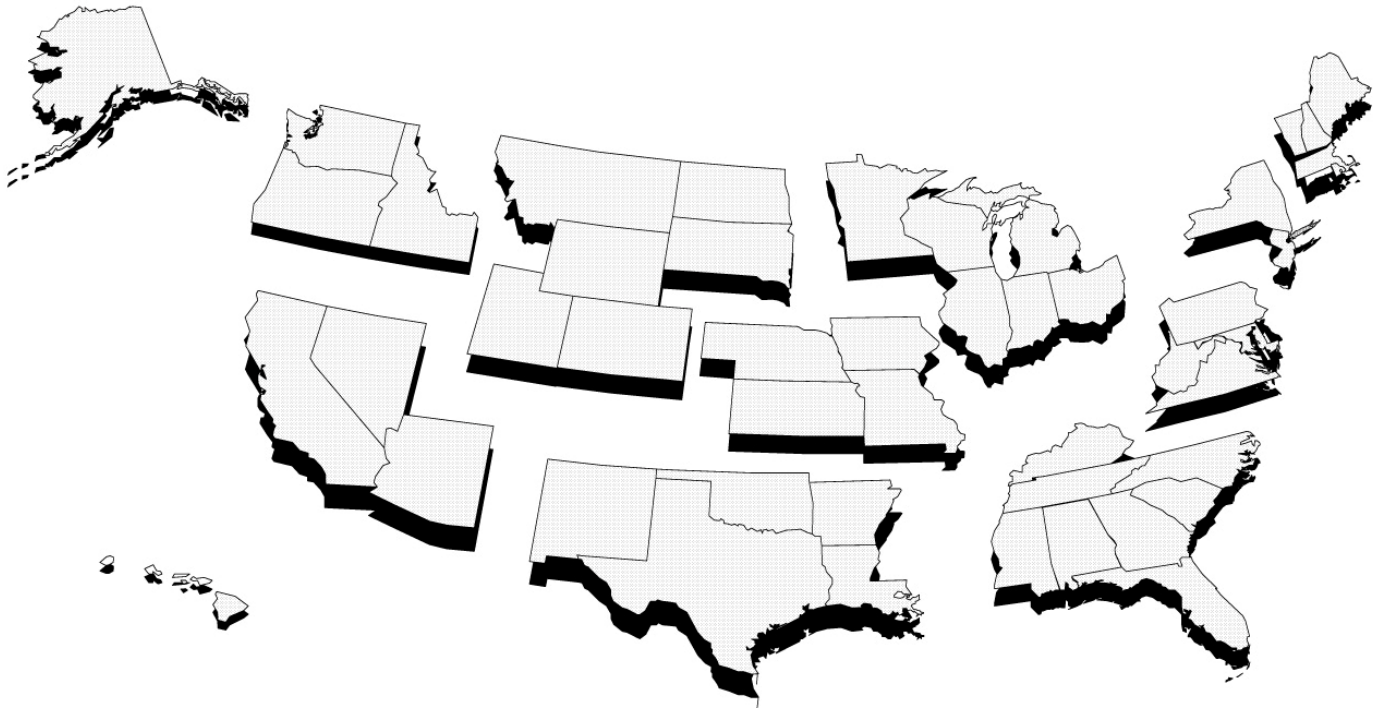


# Remote Sensing Program for EPA

## FY 2006 Program Summary





# **Remote Sensing Program for EPA**

## **FY 2006 Program Summary**

Environmental Photographic Interpretation Center  
(EPIC)

U.S. Environmental Protection Agency  
Office of Research and Development  
National Exposure Research Laboratory  
Environmental Sciences Division  
Landscape Ecology Branch  
Las Vegas, Nevada 89193-3478

Notice: The U.S. Environmental Protection Agency (EPA), through its Office of Research and Development (ORD), partially funded, performed, and collaborated in the research described here. It is intended for internal EPA use. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

U.S. Environmental Protection Agency  
Office of Research and Development  
Washington, DC 20460



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## **Abstract**

The Environmental Sciences Division of the Office of Research and Development in Las Vegas, Nevada, provides remote sensing and aerial imagery acquisition and interpretation support to the Program Offices and each of the 10 Regional Offices of the Environmental Protection Agency. Support is provided for site-specific to regional environmental characterization and change analyses; emergency response to hazardous materials release situations; current site condition assessments; historical reviews of site developments; waste site inventories for large geographical areas, and topographic mapping of sites. Support is provided through the Division facilities of the Landscape Ecology Branch (LEB) in Las Vegas, Nevada and Reston, Virginia.

In FY 1999, LEB/EPIC initiated a new remote sensing research and development program. Research plans were prepared and underwent peer review. Research commenced for some projects in FY 2000 and continued through FY 2006.

This document describes program operations, management procedures, and types of projects conducted for requesting offices.

### **Superfund Program Support**

In FY 2006, work was conducted on 54 Superfund aerial survey projects covering more than 50 specific waste sites. Of these, two (2) overflights were completed to acquire new aerial photographs; two (2) fracture trace analyses; and twenty-four (24) historical site analyses were completed. Work on nine (9) projects was carried over into FY 2007.

It is anticipated that in FY 2007, operations will be conducted in much the same way as previous years.

### **Non-Superfund (e.g., RCRA, wetlands, etc.) Program Support**

In FY 2006, work was initiated on two (2) non-Superfund projects covering 2 sites. These projects were in support of enforcement and compliance activities. Work on these projects was completed in FY 2006.

### **ORD Program Support**

In FY 2006, LEB/EPIC provided remote sensing and GIS support in the form of database development, research, data acquisition, processing, and analysis to: 1) Great Rivers – Major Tributaries project; 2) LIDAR Data Acquisition; 3) Pesticides and Nutrients Investigations; 4) Landscape Ecological Assessment Support; 5) EMAP – Great Rivers Ecosystems Landscape Analysis; 6) Nutrient Research Study; 7) Isolated Wetlands Remote Sensing Activities; 8) LIDAR and GPS Data & CIR Data Acquisition; 9) Geodetic Ground Survey Monument study; 10) LIDAR-Based Digital Elevation Models; and 11) Modifications to Heads-up Digitizing

AML.

A Remote Sensing Training CD-ROM entitled *Remote Sensing: Fundamentals and Applications* is available from LEB/EPIC upon request. The LEB/EPIC also maintains a remote sensing website that contains a wealth of information on the fundamentals of remote sensing and the technical support products, services, and R&D activities of the Environmental Photographic Interpretation Center. The URL for the site is: <http://intranet.epa.gov/epicrest/default.htm>.

## **Special Support and R&D Projects**

### **Leviathan Mine - Leviathan Canyon Overflight**

In FY 2005 airborne remote sensing data (LiDAR and hyperspectral imagery) were collected to support this project that involves collaborative research with EPA Region 9 and EPIC scientists on mapping and identification of vegetation. The goal of the project is to develop detailed vegetation maps from high-resolution aerial imagery in support of the investigation of vegetative uptake of released materials from a Superfund site..

In FY 2006, field visits were made to obtain *in situ* spectroscopy and vegetation samples.

In FY 2007, provided that funds become available to support field activities, field visits will continue along with the development of a research application for spectral detection of fugitive contaminants. Analysis of in-situ hyperspectral data will be started. and, following the data fusion of the LiDAR and hyperspectral data, additional analyses will be initiated.

