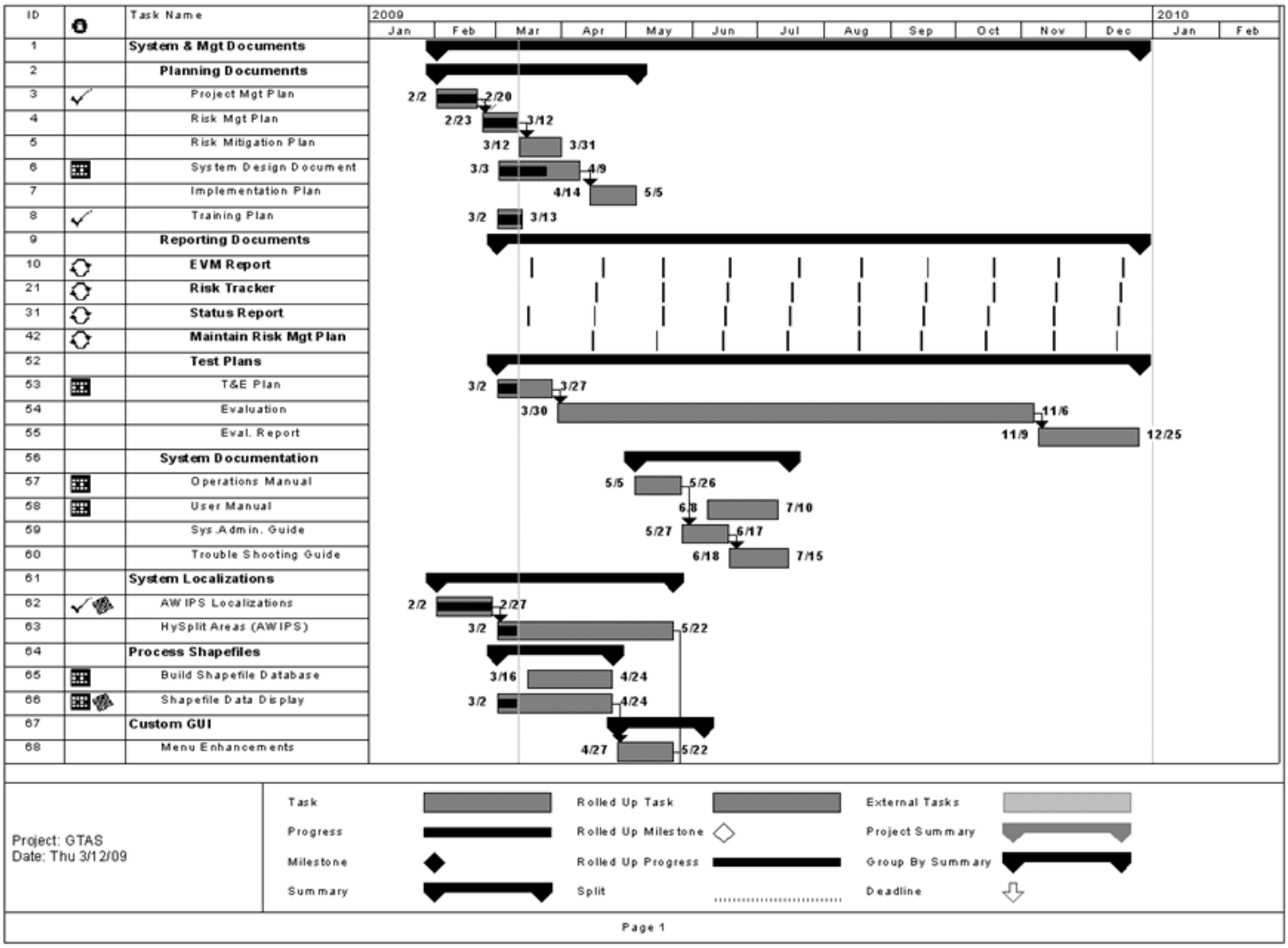
The Project will run from February 2009 through December 2009. Extending the Project into the first quarter of FY2010 allows time for all the development, deployments and documentation outlined in the Statement of Work to be completed. Specific timelines for all GTAS Project activities are given in the accompanying Microsoft Project Spread Sheet.

