Survey Management
and
Measurement Management

Project Planning Document

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1.0 Project Overview

1.1 Project Description

Name of Project	National Integrated Land System
Sponsor (Name, Title, Program/office)	Jack Arthur, Director, IRM and Jack Craven, Director, Lands, for the Forest Service. Hord Tipton, Assistant Director, IRM and Pete Culp, Assistant Director, Minerals, Realty & Resource Protection, for the Bureau of Land Management.
Direct Beneficiaries	Cadastral Surveyors and Land Management Specialists
Products	Survey Management (SM) – An automated, GIS-based set of Cadastral surveyaing and data collection tools. Measuement Management (MM) – A GIS-based set of tools for the creation and management of cadastal survey networks. .
Justification	In order to effectively accomplish its mission of administering the nation's public lands, the BLM must have at its disposal the most efficient land surveying technologies. With the increasing complexity of federal land management business rules and regulatory requirements, standardized and accurate methods for locating monuments, corners, boundaries and features (wells, rights of way, etc) are a must. Currently, many different land-based systems and methods exist for performing the day-to-day business tasks of the BLM and other agencies. The unrelated and dissimilar nature of these applications create unnecessary work and backlogs, opens the door for error and is very inefficient. A common basis of doing business throughout all agencies must be made available to management and staff. Achievement of these demands can only be met with user tools which conform to a standard, are automated as much as possible and are maintained in a Geographic Information System (GIS) environment which preserves its data in a store conforming to a standard model. Survey Management would provide the BLM and its customers with software to support the automated capture of survey data into the database format. Measurement Management would provide the mathematical and survey adjustment processes to create high quality control networks. Together Survey Management and Measurement Management would furnish the basis for efficient parcel management, which is the ultimate goal of land managers.
Return on Investment (ROI) ratio	The Benefit/Cost ratio is 2.7.

Survey Management and Measurement Management are extensions to the National Integrated Land System (NILS). Many of the initial phases of the Survey Management and Measurement Management projects are summarized in the NILS Concept of Operations and User Requirements (COURS) document. This document will refer to the COURS document and to

NILS where appropriate. Also, since Survey Management and Measurement Management are closely related in purpose and functionalities, their project planning is contained in this one document and they will be developed in one effort.

The National Integrated Land System is a service-first initiative of the Bureau of Land Management (BLM) and the U.S. Forest Service (FS). The Project Charter was signed in March 1999 by the four Project Sponsors, Jack Arthur, Director, IRM and Jack Craven, Director, Lands, for the Forest Service and Gayle Gordon, Assistant Director, IRM and Pete Culp, Assistant Director, Minerals, Realty & Resource Protection, for the Bureau of Land Management.

The Survey Management and Measurement Management Project would be directed and managed by the BLM and FS in partnership with the Parcel Consortium, a team of other federal, state and local governments, and other interested parties active in the fields of surveying and measurement management. The BLM, FS, and Consortium, in cooperation with Environmental Systems Research Institute (ESRI) would develop automated field surveying tools and a toolset for managing cadastral survey networks in a Geographic Information System (GIS) environment. The surveying and measurement management toolsets would fulfill BLM and FS core business requirements critical to meeting the common mission objectives of both agencies

Deployed as part of NILS, Survey Management And Measurement Management would facilitate the collection and management of survey information across all levels of government and the private sector while protecting and enhancing current investments in cadastral data.

1.2 Project Purpose

1.2.1 Project Objectives

- **Survey Management Extension:** Develop an integrated set of automation objects that are embedded into compatible survey data collection software packages to support the capture of measurement features and metadata into a database format. The goal of the Survey Management extension is to minimize the need for data conversion and re-construction as new and existing survey data is incorporated into the land records management system.
- **Measurement Management Extension:** Develop GIS-based tools to produce a new feature coordinate solution by performing a weighted parametric-geodetic adjustment according to the qualitative characteristics of users data to create a higher-quality, control network database for the Public Land Survey System (PLSS) and the non-Rectangular Survey System (metes and bounds), relying upon much of the feature and functionality inherent in the GCDB Measurement Management system (GMM).

1.2.2 Compliance with Laws

1.2.2.1 Clinger-Cohen Act.

- Land management business practices and requirements specific to land management offices are currently, but not totally and concisely implemented in software. This eliminates the use

of Commercial, Over-the-Counter Software (COTS). The BLM would cooperate with a prominent GIS software development contractor to take advantage of existing functionality and to develop additional functionality to create a state-of-the-art land management system.

- The Survey Management and Measurement Management Project supports the BLM goal of developing a common solution for BLM, the Forest Service and their partners for the business processes involved with the management of cadastral land records.