### **Imaging Spectroscopy of Fugitive Environmental Contaminants**

In FY 2006 activities revolved around three specific research and development efforts. First, the principal investigator (PI) serves as a member of the Spring Valley Partnering Team which includes the U.S. Army Corps of Engineers (USACOE), the USEPA, the Agency for Toxic Substances and Disease Registry (ATSDR), and the District of Columbia Department of Health (DOH). In this capacity the PI serves as the primary scientist for all issues relating to remote sensing, GIS and mapping and also serves on a special Area of Interest Task Force (AOITF) which investigates and makes recommendations on new and/or outstanding issues relating to the Superfund cleanup, including the investigation of classified, historic military records of activity at the American University Experiment Station. The second activity involves the investigation of the potential for arsenic phyto-remediation using the arsenic-hyperaccumulating *Pteris* ferns. A small contract was established with Edenspace Corporation, (Dulles, Virginia) for a controlled greenhouse experiment in which *Pteris* ferns, control ferns and common lawn grasses are being grown in varying levels of soil arsenic over a 20-week period. The PI collects reflectance spectra at regular intervals in coordination with harvesting and testing of the plants for arsenic concentration, with the goal of establishing a spectral reflectance 'signature' of arsenic stress and uptake in this vegetation. This work is currently on-going. In the third R&D effort, the same *Pteris* ferns are being utilized for active phyto-remediation in the Spring Valley Formerly Used Defense Site (FUDS) in Washington, D.C. Field work, in cooperation with the USACOE, including the collection of reflectance spectra is being conducted to determine the spectral characteristics of arsenic stress and uptake and the level of arsenic removal that can be practically achieved through the use of this phyto-remediation method.

## **The Detection and Mapping of Impervious Surfaces: a Multi-date, Multi-scale, Multi-sensor Approach in a Mid-Atlantic Sub-Watershed**

This project addresses the development of impervious surfaces estimators for local to regional scale assessments of watersheds and their landscape relationship to stream ecology. The amount of impervious surface area in a watershed is a key indicator of landscape change. As a single variable, it serves to integrate a number of concurrent interactions that directly influence a watershed's hydrology, stream chemical quality and thus the in-stream habitat. It is our working hypothesis that impervious surface area within a watershed, as an independently mapped predictor variable, can be used to generally track a range of watershed ecological parameters (non-point source (NPS) pollution, biological integrity, TMDLs, etc.) that are of concern to local, state and federal environmental managers.

A pilot project that investigated the role of impervious surfaces on stream hydrology in the upper Accotink Creek in Fairfax County, Virginia has been completed. Results from the pilot were presented at national and international scientific conferences and the results published in the peer-reviewed literature in FY00-FY02. A coefficient model that would determine a watershed Total Impervious Area% (TIA%) from the NLCD92 was developed to enable a statistically relevant TIA% to be calculated for multiple watersheds over large regional areas such as the Chesapeake Bay. Results from the pilot were presented at national and international scientific conferences and the results published in the peer-reviewed literature in FY02-FY04. An accuracy assessment (AA) protocol to assess remotely sensed estimates of impervious surfaces was developed and is the basis for a USGS internal prospectus investigating the accuracy of various sub-pixel impervious surface datasets derived for the Mid-Atlantic/Chesapeake Bay region in the FY04-FY07 period. Preliminary results were presented at the 2006 EPA Science Forum and a peer-reviewed publication is in preparation. A collaborative research program has been developed with EPA, USGS, Montgomery County Maryland, and the University of Maryland Baltimore and College Park acting as partners to investigate the effects of urban development on streamflow, biota, and water quality in the Clarksburg Special Protection Area, Maryland during FY03-FY04. These activities will continue through FY09. Additional EPA partners from Athens and Cincinnati are now involved in the hydrology and modeling aspects of this ongoing research project.

## **LEB/EPIC Library/Archive**

The EPA Remote Sensing Archive contains over 25 years of aerial and satellite film acquisitions, related products and documentation. In FY 2006, a new Archive contract was awarded and the Archive contractor continued to support EPIC's remote sensing support contractor fulfilling their requests daily. Additional duties included generation of datasets for the U.S. Geological Survey's EROS Data Center (EDC) metadata and film footprint project, continued conversion of some reports from an analog media into a digital format, and management of the daily operation of the facility, databases and holdings. The EDC project, as explained below, continued throughout the year. In addition to the efforts of the permanent staff, two temporary employees worked full time at the Archive in support of this project over this fiscal year, and great advancement was made in the quantity of metadata collected by years end. Once the footprints of the film have been captured in a digital form, these records are sent to the

EDC for ingestion into the EPA side of their EarthExplorer database.

The EDC effort was initiated in FY 1999 through an Interagency Agreement between EPA/EPIC and USGS/EDC. This is an on-going effort. The EDC is to provide EPA with metadata search and retrieval services based on a graphical interface developed by EDC. This search and retrieval system will enable EPA users to quickly search for and determine the extent and attributes of the Archive's aerial photographic and satellite image coverage for any location in the United States. The goal of this effort is to create a searchable, easy to use softcopy metadata database.

### **Multi-Media Training CD-ROM**

LEB/EPIC completed a project in FY 1999 to develop a first-of-its-kind remote sensing training CD-ROM for environmental users. This CD-ROM, first made available in FY 2000, presents the fundamentals of analog and digital remote sensing using text, graphics, animation and sound to provide basic remote sensing training for LEB/EPIC customers. This project was initiated through an interagency agreement with the General Services Administration under the FAST program. In FY 2006 the CD-ROM continued to be available upon request to EPA offices.

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# Remote Sensing Program for EPA

## FY 2006 Program Summary

### Introduction

The Environmental Sciences Division in Las Vegas, Nevada (ESD) of the Office of Research and Development, provides **remote sensing technical support** including aerial photograph acquisition and interpretation for site-specific to regional environmental characterization and change analyses. Support is provided by the ESD to EPA Program Offices, ORD Laboratories, and all 10 EPA Regional Offices. This support is provided through the Environmental Photographic Interpretation Center (EPIC), a field station of the Landscape Ecology Branch (LEB), and its remote sensing capabilities in Las Vegas, Nevada and in Reston, Virginia.

In FY 2006, LEB/EPIC continued its **remote sensing research and development** program. Two on-going research projects are described briefly beginning on page 6 of this annual report.

### Remote Sensing Technical Support

Analysis of air- and space-borne acquired imagery is the most commonly used remote sensing technique for supporting the Spill Prevention Control and Countermeasures (SPCC), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and other EPA programs and investigations. The principal aerial photographic system used is the 9-inch format mapping camera. While color film is most frequently used for photo analysis, black and white film is often used for mapping, and color infrared films are often used to enhance such features as surface water turbidity, soil moisture, and vegetation stress. Various types of aircraft are used at flight altitudes ranging from 1,000 to 25,000 feet above the ground. Archival aerial photographs provide a valuable source of information for the historical analysis of hazardous waste sites. Routine search and acquisition of these photographs from sources nationwide is a significant step in our analysis of sites. If insufficient current coverage is found through archival sources, new imagery is acquired. Finally, our image analysts who perform the interpretation of the aerial photographs are fully qualified to furnish advice and expert witness testimony on findings from the analyses in instances of litigation.

