
EXAMPLE 4
REMOTE SENSING STATEMENT OF WORK

TECHNICAL REQUIREMENTS FOR KISSIMMEE RIVER RESTORATION
REMOTE SENSING PILOT STUDY SURVEY SEBRING, FLORIDA (SURVEY 01-207)

Revised 3-July-2001 (edited by Lowe & USACE on 7-16-01)

1.0 Location of Work

The project is located in Highlands and Okeechobee Counties at Sebring, Florida. The study area will be as described on the attached coordinate map, roughly running 8-10 miles along Pool C of the Kissimmee River and up to 2.0 miles of coverage on either side of the river. See Enclosure 1 for Kissimmee River Restoration Phase 1 Area Map and X, Y coordinates of the area.

2.0 Scope of Work

A remote sensing (RS) pilot study, utilizing hyperspectral imagery as a means to evaluate the potential of hyperspectral to detect, measure, and map vegetation composition, structure and species classes (including invasive/exotic species) in an automated fashion. The Pilot study shall establish the post Phase I construction conditions for the Kissimmee River Restoration project.

Consistent with Kissimmee River Restoration Evaluation Program (KRREP) objectives to determine progress towards restoration of ecological integrity by measuring key component indicators, the design and completion of this study must meet all requirements of the Protocol for Review and Submission of Information (Protocol) to the KRREP Database. The Protocol specifies requirements for area-based sampling, data formats and products. All data, products and deliverables submitted must be consistent with the objectives and specifications of the Protocol, as well as the USACE and SFWMD spatial systems. In addition, the above-mentioned products must meet the Spatial Data Standards for Federal and State Governments.

The services required for the preparation and execution of the pilot study, including specific tasks associated with the accomplishment of the work and other requirements for supporting, collecting and storing documentation obtained during the completion of the pilot study. There are three (3) main Tasks. Task 1 – Work plan Development, Task 2 – Establish Post Phase I Construction Conditions Utilizing Remote Sensing Technologies and Task 3 – Remote Sensing Pilot study Report Preparation, including Meetings, Conferences and Discussions. Specific attention to the delivery order schedule is critical to the success of the project, as the fieldwork, data collection and ground truthing must be accomplished in the August to October 2001 timeframe, which may accelerate the Contractor's work efforts.

The overall goal of the pilot study will be to move from a manual process of photo interpretation and manual processing of data into automated processes (i.e. hyperspectral imagery, LiDAR, etc.) to enhance and expedite the processing and delivery of ecosystem restoration mapping and recovery of data.

2.1 Compliance

The Contractor shall provide to the USACE all services, labor, materials, and equipment required to accomplish the work described in the technical requirements, not to exceed the ceiling identified in the task order. All pertinent Federal, State, and local rules and regulations must be followed, including, as a minimum, those administered by the USACE, the State of Florida, the SFWMD, the U.S. Fish & Wildlife Service and the US EPA. Details not specifically described in these instructions are nevertheless a firm requirement if they can be identified as an item, or items, commonly a part of professional grade work of a comparative nature.

All remote sensing pilot study deliverables must be compatible with the SFWMD existing digital ortho base (1994) and their existing GIS data base (1996) along with the Spatial Data Standards for Federal & State Governments, EM-1110-1-2909 Geospatial Data and System, Tri-Services A/E/C CADD Standards (www.tsc.wes.army.mil), and Chapter 177, Chapter 472, and Chapter 61G17 of the Minimum Technical Standards set by the Florida Board of Professional Surveyors and Mappers.

2.1.1 Digital Geospatial Metadata

Metadata are “data about data”. They describe the content, identification, data quality, spatial data organization, spatial reference, entity and attribute information, distribution, metadata reference, and other characteristics of data. Each survey project shall have metadata submitted with the final data submittal. All metadata submitted must be compliant with the Federal Geographic Data Committee Standard “Content Standard for Digital Geospatial Metadata”, FGDC-STD-001-1998. This standard is available for download from www.fgdc.gov. A graphical, annotated workbook explaining the standard is available in PDF format at www.fgdc.gov

Furnish a digital file using Corpsmet95 Metadata Software. Corpsmet95 is available for download from <http://corpsgeo1.usace.army.mil/>. all sections applicable to this collection effort must be completed. The point of contact in Survey Section for questions about metadata is Mr. Bill Mihalik at 904-232-1462.