1.2.2.2 Government Performance and Results Act (GPRA)

- The Survey Management and Measurement Management project efforts are aligned with the BLM Performance Plan.

- The implementation of Survey Management and Measurement Management would improve land data accuracy thus reducing technical and legal risks and would develop a higher level of customer confidence.

- Survey Management and Measurement Management conform to the BLM mission statement by providing the best practices of managing the public lands.

- Survey Management and Measurement Management have been initiated and would be tracked to completion using state of the art project management practices.

- Results would be measurable - consistency of data, efficiency, paperwork reduction, customer satisfaction.

1.2.2.3 Paperwork Reduction Act (PRA)

- By digital automation of land management business practices from data capture to final product, paper records and maps would be minimized and/or eliminated.

- Automated sharing of land data would become digital vs. the now prominent duplication of information using copies. Data retrieval and analysis would be performed in a GIS environment.

- Communication of task plans, needs and specifications would be carried out via electronic methods.

1.2.2.4 Americans with Disabilities Act.

See section 3.8.

1.3 Summary of Project Management Information

1.3.1 Project Management

The Project Manager is Leslie Cone with the Bureau of Land Management, located in the Denver Federal Center, Building 40, WO-330D 80225-0047, Denver, CO. The Project Manager may be reached at [303-236-0815] or by e-mail at Leslie_Cone@blm.gov. This project is documented on the World Wide Web at www.blm.gov/nils.

An object-oriented analysis and design (OOAD) method would be used to capture the essential business process requirements that would be supported by the Survey Management and Measurement Management software application. The result of this process is captured in the COURS document. Analysis, data modeling, build and review phases of Survey Management and Measurement Management would also follow OOAD principles. Project management of Survey Management and Measurement Management is based upon the concepts of Managed Evolutionary Development (MED) and would follow these concepts throughout the life of the project. Resources and scheduling would be tracked throughout the life of the project using a Work Breakdown Structure (WBS) and a Gantt chart. The economics of the project would be analyzed using Return on Investment (ROI) techniques. Other project management techniques applied to the project would include forms of Life Cycle Management and Uniform Modeling Language (UML).

The Survey Management and Measurement Management data architecture will comply with the Federal Geographic Data Committee's (FGDC) Cadastral Data Content Standard. and metadata standards. It is expected that the Survey Management and Measurement Management data architecture would extend the FGDC Cadastral Data Content Standard.

1.3.2 Project Schedule Overview

The Requirements phase of the Survey Management and Measurement Management extensions to the NILS project was completed in March 2000. In this phase, the business rules, business requirements and functionalities were determined and documented. See the NILS Concept of Operations and User Requirements document. The Analysis and Design phase would include use case refinement and gap analyses with existing Commercial Over-The-Counter (COTS) software; development would consist of data modeling, prototyping, software development and testing. NILS functionalities and software would be developed in modules (extensions) by Environmental Systems Research Institute (ESRI), contractor for the project. The modules addressed in this document are Survey Management (SM) and Measurement Management (MM); Parcel Management (PM) and GeoCommunicator (GC) are addressed in separate Project Planning documents.

A basic requirement of the NILS development is to ensure that the functional requirements for the extensions are compatible with ESRI's latest version of their COTS. The extensions are being developed in parallel with ArcInfo's Modules. Survey Management which is scheduled for completion in FY Qtr. 2 of 2001 and Measurement Management scheduled for completion in FY Qtr. 2 of 2002 track ArcSurvey;

The Transition and Deployment phase will include site installations, COTS installations, site testing, readiness review, user training and deployment.

The Operations and Maintenance Phase will consist of BLM staff dedicated to the support of NILS and its extension.

A high level Gantt chart of the Survey Management and Measurement Management schedule is in Section 6.1.2.1 of this document.

The Survey Management (SM) and Measurement Management (MM) milestones are listed in the following table:

Phase	Milestones	Date
Initiation	Partnership Agreement	6/11/98
Design (Requirements)	Completion of Requirements Document	3/00
Analysis	Completion of Detailed Feature/Functionality Document	9/18/00
	Completion of Software Development Plan and Analysis document.	8/01
Development	Completion of Construction	7/1/02
Transition/ Deployment	Deployment	9/1/02
Operations/ Maintenance	SM and MM turn-over to Operations and Maintenance; close-out	9/1/02

1.3.3 PO-504 Project Budget/Resources Overview

The following table shows the FY2002 budget for PO-504.