The most frequently applied spaceborne imagery is Landsat Thematic Mapper for conducting broad area characterizations of environmental and natural resources, and land use and land cover assessments and mapping. However, new, higher spatial resolution satellite image data sets which provide sub-meter pixel sizes are also available for analysis and more detailed site characterization.

Sanborn Fire Insurance Maps may be acquired and used to provide information about a site between approximately 1860 and the advent of regularly acquired aerial photographs in approximately 1930 and, later, to provide information not available from the photographs about ownership, occupancy, land and building layouts, and materials on-site.

LEB/EPIC conducts four basic types of remote sensing technical support projects under the CERCLA, RCRA, and other programs. The highest priority projects are emergency responses to hazardous material release situations requiring rapid assessment of conditions at a site. When current information on a site is required, it is generally the practice to acquire new photographs for the specific purpose. Single-date analysis may be conducted on this new imagery or on historical imagery taken during a particularly significant period in the history of a site. Intensive site analysis projects are performed on selected sites to document changing conditions over a period of time and include analysis of both current and historical photographs. Finally, waste site inventories are surveys over large areas that are used to establish a baseline reference of possible sites.

A number of special-purpose products are produced from photographic data which are based on advanced technologies. Such products include topographic and flood-plain maps using photogrammetry, and digital elevation and GIS data. Surveys, aerial photography, and automated optical equipment are required to produce modern topographic maps. Such maps, at various scales, provide highly accurate representations of sites that include horizontal distances, building dimensions, volumes and dimensions of lagoons and landfills, and contours to provide elevation data throughout the mapped area. The maps are used to record site features, well sites, or any feature that needs to be accurately located. Other uses include planning, quantity estimates, and a variety of special purposes.

## Technical Support Project Types

A summary of the following remote sensing technical support project types may be found in Table 1.

**Table 1. Remote Sensing Technical Support Projects, Products, and Average FY 2006 Costs<sup>++</sup>**

<b>Project Type</b>	<b>Application</b>	<b>Product</b>	<b>Turn-around</b>	<b>Approximate Cost/Site</b>
Emergency Response	Hazardous Materials Release	Photos and Overlays, Annotated Maps, Interpretative Description	24 hours	\$19,000 <sup>++</sup>
Single-Date Analysis	Current Information	Report with photos, Maps, Overlays, and Interpretive Description	6 to 36 weeks	\$12,000 <sup>**</sup>
Intensive Analysis	Change Analysis	Report with Photos, Maps, Overlays, and Interpretive Description Using Historical and Current Data	4 to 12 months	\$22,000
Site Discovery or Wide Area Analysis	Regional or Area Survey	Report with Photos, Maps, Overlays, and Interpretive Description	2 to 12 months	\$70.00 per square mile
Photogrammetry	Mapping and Quantitative Analysis	Topographic Maps, Area and Volume Calculations	3 to 6 months	*
Floodplain Analysis	Flood Extent Prediction	Floodplain Contours	2 to 6 months	\$13,500 <sup>**</sup>
Litigation Support	Intensive Witness Preparation	Specialized Analysis; Depositions; Photo/Map - Courtroom Exhibits, Affidavits, Expert Witness at trial	2 weeks to designated appearance at trial	\$10,000 to \$15,000 including travel

<sup>++</sup>Note: Average costs were calculated for projects completed in FY 2003.

\*Note: Cost depends on contour intervals, size of site, population density, and on whether or not ground survey teams are required to wear protective gear while surveying the site. The larger sites will average out to lower cost per acre than the small sites. The costs have ranged from \$10.00 to \$13.00 per acre, depending on the mapping requirement of each site. It is more cost effective to conduct the ground survey around the hazardous waste site and not require the survey team to suit up into protective gear.

\*\*Note: These figures are for planning purposes only. We have insufficient data at present to provide accurate cost. Call for cost estimate on specific sites.

## **Emergency Response**

Emergency requests are given top priority, and emphasis is directed toward rapid response. An aircraft that has aerial photographic capabilities is dispatched to the site as soon as possible, and emergency response procedures are put into effect in the photo processing laboratory. All personnel are prepared and are on call to work around the clock to process the photographs, analyze the film, document the analysis results, and ship the results to the requester as soon as possible.

Emergency requests, in response to a hazardous material release situation, require current information on conditions at the site. Extent and location of a visible spill, vegetation damage, and threats to natural drainage and human welfare are typical of the types of information gathered from emergency response activities at a spill site. Typical products for an emergency response project include an immediate telephone report followed by photographic prints or positive film transparencies with interpretations annotated on overlays to the photographs, annotated topographic maps, and a short letter report describing results of the analysis. Scales for emergency photo coverage vary with condition and area coverage requirements. A response time of 1 to 5 days, depending on weather conditions and type of coverage required, is typical. On-scene support by photo analysts is provided as required.

## **Single-Date Analysis**

Projects in this category are conducted on a routine basis to acquire current or single date information on a site or sites. These projects usually require acquisition of new aerial photography of a site, although recent (existing) photographic coverage of a site may suffice. Analysis of the photographs generally focuses on surface drainage conditions, evidence of leachate, vegetation damage, adequacy of containment features, and threats to sensitive environments. Final products normally include a report documenting the results of the analysis, with emphasis on the specific requirements of the requester. The report also includes photographs and maps with interpretation annotated on clear overlays to pinpoint the site locations and conditions. These routine projects can normally be conducted in 6 to 36 weeks after data collection; the length of time is dependent on the number, size, and complexity of the sites and on the detail of information required.

## **Intensive Site Analyses**

These projects are performed when the Regional or Program Office requests an analysis of changing conditions at a site through time. They rely heavily on the availability of historical aerial photographs. However, the historical photographs may be augmented with current photo coverage when needed by the requester. Historical photographs that date back to the 1930's are available for many areas.

Photographs of a site prior to the existence of any hazardous waste processing and disposal activities or other man-made impacts are obtained when available. Later photographs are used to monitor changes at the site over time. Special attention is paid to photographs taken on or near dates identified as critical by the requester.

Most historical photographs are panchromatic (black and white). Few color or color infrared photographs are available for the years prior to 1970. A major reference source for historical photographs is the Earth Science Information Center (formerly the National Cartographic Information Center) of the U.S. Geological Survey. The Center maintains an index of the imagery holdings of the EROS Data Center (EDC) of the Department of the Interior and the Aerial Photography Field Office of the Department of Agriculture. The earliest photographs are available from the National Archives and Records Administration. When photographs taken during a particularly significant period are not found in Federal archives, State and local governments and private sources are investigated.

In-depth analysis of historical photographs affords the opportunity to characterize site conditions and to identify specific activities at different points in time. By characterizing conditions at a site for several dates, the sequence of events leading to the current conditions can be understood. Intensive studies have been performed to characterize environmental or ecological changes in surface drainage conditions; to identify the location of landfills, waste treatment ponds/lagoons, and their subsequent burial and abandonment; to detect and identify the burial of waste drums; to count the number of drums and to estimate the depth and horizontal extent of the burial pits; and to recommend drilling sites for sampling and for identification of the sources of the spillage and of the discharge of wastes.