3.0 Task 1 – Work Plan Development

Prior to beginning collection of any RS data, the Contractor shall prepare and submit a written work plan detailing each and every task associated with the Pilot study. No hyperspectral imagery work will be permitted until the Contracting Officer Representative (COR) has approved the Contractor’s work plan. At a minimum, the work plan must contain an outline for:

- Technology Applications Plan (covering each of the restoration components; providing a written description of the specific instrumentation, the methods or applications to be used and the analytical/interpretive procedures to be used).
- Field Sampling & Ground-truthing Plan (including protocols, procedures, training, calibrations, interim reviews, ground control data, etc.).
- Pilot study Report (outline with associated appendices & documentation).

- To ensure collection of August to October 2001 field data, the initial work plan Submittal will include the Field Sampling & Ground-truthing Plan only. Supplemental submittals will address the other focus areas required for a complete and thorough work plan.

4.0 Task 2 – Establish Post Phase I Construction Conditions Utilizing Remote Sensing Technologies

If the hyperspectral sensor - source data cannot be collected by the cutoff date, then the delivery order will be placed on a "temporary halt status" until next agreed upon stable sampling season, therefore no hyperspectral/remote sensing data shall be collected and a modification to the task order will be performed.

4.1 Control

The horizontal datum shall be State Plane Florida East NAD 1983/86 and vertical datum shall be NGVD 29.

4.2 Sensor

At a minimum, the airborne hyperspectral sensor shall be of sufficient quality to support the mapping of vegetation and other materials as outlined in the scope of work. The sensor will be of the AVIRIS/HyMap class extending through the reflective spectral range (400 - 2,500 nm).

4.3 Field Samples/Ground-Truth

The Contractor shall prepare and submit a Field Sampling & Ground-truthing Plan (FSGP) prior to beginning any fieldwork. This is a critical measure, since the FSGP must be prepared in accordance with the requirements given below and no fieldwork will be permitted until the Contractor's FSGP has been approved. Guidelines for developing an acceptable FSGP can be obtained from the SFWMD.

4.3.1 Field Vegetation Sampling

Field vegetation sampling will be conducted by the Contractor at approximately 700 predetermined polygons selected by SFWMD within the study area. Additionally, approximately 162 samples will be added to the overall results from data collected by SFWMD using a helicopter. Sample stratification was based on 1996 data on the distribution and abundance of 62 community types on the floodplain. The Contractor is to use established vegetation categories in the SFWMD classification document. Types that may be encountered by Contractor that have not been previously described are to be defined by SFWMD personnel in consultation with the Contractor for representation in the vegetation map.

Sampling points will be allocated by SFWMD for two uses: a) map accuracy assessment, and b) sensor calibration (training data set). Approximately 560 of the points will be reserved for the accuracy assessment sample; approximately 300 of the points will be allocated to the training sample. Vegetation sampling methodology will be determined by SFWMD in consultation with the contractor. Sampling points will be provided to the Contractor as State Plane coordinates in MS Excel spreadsheet format.

- Project organization; plus responsibility, qualifications and experience of (primary/support) personnel involved in the RS pilot study.
- Specific field sampling and data collection procedures to be used.
- Sampling location, using sub-meter/resource grade GPS (e.g. Trimble Pro-XR type) at each site.
- Digital photo(s) documenting conditions at each field sampling location with coordinates of the location of the photos along with the time, and date. This information shall be labeled on the digital image (photo) in the form of a digital GPS watermark.
- A description of equipment, field instruments, airborne/satellite instruments, samples data elements, data media & interface procedures and storage.
- Field documentation details and procedures.
- Documentation procedures (forms, field logbook entries, notes, etc.) to be used to record sample history, sampling conditions and analyses to be performed.
- Schedule for sample collection events throughout completion of the scope of work.

4.4 Data Interpretation or Classification

The Contractor shall make the necessary computations to verify the correctness of all measurements and apply the proper theory of location in accordance with the law or precedent and publish the results of the survey. The Contractor shall document whether reflectance or at-sensor radiance is used to derive the hyperspectral imagery vegetation classification. If reflectance is used, the Contractor shall document the atmospheric correction model used to account for water vapor (and other) effects.