RESP	DESCRIPTION	ACTIVITY	WMs	OC 11	OC21	OC25	OC26	OC31	
				Labor	**Travel**	**Contract**	**Supplies**	**Equip**	**Total**
	PO-504 NILS								
LABOR	Project Manager	4550	12	146,000					146,000
LABOR	Deputy Project Manager	4550	6	54,000					27,000
LABOR	Technical Lead	4550	6	48,000					24,000
LABOR	vice Program Analyst	4550	12	83,000					83,000
LABOR	Program Analyst	4550	12	89,000					89,000
LABOR	Program Analyst	4550	12	89,000					89,000
LABOR	Program Analyst	4550	12	81,000					81,000
LABOR	GIS Specialist	4550	6	44,000					44,000
LABOR	Program Analyst	4550	12	80,000					80,000
LABOR	Administrative Assistant	4550	12	49,000					49,000
LABOR	SME Participants	4550	12	50,000					50,000
TRAVEL	Travel-staff	4550			50,000				50,000
TRAVEL	Travel Domain Experts	4550			75,000				75,000
TRAINING	Training	4550			40,000				40,000
CONTRACT	Contract Support (CM/QA)	4550				50,000			50,000
CONTRACT	GeoCommunicator O&M (NILS)	4550				250,000			250,000
CONTRACT	Survey Mgmt & Measurement Mgmt	4550				500,000			500,000
CONTRACT	Design and Analysis Parcel Mgt (NILS)	4550				800,000			800,000
CONTRACT	FGDC Compliance Support Contract	4550				35,000			35,000
CONTRACT	Contract Documentation & Mgt	4550				160,000			160,000
CONTRACT	Integrate BLM Land Data	4550				460,000			460,000
MISC	Maintenance-Evoke Software	4550				90,000			90,000
EQUIPMENT	Equipment	4500						140,000	140,000
MISC	Misc	4550					25,000		25,000
	TOTAL		**90**	**813,000**	**165,000**	**2,345,000**	**25,000**	**140,000**	**3,437,000**

1.4 Project Documentation Plan

Document Name	Date completed/Updated
Partnership Agreement	June 11, 1998
Project Charter	March 9, 1999
Vision Document	September 22, 1999
Project Plan	September 22, 1999
Project Planning document	August, 2001
Project Gantt Chart	August, 2001
Work Breakdown Structure	August, 2001

2.0 System Boundaries

2.1 Scope of Project

The NILS Project incorporates tasks and concepts originally planned for separate, independent development in the Forest Service's ALP Project, BLM's ALMRS Release 2 Project and Cadastral programs into an integrated, collaborative effort. The criteria for determining the areas of overlap are based on the common business requirements of both agencies and the Parcel Consortium in the areas of realty and records and are identified as priorities for development in the Project Plan and supporting narratives. NILS would be tightly focused on development of parcel level interagency spatial land applications to integrate ALP and ALMRS Release 2 capability and meet basic user needs. The Project Team would actively seek input and validation from external customers and partners; however, the focus would be on business functions defined by ALP and ALMRS.

Concepts for inclusion into the Survey Management extension to NILS are:

- Assist the user in locating survey and survey related records.
- Preparation of data collection equipment files for use in the field.
- Manipulation and configuration of computer files in the field.
- Reading and storage of observations and of field measurement data and metadata in a database format.
- In-field survey calculations and reduction of the observations using coordinate geometry and pre-adjustment functionalities.

For Measurement Management, extension concepts are:

- Combine the individual components of measurement data from a variety of sources and reliabilities (pre-adjusted measurement network) into a seamless and coherent survey network (adjusted measurement network).
- Further divide the network into its required detail based on legal descriptions to form all the spatial features needed to display the legal descriptions (legal description fabric).

The other components of an integrated land information system, technology (i.e., the computers, operating systems, networks, and communications), must accommodate and facilitate the development components and must be developed in partnership with this project. As major applications for each agency, Measurement Management and Survey Management would be factors in decisions concerning their IT investments. The extensions would define technology requirements, network performance, disk space, etc to implement tools and applications. The NILS project would also need to evaluate and test new technology to support its own development needs and would present proposed solutions to each agency's IT staffs. The project incorporates development originally planned for ALP and ALMRS Release 2; it integrates the development and overlaps both independent projects as well as maintenance requirements.

2.1.1 Targeted Business Processes

2.1.1.1 Survey Management

- Research project area history, access records, plats, monument rubbings, aerial photos, survey notes, etc. before going to the field.
- Setup project on data collector or in fieldbooks based on the type of survey being conducted.
- Set up survey instrument and data collector, if applicable, in field.
- Capture/modify field survey observations directly in the field
- Calculate point coordinate position and lines.
- Transfer field data to land management database.