Occasionally, photographs are not available for the location or time of interest. In these cases, Sanborn Fire Insurance Maps have proven to be a useful source of data for historical analysis. For more than a century, the Sanborn Map Company of Pelham, New York, has published maps and atlases of more than 12,000 U.S. cities and towns. These large-scale, highly detailed maps of commercial, industrial, and residential buildings are designed to provide accurate, current, and detailed information to fire insurance companies about the buildings they insure. The Sanborn Maps furnish information about ownership, occupancy, building layouts, and materials on-site that are used in chemical and other manufacturing processes.

The current collection of Sanborn maps comprises over 700,000 single sheets in 50,000 volumes. The Library of Congress maintains this collection, and a published volume may be purchased from the Library of Congress office cataloguing the collection. Maps published prior to September 19, 1906, are available as photocopies or microfilm directly from the Library of Congress, Photo Duplication Division. Authorization to use Sanborn maps published after that date must be obtained from Sanborn on a case-by-case basis, and requests for that authorization must be presented to the Library of Congress before duplicates will be made.

Generally, an intensive site investigation requires 4 to 12 months to complete. However, the time required to complete any single project will depend largely on the number of available data sets that must be processed and analyzed. The photo analysis can be greatly enhanced when pertinent background information is made available by the requester. Helpful information includes known conditions or suspicions at specific points in time, drainage and ground water studies pertinent to the sites or general areas, detailed maps and sketches, and names of facilities and of operators associated with the site.

Products of intensive site investigations include a detailed report documenting the results of the photographic interpretation. The reports usually include photographs and maps with major observations annotated on clear overlays. Annotated photographic enlargements for field use, or as courtroom exhibits are provided as required.

### **Waste Site Inventories**

LEB/EPIC conducts general inventories over relatively large areas to detect and locate hazardous waste sites. The inventories are conducted by using archival, recent, or newly acquired aerial photographs and may be single-date or multi-date in nature. Site locations are annotated on map sheets or on overlays to maps and photographs. No detailed site analyses are provided. However, the interpreter will frequently flag those sites that appear to be particularly hazardous or threatening. The use of archival photographs offers the most economical and accurate method of compiling these inventories.

Should the requester desire new aerial photographs from an overflight, LEB/EPIC can acquire them at specifications commensurate with the requester's information needs. The time required to complete an inventory will vary with the total square miles involved, the number of sites, the chronological range, and the analysis requirements.

### **Superfund Site Atlas**

Uncontrolled hazardous waste sites listed by the EPA as being eligible for remedial response actions under Superfund are documented in photographic volumes for each of the 10 EPA Regions. The atlas, intended as a reference document and planning guide for hazardous waste site cleanup under CERCLA, contains site location maps and color aerial photographs with photo overlays showing the boundaries of the site, and the surrounding areas. Boundaries shown indicate the general location of the sites, and are not intended to denote legal property lines or ownership. Also included are individual site descriptions. The atlas covers those sites designated as eligible on the National Priorities List (NPL) as of September 1984. The LEB/EPIC maintains an index to available aerial photographic data for these priority sites.

### **Removal and Remedial Action Documentation**

Aerial photographs are collected before, during, and following removal and remedial actions at selected sites. Such documentation provides a useful record of the effectiveness of the cleanup efforts.

### **Topographic Mapping**

LEB/EPIC produces topographic and feature maps, generally at a small contour interval (usually specified at 2 feet to 10 feet; however, any interval can be used), using precision photogrammetry of a site on which control points have been established. This technique requires specialized equipment, complex computations, aerial photography, and field surveys. These maps are produced in conformance with National Map Accuracy Standards and EPA Photogrammetric Mapping Specifications.

A typical product from a topographic mapping project might include an orthogonally correct black-and-white, enlarged photograph of a site and reproducible stable base map sheet(s) containing highly accurate, detailed topographic and planimetric features. At a very large scale (for example, 1 inch equals 50 feet), the map may show buildings, roads, railroads, drainage features, bridges, culverts, fences, driveways, poles, sidewalks, individual trees, fire hydrants, manholes, catch basins, and other features of similar size. Map scales, contour intervals, and planimetric details can be varied to suit specific requirements.

There are several useful applications to topographic mapping in support of hazardous waste site assessments and removal or other remedial actions. Highly accurate topographic and planimetric details may be recorded without setting foot on the site. This capability can be significant in overcoming problems related to gaining access to private lands and related to protecting field personnel from hazardous conditions on-site. Maps may be useful in measuring the area, volume, and locations of the hazardous material to be handled such as contaminated soil; defining drainage patterns; determining the height and placement of containment berms, dikes, and impoundments; and determining the depth of waste pits. Topographic mapping techniques are also useful in support of geophysical monitoring or well monitoring in terms of establishing precise location and orientation data. In addition, changes in size, shape, and other physical characteristics of a waste site can be documented through sequential topographic mapping.

## **Remote Sensing Research and Development**

The LEB/EPIC remote sensing research and development program involves the scientific evaluation of existing and developing air- and space-borne remote sensing systems and data in order to determine their utility for providing information about the earth at multiple scales, its ecological resources, and impacts on these resources through natural and human-induced processes. Research continued through FY 2006. Two of these projects are briefly described on pages 7 and 8 of this report. The research projects are entitled:

- 1) Imaging Spectroscopy for detecting fugitive environmental contaminants
- 2) The Detection and Mapping of Impervious Surfaces: a Multi-date, Multi-scale, Multi-sensor Approach in a Mid-Atlantic Sub-Watershed

Results of this research are reported at scientific symposia, in appropriate reports, in scientific journals and other publications.

### **Leviathan Mine - Leviathan Canyon Overflight**

In FY 2005 airborne remote sensing data (LiDAR and hyperspectral imagery) were collected to support this project that involves collaborative research with EPA Region 9 and EPIC scientists on mapping and identification of vegetation. The goal of the project is to develop detailed vegetation maps from high-resolution aerial imagery in support of the investigation of vegetative uptake of released materials from a Superfund site..

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Total Impervious Area% (TIA%) from the NLCD92 was developed to enable a statistically relevant TIA% to be calculated for multiple watersheds over large regional areas such as the Chesapeake Bay. Results from the pilot were presented at national and international scientific conferences and the results published in the peer-reviewed literature in FY02-FY04. An accuracy assessment (AA) protocol to assess remotely sensed estimates of impervious surfaces was developed and is the basis for a USGS internal prospectus investigating the accuracy of various sub-pixel impervious surface datasets derived for the Mid-Atlantic/Chesapeake Bay region in the FY04-FY07 period. Preliminary results were presented at the 2006 EPA Science Forum and a peer-reviewed publication is in preparation. A collaborative research program has been developed with EPA, USGS, Montgomery County Maryland, and the University of Maryland Baltimore and College Park acting as partners to investigate the effects of urban development on streamflow, biota, and water quality in the Clarksburg Special Protection Area, Maryland during FY03-FY04. These activities will continue through FY09. Additional EPA partners from Athens and Cincinnati are now involved in the hydrology and modeling aspects of this ongoing research project.