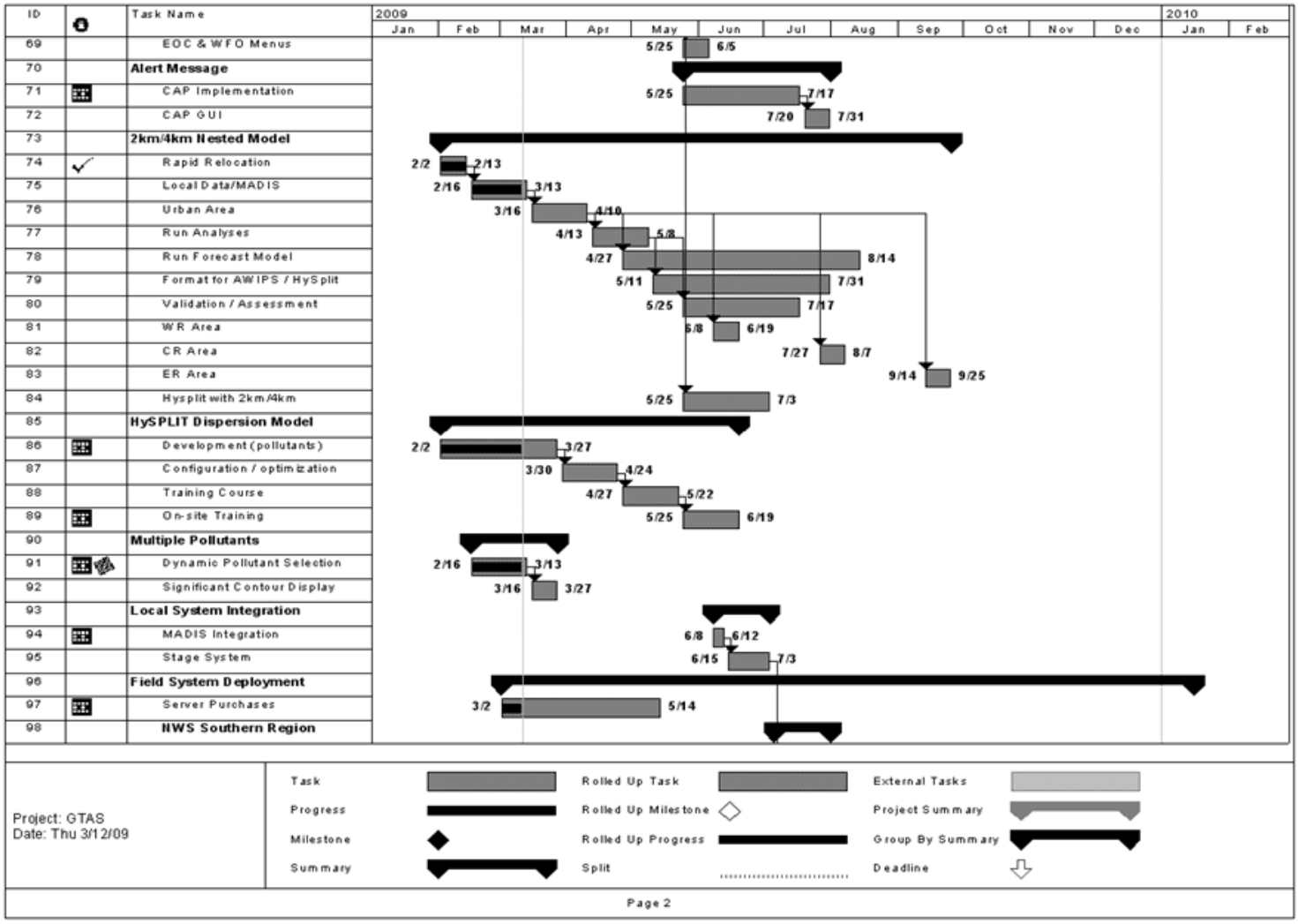
**Budget Breakdown**

| Activity | FY09 | FY10 | FY11 | FY12 | FY13 | |
|---|---|---|---|---|---|---|
| Management | 200K | 200K | 150K | 150K | 175K | |
| **Complete Development** MADIS, High-Res Models, ARAC/HySPLIT Dispersion, FXC Client & Server Software | 968K | 823.5K | 566.4K | 361.6K | 92K | |
| Field Deployment | 5 sites 250K | 4 sites 240K | 4 sites 150K | PDA/Cell 125K | 0 | |
| Plume Dispersion Training Regions/WFOs/EOCs | 240K | 200K | 125K | 50K | 0 | |
| GTAS FXC Training Regions/WFO/EOC | 99.5K | 65.2K | 65.2K | 108.4K | 0 | |
| System | 34.5K | 51.3K | 168.4K | 250K | 463K | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Requirements/Architecture Documentation | | | | | | |
| Chemical Sensor Research/Ingest/Display | 0 | 0 | 75K | 75K | 170K | |
| Total Annual Cost | $1.792K | $1.580K | $1.300K | $1.120K | $900K | |
| | | | | | | |

ATTACHMENT
Project Schedule and Milestones

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69 EOC & WFO Menus
70 Alert Message
71 CAP Implementation
72 CAP GUI
73 2km/4km Nested Model
74 Rapid Relocation
75 Local Data/MADIS
76 Urban Area