2.1.1.2 Measurement Management

- Survey reduction and calculation of survey geometry to create a survey network
- Provide logical connection between parcel geometry and parcel attributes; data validation; determine more exact location of property boundaries.
- Find and correct errors; create aliquot parts.
- Survey Adjustment.
- Create initial structure of land parcels.

2.1.2 Function

Provide automated, standardized survey data management tools for field surveying and land survey calculations.

2.1.3 Intended Customers/Users

Federal, state, county, local government land and resource management departments; professionals with requirements for public land data.

2.1.4 Geography

The extent will depend upon the level and number. Survey Management and Measurement Management will be deployed, over a period of time, to land surveyors and land management specialists throughout the BLM. Also, NILS software will be released in the public domain.

2.1.5 Business Sites

Federal, state, county, local government land and resource management offices.

2.1.6 Interfaces with other Systems/Processes

Any existing land-based system in use by the BLM, FS and their customers.

2.1.7 Other Existing or Similar Systems

Gap analysis was performed on existing software: Automated Land Project (ALP), Cadastral Electronic Field Book (CEFB), Cadastral Measurement Management (CMM), Geographic Coordinate Data Base Measurement Management (GMM). If new COTS with requirements similar to Survey Management or Measurement Management is discovered, gap analysis will be performed.

2.1.8 Other components where any potential ambiguity may introduce scope creep

None.

2.1.9 Risk Management

Overall risks, which apply equally to Survey Management, Measurement Management and the NILS project have been identified. See the table in this sub-paragraph. These risks are managed by the NILS Project Team. New risks (and the corresponding mitigation) are identified as the project progresses through its phases. Mitigation plans are developed as new risks arise

The contractor identifies and manages risks which are directly related to the software development processes. It is their responsibility to mitigate risks that would result in deviation from the project timeline.

Overall Risks Managed by NILS Project Team:

RISK	MITIGATION
1. Dedicated technology lead and	Personnel assigned and teams

extension teams from BLM are required	formed during Project Initiation phase.
2. Decentralized data conversion effort	QA analysis program; data content standard; GCDB; subsequent enforcement Data Integration effort
3. Missing fundamental user requirements	OOAD process to guide design; user validation
4. Late, infrequent deliverables to illustrate progress	Project web site, iterative prototyping; communications plan
5. Lack of user support and/or acceptance because of perceived insufficient input from multiple levels of users	Publicity and support drive, communication plan; users participate in requirements phase.
6. Tools do not enforce data model standard and business rules effectively	Iterative Prototyping
7. System not capable of aggregating and splitting land units properly	Enforce BLM business rules within analysis of requirements.
8. Newly legislated business requirements	Easily versioned software to accommodate new functionalities and business rules.
9. Changes in Freedom of Information Act (FOIA) requirements.	Same.
10. Changes in the nature of confidential BLM data and information.	Same.

2.2 Project Completion Criteria

Phase	Milestones	Date
Initiation	Partnership Agreement	6/11/98
Design (Requirements)	Completion of Requirements Document	3/00
Analysis	Completion of Detailed Feature/Functionality Document	9/18/00
	Completion of Software Development Plan and Analysis document.	8/01
Development	Completion of Construction	7/1/02
Transition/ Deployment	Deployment	9/1/02
Operations/ Maintenance	SM and MM turn-over to Operations and Maintenance; close-out	9/1/02

2.3 System Boundary Changes

Changes since first version of MED document	Approved By	Date of Approval
NONE		

3.0 Target Business Processes

3.1 Supporting Documents

Documents containing detailed material about the existing and re-engineered business processes:

Document Citation	Date	Information Content	On Web Site?
Geographic Measurement Management User's Manual and other documentation.	2/28/00	Geographic Coordinate Database and cadastral survey spatial information processes.	http://www.spatial.maine.edu/~kwurm/
BLM land management business process procedures.		Business rules and functional requirements for land management.	No
NILS Concept of Operations and User Requirements document.	3/00	Project requirements which would drive analysis/build /review phase.	http://www.blm.gov/nils
BLM IT Architecture vs. NILS Essential Elements Cross-walk.	3/14/00	Comparison of BLM IT Architecture and NILS proposal	No.
Draft Business Process to Strategic Plan Comparison	3/10/00	Comparison of NILS business processes with BLM business processes	No.
Manual of Surveying Instructions	1973	BLM surveying business rules	No
Detailed Feature/Function Specifications	9/00	Expanded Use Case Requirements	No
BLM Information Technology Architecture Technical Reference Model (TRM) Vol. 1, Management Overview	7/31/00	Direction for design, construction, purchase, deployment and management of Information Technology	http://web.wo.blm.gov/blma/
Content Standard for Geospatial Metadata, FGDC STD 001-1998	1998	Metadata standards.	http:// www.fgdc.gov
FGDC Cadastral Data Content Standard for the National Spatial Data Infrastructure.	1999	Standard for cadastral data model.	http:// www.fgdc.gov
Use case Analysis Document	7/2001	Detailed Requirements	http://www.blm.gov/nils
Software Development Plan	7/2001	Structure and content of software.	http://www.blm.gov/nils