## **Program Management**

### **General**

The Environmental Photographic Interpretation Center (EPIC), a field station of the ESD's Landscape Ecology Branch (LEB), has staff in Las Vegas and at its headquarters facility in Reston, Virginia, and is responsible for research and development and operational activities of the remote sensing program. The LEB/EPIC responds to routine Regional and Program Office needs for remote sensing support upon receipt of a written request from the Regional Program Office. This written request should be sent to the attention of the director of the Environmental Photographic Interpretation Center. A concurrent telephone call and correspondence copy of the request may also be directed to the appropriate Regional Remote Sensing Coordinator. The LEB/EPIC director reviews the request and assigns it to an LEB/EPIC Work Assignment Manager (WAM) for action. The WAM works with the requester to identify the study objectives, the approach to be taken, the additional information required, the reports and data to be delivered, and the estimated completion dates. Appendix B lists LEB/EPIC WAMs as well as other LEB contacts that are available to assist those in the Regional or other EPA Offices who request LEB support. When the requester's requirements are clear, a Work Assignment (WA) is prepared in which the scope of work, deliverables, estimated costs, and schedules are identified. Projects are generally performed through the Division's support contractors. In addition, within each Regional Office is an identified individual who acts as a Remote Sensing Coordinator (see Appendix C). This person acts as a liaison between LEB/EPIC and the Region to accept Regional requests for LEB/EPIC support work, assist requesters in identifying their remote sensing requirements, and coordinate the flow of paperwork and project status information between the Region and LEB/EPIC. Remote Sensing Coordinators assist requesters by providing them with information on the type of support available through LEB/EPIC, and the proper procedures to be used for initiating a remote sensing technical support work request.

For emergency responses, the initiating request may be made by telephone from the Regional Program Office. The request is immediately coordinated with the requesting office, and, with their approval, a project is initiated.

Expenditures of funds supporting this program are tracked on a project-by-project basis for cost accounting and program management analyses. After receipt of a valid request, a work assignment is developed and sent, after approvals, to the EPA remote sensing technical support contractor who prepares a technical work plan and a completion schedule. Upon completion of a project, the requester is provided the required number of report copies or other products; one file copy is maintained by the Landscape Ecology Branch remote sensing report library and archive.

As a part of an on-going planning process to identify Regional remote sensing support needs for the coming year, LEB/EPIC WAMs work with Remote Sensing Coordinators and administrative and budget counterparts in the 10 regions. During this process, progress and problems are discussed, associated with the funding of project assignments at LEB/EPIC, and strategies are developed for ensuring that Regional support requirements and funding needs are met.

### **Contractor Support**

In support of LEB/EPIC, a professional contractor staff acquires photographs, provides aerial photographic interpretation, and prepares final written reports with photographic and other graphics displays. EPA scientists provide technical oversight of each project, prepare statements of work, and monitor progress toward completion. In FY 2006 a new remote sensing technical support contract was awarded. This is an off-site, non-dedicated contract which was awarded for a one-year base period, and four one-year option periods.

### **Quality Assurance**

The ESD has developed a Quality Management Plan (QMP). The LEB/EPIC support contractors are also required to prepare and submit to EPA a Master Quality Assurance Project Plan that describes the contractors' capabilities and approach to Quality Assurance (QA). The Quality Assurance Project Plan contains Standard Operating Procedures (SOPs) detailing the specific QA procedures to be followed during completion of the principal contract activities. In the case of LEB/EPIC, for example, SOPs have been developed and/or updated for the following processes: data acquisition; data processing; data analysis; and report production. A QA Review Checklist has been developed by ESD. This form is attached to and filled out for each Work Assignment by the Work Assignment Manager. The form is approved by the EPA Project Officer and the designated EPA QA Officer. All of these procedures ensure that LEB/EPIC's clients receive the highest possible quality in the products and services requested.

### **Personnel, Equipment, and Material Requirements**

The resources to support the aerial photographic interpretation and analysis program are derived from two sources. Base funding is provided through the Office of Research and Development (ORD). These resources provide for in-house personnel and materials as well as limited extramural support. Funding to support specific projects comes directly from the requesting Program or Regional office. These resources primarily support contractor work and operations and equipment acquisition. All capital equipment purchases are justified in accordance with established EPA procurement procedures.

## **FY 2006 Program Summary**

During FY 2006 LEB/EPIC continued to support task requests from the Regions and Program Offices. While some of the Regional Superfund requests were not listed in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, they were fully justified as Superfund activities, and in many cases had higher priorities in the Regions than those tasks identified in CERCLIS.

Resources for FY 2006 are shown in Table 2. A total of \$2,658K in extramural funds was available for direct support of remote sensing for hazardous waste site assessment and emergency response under the Superfund and non-Superfund hazardous waste programs. This included supplemental funding of \$75K provided by OERR in FY 2006 to allow the Division to maintain its capability for providing remote sensing support to the Regions. Also in FY 2006, LEB/EPIC received \$64K in ORD Superfund funding. Of the SF, non-SF and OERR funding, \$779K was carried over from FY 2006 to FY 2007. Non-Superfund ORD funding in the amount of \$860K to support the R&D activities of the Landscape Ecology Branch was received in FY 2006. \$206K of this ORD funding was carried over to FY 2006. Smaller amounts of funding were received to support the specific project requirements of other programs and/or offices.

In FY 2006, work was conducted on 54 Superfund aerial survey projects covering more than 50 specific waste sites. Of these, two (2) overflights were completed to acquire new aerial photographs; two (2) fracture trace analyses; and twenty-four (24) historical site analyses were completed. Work on nine (9) projects was carried over into FY 2007.

In FY 2006, work was initiated on two (2) Non-Superfund projects covering 2 sites. These projects were in support of enforcement and compliance activities. Work on these projects was completed in FY 2006.

In FY 2006, LEB/EPIC provided remote sensing and GIS support to the ORD Program in the form of database development, research, data acquisition, processing, and analysis to: 1) Great Rivers – Major Tributaries project; 2) LIDAR Data Acquisition; 3) Pesticides and Nutrients Investigations; 4) Landscape Ecological Assessment Support; 5) EMAP – Great Rivers Ecosystems Landscape Analysis; 6) Nutrient Research Study; 7) Isolated Wetlands Remote Sensing Activities; 8) LIDAR and GPS Data & CIR Data Acquisition; 9) Geodetic Ground Survey Monument study; 10) LIDAR-Based Digital Elevation Models; and 11) Modifications to Heads-up Digitizing AML.

**Table 2. Funding Available in FY 2006 (\$K)**

Source	Carryover from Previous Years to FY 2006			FY 06 Funds Received			Carryover from Previous FY to FY 2007		
	SF	Non-SF	Other	SF	Non-SF	Other	SF	Non-SF	Other
Region 1	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Region 2	\$200	-0-	-0-	\$444	-0-	-0-	\$169	-0-	-0-
Region 3	\$250	-0-	-0-	\$350	\$10	-0-	\$173	-0-	-0-
Region 4	-0-	-0-	-0-	\$100	\$44	-0-	\$95	-0-	-0-
Region 5	\$150	-0-	-0-	\$300	-0-	-0-	\$207	-0-	-0-
Region 6	\$75	-0-	-0-	\$75	-0-	-0-	\$49	-0-	-0-
Region 7	\$210	\$20	-0-	\$210	\$20	-0-	\$13	-0-	-0-
Region 8	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
Region 9	\$10	-0-	-0-	\$40	-0-	-0-	\$28	-0-	-0-
Region 10	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
ORD	-0-	-0-	\$423	\$64	\$786	-0-	-0-	\$206	-0-
OERR	\$75	-0-	-0-	\$75	-0-	-0-	\$45	-0-	-0-
Other Program Offices	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
<b>Total:</b>	<b>\$970</b>	<b>\$20</b>	<b>\$423</b>	<b>\$1,658</b>	<b>\$860</b>	<b>-0-</b>	<b>\$779</b>	<b>\$206</b>	<b>-0-</b>

## Records Management

Records management refers to the way in which LEB/EPIC organizes and catalogs its technical reports and associated products that result from its day-to-day activities in support of Regional and Program offices. Since 1975, more than 4,000 reports have been produced covering hazardous waste sites and approximately 11,100 industrial sites (under Spill Prevention Control and Countermeasures). Most of the imagery acquired for the reports is located at the EPA Remote Sensing Archive in Las Vegas, Nevada.