4.4.1 Vegetation Map Accuracy Assessment

The Contractor will use error matrix procedures described in Congalton 1999 for description and assessment of vegetation map accuracy [Congalton, R.G. 1999. Assessing the accuracy of remotely sensed data: principles and practices. Lewis Publishers, New York]. Accuracy analysis results to be provided will include results for vegetation maps produced at a) Vegetation Community Type (bcode) and b) Habitat (Bcode Group) classification levels. Deliverables to be provided by the Contractor will include full documentation of accuracy assessment methods and results; error matrices; estimates of user's, producer's, and raw overall accuracy; estimates of overall accuracy using the Kappa statistic (Congalton 1999); and a report presenting methods and results in detail for both vegetation maps.

The SFWM database consists of approximately 68 vegetation communities and 12 habitats.

5.0 Task 3 – Remote Sensing Pilot study Report Preparation

The pilot study report shall be drafted and developed in multiple stages to ensure adequate opportunity for dialogue with and input from the USACE and the SFWMD. By taking a steady, iterative approach to the development of this study document, the study team will be able to better focus on the goals and objectives of the pilot study and will be in a better position to incorporate improvements and corrective actions into the finished product, the final pilot study report. Thus, the following meetings, data submissions and report submittals will be required:

- Post Ground-truthing Review Conference.
- Classified Image, Field Data & Accuracy Analysis Review Conference
- Final Pilot study Report Submittal.
- Final Remote Sensing Pilot study Workshop

6.0 GIS

The remote sensing data shall be translated or digital captured into ESRI shape files.

The vegetation image classifications will be delivered in an annotated thematic format compatible with the spatial systems of the USACE and SFWMD. For the USACE and SFWMD this format will be ESRI shape files, as specified in the Protocol. All sample data will be delivered in ASCII comma quote format.

All field sample data, imagery and thematic layers will be double-precision and georeferenced to the State Plane coordinate system, Florida East Zone, NAD83, NGVD29, feet. Coordinate conversion RMS values will be submitted for all spatial data. All data layers must have relative accuracy and logical consistency with the SFWMD database and KRREP data layers, as specified in the Protocol.

6.1 ESRI Shape Files

The vegetation community data shall be furnished in one shape file with codes for approximately 68 vegetation communities and shall be geo-referenced to the existing SFWMD digital ortho base (1994) and their existing GIS base (1996).

The habitat data shall be furnished in 1 shape file with codes for approximately 12 habitat and shall be geo-referenced to the existing SFWMD digital ortho base (1994) and their existing GIS base (1996)..

Each image shall have a separate tiff image data (.tiff suffix) and coordinate "world" ASCII reference file (.tifw suffix).

7.0 Deliveries

All digital data shall be submitted on Recordable (CD-R) Compact Disk, media. Compact Disk, Rewritable (CD-RW) will not be accepted. Four sets of final CD's (2 to USACE and 2 to SFWMD).

- ESRI shape files.
- Tiff and Tifw files.
- Ten copies of each different report (or deliverable), in bound report format (5 to USACE and 5 to SFWMD). All text documents shall be MS word (*.doc) files.
- Furnish a digital file using CORPSMET 95 (Metadata Software) with the appropriate data included.

8.0 Schedule

(All days and dates are shown as calendar days/dates)

ACTIVITY OR DELIVERABLE	DELIVERY DATE
DATE OF AWARD/Notice to Proceed (NTP)	To Be Determined
TASK(S) 1, 2, & 3 Initiated	20 July 01
TASK 1 Initial (Ground-truthing)	
Work plan Submittal	26 July 01
TASK 1 Initial (Ground-truthing)	
Work plan Approval	31 July 01
TASK 2 Field Sampling & Ground-truthing	1 August 01
Mob. w/ RS Activities Commencing	
TASK 1 Overall RS Work plan Submittal	29 August 01
TASK 1 Overall RS Work plan Approval	12 September 01
TASK 3 Post Ground-truthing Review Meeting	27 September 01
TASK 2 Cutoff for Collecting Remote Sensing & Ground-truthing Data	31 October 01
TASK 3 Classified Image, Field Data and Accuracy Analysis Review Conference	9 November 01
TASK 3 Final Remote Sensing Pilot study Report Submittal	17 December 01
TASK 3 Government Comments	7 January 02
TASK 3 Corrected Final Remote Sensing Pilot Study Report (w/responses to comments)	28 January 02
TASK 3 Remote Sensing Pilot study Workshop	28 February 02

9.0 Site Visits, Meetings/Conferences and Discussions

During the course of the execution of the pilot study, the Contractor will be required to schedule and meet several times with the USACE and the SFWMD staff elements. The purpose of the interactive site visits and meetings will be to discuss key project issues in light of overall project objectives and to make adjustments that will maximize the results of the Pilot study. Brief trip reports shall be prepared and documented in the final pilot study report, thus summarizing the site visits, meetings and discussions that attest to the particular project issues discussed, the personnel contacted, the time & location of the meetings, the data gathered and decisions rendered, etc.