Document Citation	Date	Information Content	On Web Site?
Glossary of Use Case Terms	7/2001 (update)	Explanation of terms and concepts.	http://www.blm.gov/nils

3.2 Target Business Processes:

Business Areas:

- **Survey Management:** Land-data collection, survey planning and the capture and processing of raw survey measurement data. The data collected from the field survey is used as the basis for parcel geometry.

- **Measurement Management:** Adjustment of survey data; error detection; subdivision of parcels based on business rules. Creation of parcel geometry intermediate to the raw data input/processing (as done in SM) and the final data representation; includes user intervention and GIS facilities for data editing.

Target Business Processes for each Business Area:

Survey Management Business Area					
Description of Current Process	**Proposed Change**	**New Business Process**	**Customers for Final Product from Process**	**Criticality of Process to Business Area**	**Proposed Benefits**
Research project area history, access records, plats, monument rubbings, aerial photos, survey notes, etc. before going to the field.	Locate, view and evaluate all relevant digital database and non-digital records for the research scope. Sources may include hardcopy records, plats, monument rubbings, aerial photos, survey notes, etc.	SM01. Survey Research	Federal, state, county and local government land management specialists; private concerns	Most Critical	Automated, shared source of survey data A common land net and common display of land data will lead to quality decision making. GIS environment for locating/using data.
Setup project on data collector or in fieldbooks based on the type of survey being conducted.	Process to create a field survey setup file to manage the collection of readings, observations, and measurements.	SM02. Pre Field Survey Setup	(same)	(same)	Automated , shared, pre-defined source of data to preconfigure surveys. GIS environment for locating/using data.

Survey Management Business Area					
Description of Current Process	**Proposed Change**	**New Business Process**	**Customers for Final Product from Process**	**Criticality of Process to Business Area**	**Proposed Benefits**
Set up survey instrument	This is the in-field process to configure a data collection device and/or a computation device by selecting and applying a field survey setup file. (An example data collection device is a palmtop configured with NILS field survey software. An example computation device is a laptop configured with NILS field survey software. Data collection devices and/or computation devices are distinguished from a measuring device such as a total station.)	SM03. In Field Survey Setup	(same)	(same)	Automated setup and configuration of data collection device.

Survey Management Business Area					
Description of Current Process	**Proposed Change**	**New Business Process**	**Customers for Final Product from Process**	**Criticality of Process to Business Area**	**Proposed Benefits**
Capture/modify field survey observations directly in the field Construct a "true line" from a set of line measurements.	Perform field data collection by recording readings using a data collection device. Readings are computed with a computation device to derive observations and measurements.	SM04. Collect Field Data Observations	(same)	(same)	Shared collection and maintenance of land survey data reduces direct non-labor costs.
Calculate point coordinate position	Process to use coordinate geometry (COGO) tools to calculate coordinate positions. Includes planar and geodetic calculations. May be used to perform layout or to search for point locations. May be used in conjunction with building a measurement network, a legal description fabric, or a parcel fabric.	SM05. Perform COGO and Layout	(same)	(same)	Consistent topology is maintained with the use of standard adjustment tools; GIS environment for data calculations and evaluation..

All land management related processes are performed as daily, on-going tasks during the normal business cycle.

Measurement Management business area					
Description of Current process	**Proposed change**	**Nerw business Process**	**Customers for final product from process**	**Criticality of process to business area**	**Proposed benefits**
Survey computations	Measured features are constructed from component elements in a measurement network by applying construction and computation methods. Measured features have topological associations to their component elements (i.e. Component features and/or survey points.) This use case may be used in conjunction with building a measurement network, a legal description fabric, or a parcel fabric.	MM01. Construct measured feature	Federal, state, county and local government land management specialists; private concerns	Most critical	▪ Automated, consistent methods for creating survey geometry. ▪ Resolve cartographic and coordinate representation of non-survey features relative to surveyed features. ▪ Create gis environment for manipulation of data. ▪ Integration of parcel attributes and features with parcel geometry