LEB/EPIC has completed the creation of a computer-based technical report information retrieval system. A database has been developed which encompasses both technical and descriptive information about historical and single-date site analyses, and inventory reports produced by LEB/EPIC since the inception of the program. The core database of the system was completed in FY 1990, and initial copies of the published report were distributed to key program contacts in the ten EPA regions. In FY 1996 the database was converted from a VAX mainframe to a PC-based system and in FY 1997 a final PC-based searchable database was completed. In FY 1998 a Users Guide was developed to assist Regional users in accessing and searching the database and upgrades were made to the computer-based search routine in FY 1999 and FY 2000 to make it more user friendly for use by LEB/EPIC's customers. The database and search engine was distributed to all ten EPA Regional Offices and to OERR at EPA headquarters in early FY 2000. In FY 2004 efforts were completed to convert the Report Locator database and search engine to a Lotus Notes searchable system. At the close of FY 2004 a beta testing was being performed on the new Lotus Notes capability. The goal was to make the data base even more user friendly and available Agency-wide through the Lotus Notes email system. This PC-based program allows

Regional users to rapidly search the database to locate any report entered, and retrieve detailed information such as:

- ▶ Report name, number, and date
- ▶ Funding source
- ▶ Project Officer and Image Analyst
- ▶ Site location (USGS quad name and latitude/longitude, city, county, state)
- ▶ Imagery dates and types used
- ▶ Type of analyses performed
- ▶ Summary findings

The database is updated continuously as current projects are completed. Data base updates are provided on a periodic basis to all ten EPA Regions, and Headquarters Program Offices.

### **Equipment and Specialized Software Purchases**

In FY 2006 we purchased the following: 1) one GPS Hand Held Receiver and Accessories; 2) Element 5 Software License; 3) two Maxtor External Hard Drives; and 4) one UMAX PowerLook 2100XL Scanner.

### **Other – Training**

In FY 2006 and depending upon their individual training requirements, LEB/EPIC scientists and staff completed the training and re-certification courses entitled: *COR Recertification*; *Contract Voucher Training*; *Performance Based Contracting*; *Security Block Training*; *Federal Information Systems Security Awareness Training for FY 2006*; and the *Ethics 2006* training course. EPIC staff also participated in a Shelter-in-Place exercise at the U.S. Geological Survey facility where they are located. Also, the EPIC H&S Coordinator completed fire extinguisher training; and completed National Center (USGS HQ) Continuity of Operations (COOP) and Occupant Emergency Plan (OEP) training.

### **Future Directions**

A new off-site remote sensing technical support contract was awarded in FY 2006 to provide comprehensive remote sensing support to EPA Regional and Program Offices and laboratories. In FY 2006, LEB/EPIC continued to partner with other agencies that are leaders in the remote sensing field, and plans to continue these partnerships in FY 2006.



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## **Appendix A**

### **FY 2006 Remote Sensing Support Projects**

## ***FY 2006 Superfund Remote Sensing Support***

<i><b>REGION</b></i>	<i><b>NUMBER</b></i>	<i><b>SITE</b></i>	<i><b>COMPLETED</b></i>	<i><b>TYPE</b></i>	<i><b>TOTAL COST*</b></i>
1	20601169S	FRANK BEAN ROAD SITE, LACONIA, NH	10/11/2005	PHOTO SUPPORT	\$2,648.00
<i><b>Region 1 Total</b></i>					<i><b>\$2,648.00</b></i>

<i><b>REGION</b></i>	<i><b>NUMBER</b></i>	<i><b>SITE</b></i>	<i><b>COMPLETED</b></i>	<i><b>TYPE</b></i>	<i><b>TOTAL COST</b></i>
2	20602321S	SHORT TERM TECHNICAL SUPPORT - REGION 2	09/11/2006	OTHER	\$ 607.00
2	20602372S	FORMER ANC FACILITY IN THE POHATCONG VALLEY, WASHINGTON BOROUGH, NJ	06/26/2006	HISTORICAL SITE ANALYSIS	\$37,608.00
2	20602374S	HILLIARD'S CREEK, GIBBSBORO, NJ	01/06/2006	HISTORICAL SITE ANALYSIS	\$16,813.00
2	20602375S	DIAZ CHEMICAL CORPORATION SITE, NY	12/19/2005	HISTORICAL SITE ANALYSIS	\$23,585.00
2	20602376S	WEST UNION OIL REMEDIATION, REXVILLE, NY	01/05/2006	PHOTO SUPPORT	\$ 7,814.00
2	20602377S	ROSELLE PARK YOUTH BASEBALL FIELDS, NJ	04/05/2006	PHOTO SUPPORT	\$11,276.00
2	20602378S	BERGEN PERCHLORATE ION SITE, NJ	04/24/2006	PHOTO SUPPORT	\$ 6,641.00
2	20602379S	CIDRA GROUNDWATER CONTAMINATION SITE, PR	03/30/2006	OTH (COST ESTIMATE ONLY)	\$ 1,432.00
2	20602380S	CIDRA AREA, PR	09/05/2006	LU/LC/SDI	\$33,135.00
2	20602381S	SITE DISCOVERY INVENTORY, ST. CROIX, VI	05/09/2006	OTH (COST ESTIMATE ONLY)	\$ 1,466.00
2	20602382S	QUANTA RESOURCES, NJ	09/08/2006	HISTORICAL SITE ANALYSIS	\$30,879.00
2	20602383S	CIDRA GROUNDWATER CONTAMINATION, PR	09/11/2006	HISTORICAL SITE ANALYSIS	\$33,670.00
2	20602384S	SITE DISCOVERY INVENTORY, ST. CROIX, VI	09/11/2006	SITE DISCOVERY INVENTORY	\$22,655.00

***\*TOTAL COST REFLECTS COSTS PAID AGAINST PROJECT IN FY 2006 ONLY.***

<i>REGION</i>	<i>NUMBER</i>	<i>SITE</i>	<i>COMPLETED</i>	<i>TYPE</i>	<i>TOTAL COST*</i>
2	20602385S	PIONEER SMELTING, CHATSWORTH, NJ	09/06/2006	PHOTO SUPPORT	\$ 3,970.00
2	20602386S	MONITOR DEVICES, WALL TOWNSHIP, NJ	08/03/2006	CURRENT OVERFLIGHT	\$ 4,429.00
2	20602387S	WEST UNION OIL REMEDIATION SITE, NY	03/28/2006	PHOTO SUPPORT	\$ 2,519.00
2	20602388S	SHERWIN WILLIAMS RTE. 561/VACANT LOT, NJ	09/11/2006	HISTORICAL SITE ANALYSIS	\$ 9,279.00
<b><i>Region 2 Total</i></b>					<b><i>\$247,778.00</i></b>