77 Run Analyses
78 Run Forecast Model
79 Format for AWIPS / HySplit
80 Validation / Assessment
81 WR Area
82 CR Area
83 ER Area
84 Hysplit with 2km/4km
85 HySPLIT Dispersion Model
86 Development (pollutants)
87 Configuration / optimization
88 Training Course
89 On-site Training
90 Multiple Pollutants
91 Dynamic Pollutant Selection
92 Significant Contour Display
93 Local System Integration
94 MADIS Integration
95 Stage System
96 Field System Deployment
97 Server Purchases
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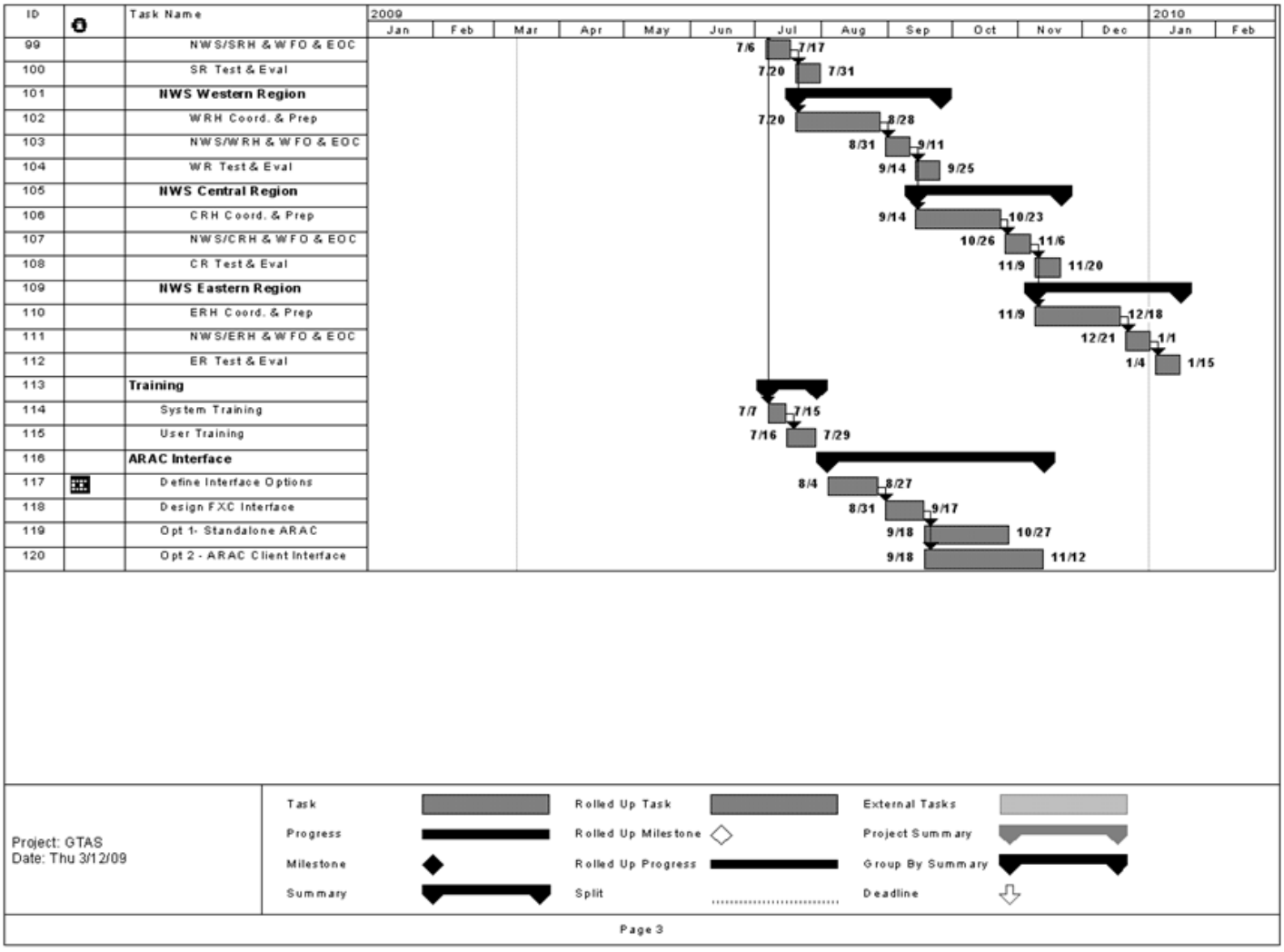
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99 NWS/SRH & WFO & EOC
100 SR Test & Eval
101 NWS Western Region
102 WRH Coord. & Prep
103 NWS/WRH & WFO & EOC
104 WR Test & Eval
105 NWS Central Region
106 CRH Coord. & Prep
107 NWS/CRH & WFO & EOC
108 CR Test & Eval
109 NWS Eastern Region
110 ERH Coord. & Prep
111 NWS/ERH & WFO & EOC
112 ER Test & Eval
113 Training
114 System Training
115 User Training
116 ARAC Interface
117 Define Interface Options
118 Design FXC Interface
119 Opt 1- Standalone ARAC
120 Opt 2 - ARAC Client Interface
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