Measurement Management business area					
Description of Current process	**Proposed change**	**Nerw business Process**	**Customers for final product from process**	**Criticality of process to business area**	**Proposed benefits**
Provide logical connection between parcel geometry and parcel attributes Data validation Determine more exact location of property boundarues	Perform an iterative parametric least squares adjustment on a measurement network to analyze and adjust coordinate values for points. Generate statistics on measurement and coordinate reliability. May be used in resolving the cartographic and/or coordinate representation (relationship) of non-survey features (map control, legal descriptions, digitized, scanned/vectorized) relative to surveyed features. May be used to resolve the representation of non-surveyed features without reference to surveyed features. Note: a measurement network may be composed of legal descriptions as well as measurements.	MM02. Edit measurement data	(same)	(same)	▪ Error detection and correction. ▪ Provides for adjustment and correction of survey boundaries in automated, gis environment.

Measurement Management business area					
Description of Current process	**Proposed change**	**Nerw business Process**	**Customers for final product from process**	**Criticality of process to business area**	**Proposed benefits**
Find and correct errors Create aliquot parts	Manual entry/edit of measurement data values. Includes types of anomaly detection and anomaly correction as part of edit validation.	MM03. Adjust and anayyze measurement network	(same)	(same)	▪ Eliminates survey errors. Error detection and correction software allows for user intervention when validating survey data. ▪ Automated, GIS environment ▪ Polygon creation and subdivision. ▪ Survey adjustment

All land management related processes are performed as daily, on-going tasks during the normal business cycle.

3.2.1 Tie Businesses to the Bureau Architecture

The Survey Management and Measurement Management business processes and the corresponding Bureau Architecture business processes are shown in the following table.

		Survey Management / Measurement Management Business Processes							
Bureau Architecture Process		**SM-01 Survey Research**	**SM-02 Pre-Field Survey Setup**	**SM-03 In-Field Survey Setup**	**SM-04 Collect Field Data Observations**	**SM-05 Perform COGO and Layout**	**MM-01 Consturct Measured Feature**	**MM-02 Adjust Analyze Measurement Network**	**MM-03 Edit Measurement Data**
2.1.1.	Determine Ability to Respond to Request	X		X	X	X	X	X	X
2.1.2.	Respond to Assessment Request	X		X	X	X	X	X	X
2.2.1.	Determine Data Collection Protocol/Standards/Location	X	X	X					
2.2.2.	Collect Condition/Status Data	X		X	X		X	X	X
2.2.3.	Generate Inventory Report	X	X	X	X	X	X	X	X
2.3.1.	Analyze Condition/Status Data	X		X	X	X	X	X	X
2.3.2.	Generate Condition/Status Report	X		X	X	X	X	X	X
2.3.3.	Maintain Condition/Status Assessment Record	X	X	X	X	X	X	X	X

3.2.2 Business Process Improvement

The design methodology for Survey Management and Measurement Management is entirely based upon the Object Oriented Analysis and Design (OOAD) techniques which, in turn, are centered upon user involvement. The functional requirements for the Project were gathered in a

series of workshops attended by users, technical experts, managers and consultants. The requirements were then refined, ie., analyzed for redundancy and overall relevancy. They were consolidated in a draft of the Concept of Operations and User Requirements document. Public review meetings were held in Portland, OR, Denver, CO, Phoenix, AZ, Atlanta, GA and Washington, DC. Comments from the review meetings were used to finalize and publish the document, which is available for viewing on the website, http://www.blm.gov/nils.

3.2.3 End users/Customers

End users and customers are cadastral surveyors and land management specialists (development planners, consultants, data stewards, assessors, case recordation specialists, recreation planners). Their employer may be the federal government; state, county or city governments or private concerns. Survey Management and Measurement Management will serve any individual or organization whose primary data/information requirements are current, consistent and accurate parcel and survey data.

Survey Management and Measurement Management have been accepted by the cadastral community as much needed and pertinent efforts to consolidate surveying and land management data and to make it easily available. The positive response to the Project is apparent from the activity on the website, the requests for presentations and the attendance at the public review meetings.