<i>REGION</i>	<i>NUMBER</i>	<i>SITE</i>	<i>COMPLETED</i>	<i>TYPE</i>	<i>TOTAL COST*</i>
3	20603435S	SHORT TERM TECHNICAL SUPPORT - REGION 3	09/11/2006	OTHER	\$ 1,235.00
3	20603544S	GAS WELL SITE DISCOVERY, MAINESBURG, PA	02/01/2006	SITE DISCOVERY	\$ 9,016.00
3	20503546S	MOUNTAINTOP LANDFILL #2, LANCASTER, PA	12/12/2005	HISTORICAL SITE ANALYSIS	\$16,793.00
3	20603547S	KENT DEFENSE INDUSTRIES DEMOLITION PIT, MD	02/01/2006	HISTORICAL SITE ANALYSIS	\$17,803.00
3	20603549S	KEYSTONE RESOURCES & EMS, INC., PA	02/01/2006	HISTORICAL SITE ANALYSIS	\$21,929.00
3	20603550S	GAS WELL FRACTURE TRACE ANALYSIS, MAINESBURG, PA	02/01/2006	FRACTURE TRACE ANALYSIS	\$14,192.00
3	20603551S	IVY INDUSTRIAL PARK, DALTON, PA	11/23/2005	OTH (COST ESTIMATE ONLY)	\$ 1,156.00
3	20603552R**	MITTAL STEEL USA – WEIRTON PLANT, WV	04/21/2006	PHOTO SUPPORT	\$ 9,640.00

\*\* "R" at end of project number indicates a non-Superfund project.

***\*TOTAL COST REFLECTS COSTS PAID AGAINST PROJECT IN FY 2006 ONLY.***

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<i>REGION</i>	<i>NUMBER</i>	<i>SITE</i>	<i>COMPLETED</i>	<i>TYPE</i>	<i>TOTAL COST*</i>
3	20603553S	IVY INDUSTRIAL PARK, DALTON, PA	08/28/2006	HISTORICAL SITE ANALYSIS	\$39,842.00
3	20603554S	SAFETY LIGHT CORPORATION, BLOOMSBURG, PA	03/04/2006	FRACTURE TRACE ANALYSIS	\$12,840.00
3	20603555S	RAVENSWOOD PCE SITE, WV	07/24/2006	PHOTO SUPPORT	\$ 6,001.00
3	20603556S	FORT MONROE MILITARY RESERVATION, VA	06/21/2006	REPORT REPRODUCTION	\$ 2,105.00
3	20603557S	PINCH DRUM SITE, WV	09/05/2006	PHOTO SUPPORT	\$ 9,278.00
3	20603558S	BROWNING LUMBER SITE, BOONE COUNTY, WV	08/03/2006	PHOTO SUPPORT	\$ 7,397.00

***Region 3 Total*** ***\$169,228.00***

<i>REGION</i>	<i>NUMBER</i>	<i>SITE</i>	<i>COMPLETED</i>	<i>TYPE</i>	<i>TOTAL COST*</i>
4	20604492S	SHORT TERM TECHNICAL SUPPORT - REGION 4	9/11/2006	OTHER	\$3,332.00

***Region 4 Total*** ***\$3,332.00***

<i>REGION</i>	<i>NUMBER</i>	<i>SITE</i>	<i>COMPLETED</i>	<i>TYPE</i>	<i>TOTAL COST*</i>
5	20605574S	SHORT TERM TECHNICAL SUPPORT - REGION 5	9/11/2006	OTHER	\$ 2,415.00
5	20505606S	HEGELER ZINC, HEGELER, IL	11/28/2005	HISTORICAL SITE ANALYSIS	\$11,207.00
5	20605610S	MATTHIESSEN & HEGELER ZINC, IL	03/17/2006	PHOTO SUPPORT	\$10,240.00

***\*TOTAL COST REFLECTS COSTS PAID AGAINST PROJECT IN FY 2006 ONLY.***

<i>REGION</i>	<i>NUMBER</i>	<i>SITE</i>	<i>COMPLETED</i>	<i>TYPE</i>	<i>TOTAL COST*</i>
5	20605611S	HEGELER ZINC, HEGELER, IL	02/01/2006	HISTORICAL SITE ANALYSIS	\$ 7,961.00
5	20605612S	FOX RIVER NRDA PCB RELEASES, WI	08/01/2006	HISTORICAL SITE ANALYSIS	\$28,472.00
5	20605613S	FOX RIVER OU's 1, 3, AND 4, WI	06/30/2006	CURRENT OVERFLIGHT	\$ 3,653.00
5	20605614S	DOUGLAS LITTLE LEAGUE, INDIANAPOLIS, IN	05/19/2006	HISTORICAL SITE ANALYSIS	\$18,859.00
5	20605615S	ASARCO TAYLOR SPRINGS, IL	09/11/2006	HISTORICAL SITE ANALYSIS	\$ 4,052.00

***Region 5 Total*** ***\$86,859.00***

<i>REGION</i>	<i>NUMBER</i>	<i>SITE</i>	<i>COMPLETED</i>	<i>TYPE</i>	<i>TOTAL COST*</i>
6	20606001S	NORTH & SOUTH CAVALCADE, HOUSTON, TX	03/22/2006	HISTORICAL SITE ANALYSIS	\$25, 566.00

***Region 6 Total*** ***\$25,566.00***

<i>REGION</i>	<i>NUMBER</i>	<i>SITE</i>	<i>COMPLETED</i>	<i>TYPE</i>	<i>TOTAL COST*</i>
7	20607001R**	WAYNE MANUFACTURING, CEDAR FALLS, IA	04/26/2006	HISTORICAL SITE ANALYSIS	\$16,882.00
7	20607008S	PRATT ARMY AIR FIELD, PRATT, KS	03/22/2006	HISTORICAL SITE ANALYSIS	\$23,408.00

\*\* "R" at end of project number indicates a non-Superfund project.

***\*TOTAL COST REFLECTS COSTS PAID AGAINST PROJECT IN FY 2006 ONLY.***

<b>REGION</b>	<b>NUMBER</b>	<b>SITE</b>	<b>COMPLETED</b>	<b>TYPE</b>	<b>TOTAL COST*</b>
7	20607010S	MCCONNELL AFB TITAN II SITE 18, KS	05/17/2006	HISTORICAL SITE ANALYSIS	\$24,229.00
7	20607011S	MCCONNELL AFB TITAN II SITE 13, KS	07/25/2006	HISTORICAL SITE ANALYSIS	\$25,195.00
7	20607012S	JEFFERSON BARRACKS (EX) TARGET RANGE, MO	09/07/2006	HISTORICAL SITE ANALYSIS	\$30,466.00
7	20607013S	JEFFERSON BARRACKS (EX) MILITARY POST, MO	08/11/2006	HISTORICAL SITE ANALYSIS	\$45,963.00
7	20607014S	MCCONNELL AFB TITAN II SITE 14, KS	09/07/2006	HISTORICAL SITE ANALYSIS	\$28,965.00
<b>Region 7 Total</b>					<b>\$195,108.00</b>