10.0 Post Ground-Truthing Review Meeting

A one-day working meeting will be held with appropriate USACE & SFWMD staff at the SFWMD Office in West Palm Beach, FL. The purpose of the meeting will be to discuss the results of the Contractor's ground-truthing program, including the field data, classification methods, and sampling procedures, along with an organized compilation of GPS coordinate data, digital photos, and other pertinent field information and documentation. The Contractor shall deliver a comprehensive MS Office – PowerPoint presentation summarizing their sampling

acquisition protocols, their field sampling and ground-truthing plan, their data interpretation and analysis techniques and their overall data check procedures utilized for the Pilot study. The Contractor representatives expected to attend and discuss these findings shall be:

- Project Manager(s)
- Senior Environmental Engineer/Scientist
- Senior Remote Sensing Scientist
- Biologist/Botanist

11.0 Classified Image, Field Data and Accuracy Analysis Review Conference

A one-day working meeting will be held with appropriate USACE & SFWMD staff at the Jacksonville District Office in Jacksonville, FL. The Contractor representatives expected to attend and give progress update presentations shall be:

- Project Manager(s)
- Senior Environmental Engineer/Scientist
- Senior Remote Sensing Scientist
- Geospatial Data/GIS Expert

12.0 Final Remote Sensing Pilot Study Report

The final remote sensing Pilot study report will include (at a minimum): a complete and concise summary of all of the work activities and phases of the pilot project; a brief discussion on objectives, procedures, protocols, sampling guidelines, and analysis techniques utilized for producing the finished product; a standard operating procedure (SOP) for the operation and use of data fields and maps produced under the pilot study; a detailed discussion on the accuracy assessment, defensibility and reproducibility; recommendations for use and applications of remote sensing for future projects with similar objectives; a brief summary and cost analysis for future remote sensing applications and overall conclusions of the remote sensing pilot. No meeting will be required prior to the submittal of the final remote sensing pilot study report. The Government will respond with comments within 21 days after receipt of this document.

13.0 Final Remote Sensing Pilot Study Workshop

A one-day Final workshop meeting will be held with appropriate USACE & SFWMD staff at the SFWMD Office in West Palm Beach, FL. The purpose of the meeting will be to present the results of the Remote Sensing Pilot study, including a brief demonstration of the finished product. The Contractor representatives expected to attend and give progress update presentations shall be:

- Project Manager(s)
- Senior Environmental Engineer/Scientist
- Senior Remote Sensing Scientist
- Geospatial Data/GIS Expert

14.0 Government Reviews

The time required by the USACE and the SFWMD to review submissions by the Contractor shall vary depending on their particular organizational workload and type of submittal. However, the USACE and SFWMD will endeavor to limit the review periods for document submittals to a maximum of 21 calendar days.

15.0 Agency Contacts

15.1 Communications

Contacts via telephone calls or e-mail messages to the USACE and SFWMD are required at least seven days before routine fieldwork is scheduled to occur.

The established points of contact (POCs) for the Remote Sensing Pilot study are:

USACE - Jacksonville District

a. Primary POCs:

John C. Hess

Tel#: 904-899-5013

E-mail: john.c.hess@usace.army.mil

SFWMD – West Palm Beach Office

Chris Carlson

561-682-6143

ccarlson@sfwmd.gov

b. Alternate POCs:

Son Q. Vu

Tel#: 904-232-1606

E-mail: son.q.vu@usace.army.mil

Laura Carnal

561-682-6982

lcarnal@sfwmd.gov

15.2 Written Communications

Written correspondences, formal letters and other types of notification or letters of transmittal for documents will be sent to the following addressees:

Ms. Chris Carlson,
South Florida Water Management District
Kissimmee Dept (4470) & Watershed
3301 Gun Club Road
West Palm Beach, FL 33406

Mr. John C. Hess
U.S. Army Corps of Engineers
P.O. Box 4970, Attn: CESAJ-DP-R
Jacksonville, FL 32232-0019

16.0 Discrepancies

The Contractor shall advise the COR of any discrepancies, ambiguities, or lack of clarity noted in the information furnished by the USACE or the SFWMD, for use in connection with the Contractor's responsibilities under this Scope of Work.