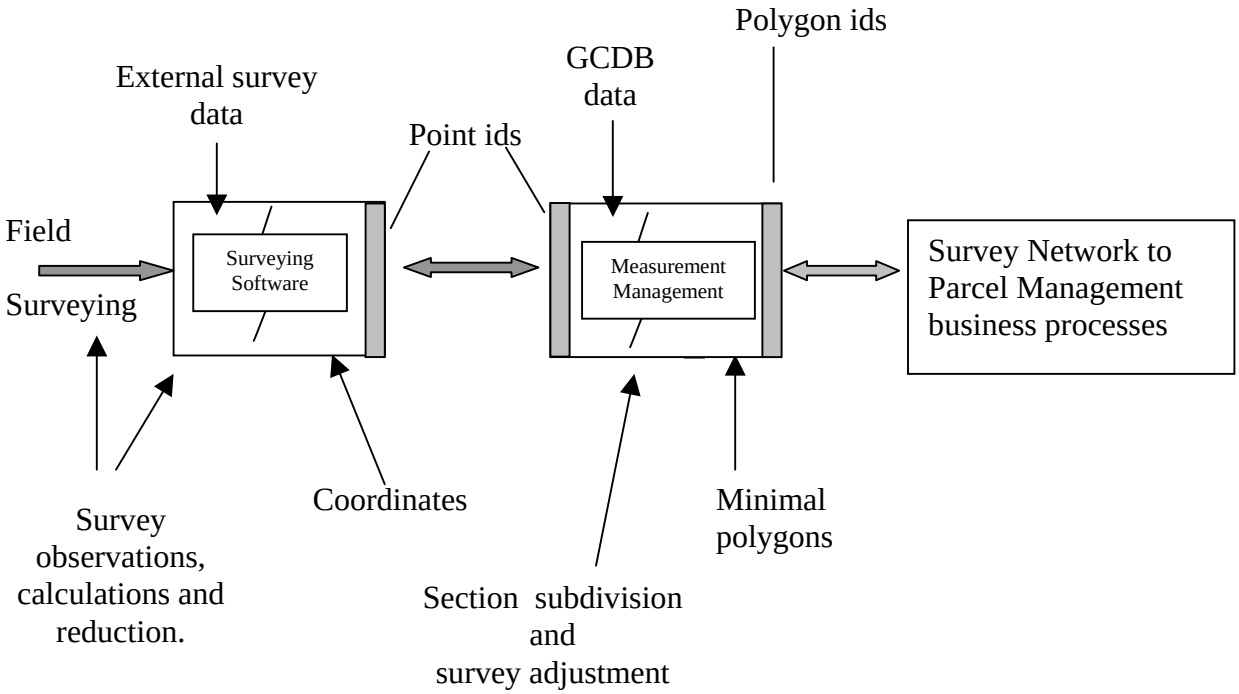
During the Analysis and Design phase, user involvement would be solicited in the same manner as a means to identify any shortcomings and to create a product which serves the needs of the customer.

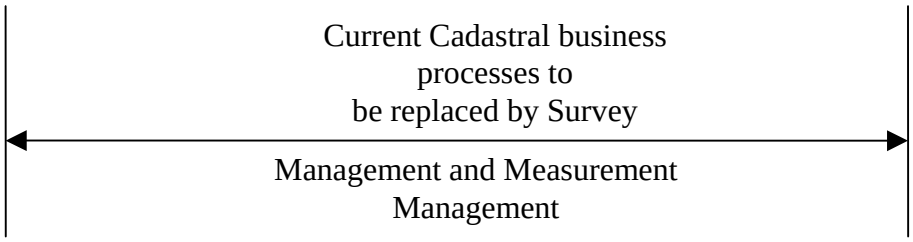
3.2.4 Other Business Areas/Programs

Since the Survey Management and Measurement Management are projects directed at creating an efficient means of working with land data and information, they will integrate with the business processes and activities of the BLM because BLM's functions are land based. This also pertains to other agencies and organizations involved in land management. The functionalities of LR2000, GCDB, RAS, leasing, rights-of –way, mining claims and the many other land-based activities within the BLM will benefit from a common land data model and set of GIS tools for land management.