<b>REGION</b>	<b>NUMBER</b>	<b>SITE</b>	<b>COMPLETED</b>	<b>TYPE</b>	<b>TOTAL COST*</b>
8	20608004S	WENDOVER I-80 CORRIDOR – PHASE 4, UT	11/18/2005	OTHER	\$ 2,573.00
<b>Region 8 Total</b>					<b>\$2,573.00</b>

<b>REGION</b>	<b>NUMBER</b>	<b>SITE</b>	<b>COMPLETED</b>	<b>TYPE</b>	<b>TOTAL COST*</b>
9	20609957S	LEVIATHAN MINE, CA-NV	01/28/2006	HISTORICAL SITE ANALYSIS	\$14,066.00
9	20609958S	LEVIATHAN MINE, CA-NV	05/30/2006	HISTORICAL SITE ANALYSIS	\$10,303.00
9	20609959S	D.W. JAQUAYS ASBESTOS/MILL SITE, AZ	05/11/2006	PHOTO SUPPORT	\$ 744.00
<b>Region 9 Total</b>					<b>\$25,113.00</b>

**\*TOTAL COST REFLECTS COSTS PAID AGAINST PROJECT IN FY 2006 ONLY.**

<i>REGION</i>	<i>NUMBER</i>	<i>SITE</i>	<i>COMPLETED</i>	<i>TYPE</i>	<i>TOTAL COST*</i>
10	20610001S	NORTH RIDGE ESTATES, KLAMATH FALLS, OR	01/12/2006	HISTORICAL SITE ANALYSIS	\$4,296.00
<i>Region 10 Total</i>					<i>\$4,296.00</i>

### *Other FY 2006 Superfund Remote Sensing Support*

ALL	206RD005S	SUPERFUND EMERGENCY TECHNICAL SUPPORT	09/11/2006	ER	\$ 384.00
ALL	206RD010S	SF SHORT TERM GRAPHICS SUPPORT	09/11/2006	OTHER	\$ 499.00
<i>Other SF Support Total</i>					<i>\$ 883.00</i>

## ***FY 2006 R&D Remote Sensing Support***

<b><i>REGION</i></b>	<b><i>NUMBER</i></b>	<b><i>SITE</i></b>	<b><i>COMPLETED</i></b>	<b><i>TYPE</i></b>	<b><i>TOTAL COST*</i></b>
ALL	206RD001R	GREAT RIVERS – MAJOR TRIBUTARIES	09/11/2006	LANDSCAPE ECOLOGY	\$192,859.00
ALL	206RD002R	LIDAR DATA ACQUISITION	12/14/2005	OTHER	\$ 2,804.00
ALL	206RD006R	INVESTIGATIONS: PESTICIDES AND NURIENTS	09/11/2006	GIS	\$ 45,903.00
ALL	206RD007R	LANDSCAPE ECOLOGICAL ASSESSMENT SUPPORT	09/11/2006	LANDSCAPE ECOLOGY	\$188,256.00
ALL	206RD008R	EMAP – GREAT RIVERS ECOSYSTEMS LANDSCAPE ANALYSIS	09/11/2006	LANDSCAPE ECOLOGY	\$ 21,850.00
ALL	206RD009R	NUTRIENT RESEARCH STUDY, GA	01/05/2006	OTHER (COST ESTIMATE ONLY)	\$ 2,727.00
ALL	206RD011R	ISOLATED WETLAND REMOTE SENSING ACTIVITIES	05/12/2006	OTHER	\$ 23,176.00
ALL	206RD012R	LIDAR AND GPS DATA & CIR ACQUISITION	09/11/2006	LIDAR, GP, AND CIR ACQUISITION	\$ 30,748.00
ALL	206RD013R	GEODETIC GROUND SURVEY MONUMENT	04/10/2006	MAP	\$ 13,764.00
ALL	206RD014R	NUTRIENTS RESEARCH STUDY SITE, GA	09/11/2006	DRAINAGE ANALYSIS	\$ 34,777.00
ALL	206RD015R	LIDAR-BASED DIGITAL ELEVATION MODELS	09/11/2006	OTHER	\$ 39,649.00
ALL	206RD016R	MODIFICATIONS TO HEADS-UP DIGITIZING AML	09/11/2006	OTHER	\$ 4,077.00
ALL	206RD018R	ISOLATED WETLAND REMOTE SENSING ACTIVITIES	09/11/2006	OTHER	\$ 11,809.00

\*\* "R" at end of project number indicates a non-Superfund project.

***R& D Support Total*** ***\$727,275.00***

***\*TOTAL COST REFLECTS COSTS PAID AGAINST PROJECT IN FY 2006 ONLY.***

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## Appendix B

### Project Support Contacts

### and Work Assignment Managers

The following LEB/EPIC staffers were available in FY 2006 to provide information to Regional and other EPA offices and staff regarding LEB products and services, technical specifications to meet the requester's requirements, and ordering instructions.

Region	LEB/EPIC WAM	Phone	Region	LEB/EPIC WAM	Phone
1	Donald Garofalo <a href="mailto:garofalo.donald@epa.gov">garofalo.donald@epa.gov</a>	703-648-4285	6	Donald Garofalo <a href="mailto:garofalo.donald@epa.gov">garofalo.donald@epa.gov</a>	703-648-4285
2	Donald Garofalo <a href="mailto:garofalo.donald@epa.gov">garofalo.donald@epa.gov</a>	703-648-4285	7	Donald Garofalo <a href="mailto:garofalo.donald@epa.gov">garofalo.donald@epa.gov</a>	703-648-4285
3	Donald Garofalo <a href="mailto:garofalo.donald@epa.gov">garofalo.donald@epa.gov</a>	703-648-4285	8	Donald Garofalo <a href="mailto:garofalo.donald@epa.gov">garofalo.donald@epa.gov</a>	703-648-4285
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#### Photogrammetric/Topographic Mapping Support

All Regions – Terry Slonecker (703) 648-4289



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## Appendix C

### Regional Remote Sensing Coordinators (RSCs)

The following are EPA Regional staff who act as liaisons between the Regions and LEB/EPIC. These people assist EPA Regional personnel and offices in ordering LEB/EPIC products and services. They are qualified to answer questions, mostly of a non-technical nature, regarding LEB/EPIC's capabilities.

Region	RSC	Program	Phone
1	Nancy A. Smith	Superfund	617-918-1436
1	Richard Piligian	RCRA	617-918-1757
2	Julie McPherson	Superfund	212-637-4159
2	Rob Alvey	ERRD/PSB	212-637-3258
3	Vic Guide	ESD	215-814-2733
3	Robin Faux	Superfund	215-814-3133
4	Carmen Santiago-Ocasio	Superfund	404-562-8948
4	Neil Burns	Superfund	404-562-8289
4	Rock Taber	GIS/Info Mgmt Branch	404-562-8011
5	Walt Francis	RCRA	312-353-4921
5	Steve Ostrodka	Superfund	312-886-3011
5	Mark Vendl	Superfund	312-886-0405
6	Rena McClurg	RCRA	214-665-8314
6	La Donna Turner	Superfund	214-665-6666
7	Aaron Zimmerman	RCRA	913-551-7333
7	John Tutorino	Superfund	913-551-7781
8	Kendra Morrison	RCRA	303-312-6145
8	Tony Selle	Superfund	303-312-6774
9	Ron Leach	RCRA	415-972-3362
9	Michael Gill	Superfund	415-972-3054
10	Elizabeth Pendleton	RCRA	206-553-2586





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