3.3 High Level Business Process Flow Diagrams

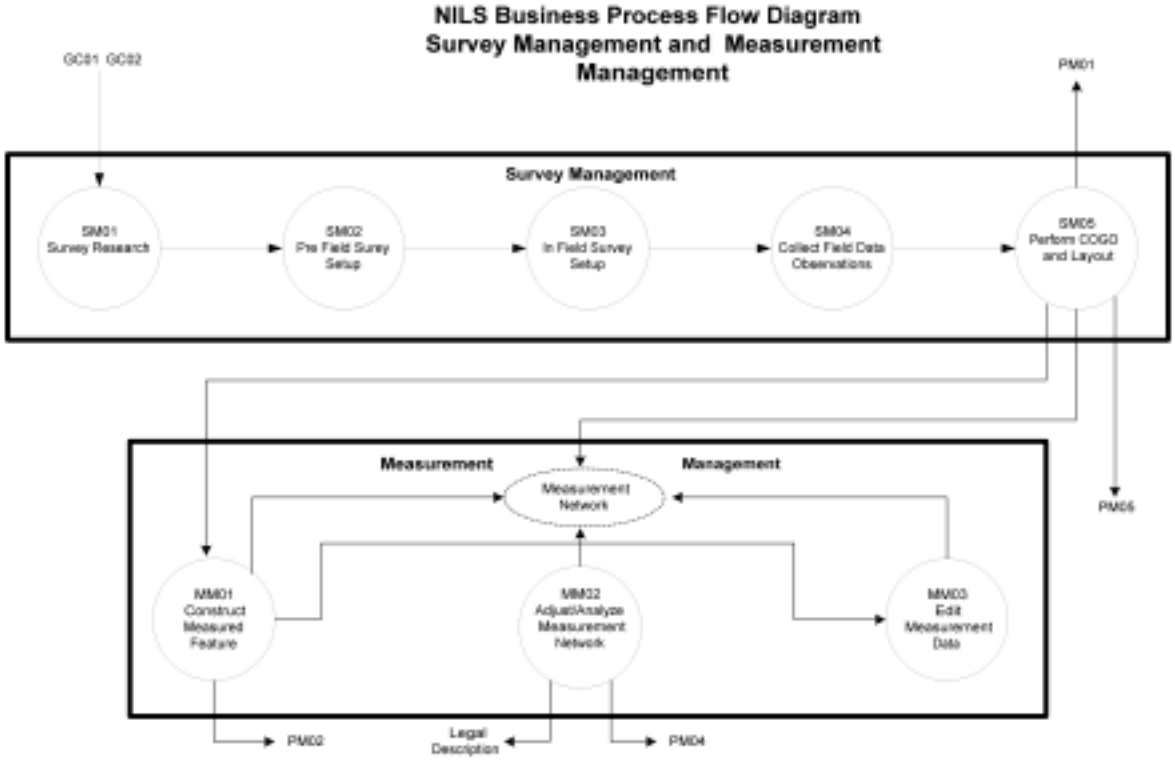
3.3.1 As Is System


Polygon ids
GCDB data
External survey data
Point ids
Field
Surveying
Surveying Software
Measurement Management
Survey Network to Parcel Management business processes
Survey observations, calculations and reduction.
Coordinates
Section subdivision and survey adjustment
Minimal polygons


Current Cadastral business processes to be replaced by Survey
Management and Measurement Management

3.3.2 Target System

The business processes contained in Survey Management and Measurement Management are shown in the following diagram.



Legend.

GC01,etc. – GeoCommunicator use cases (includes GeographyNetwork).
SM01, etc - Survey Management use cases.
MM01, etc. - Measurement Management use cases.
PM01, etc. - Parcel Management use cases.

3.4 Data Management Documentation

3.4.1 High Level Data Groups

Not Available until completion of Data Modeling. The Data Modeling effort occurs at the end of the Analysis phase and the beginning of the Development phase.

3.4.2 Data Sources

Data sources for Surveying and Measurement Management fall into one of two general categories: primary or secondary data. Primary data sources include data compiled directly from field measurements using traditional surveying methods or Global Positioning System (GPS). Secondary data sources include data compiled from deeds, legal descriptions, survey maps or previously compiled hard copy parcel maps, such as tax maps. The quality of spatial data secondary sources depends not only on the accuracy of the descriptions and extractions but also on the ability of the cadastral mapper to interpret the information in the documents

Specifically, for the BLM, data for Survey Management and Measurement Management will be obtained from raw field data, existing systems and existing records. The Data Integration Analysis (DIA) project is an effort to determine the scope, level of effort and impact of integrating land data from LR2000 and other existing BLM systems into a common data set in preparation for migration to the NILS data model. Results of DIA will be shared and used as the basis for the design, development and deployment of a consolidated cadastral land record data set.

New datasets and databases created within the Survey Management and Measurement Management business proceses would be implemented in accordance with the FGDC Cadastral Data Content Standard.

3.4.3 Data Sharing

NILS will provide receiving or disseminating land information within the cadastral community using the Geography Network (GN) and GeoCommunicator (GC, or GeoCom). These applications would provide the business processes necessary to communicate land-related activities and data over the Internet. Consumers of spatial information may use GN and GC to find and retrieve:

- data and activities related to their personal area of interest (e.g. a state or county) and how to access the information,
- geographic extent of specific data and activities (e.g. Public Land Survey coordinate data sets, planned field survey projects) how they are linked to the land and how to access the information.

Using GeoCommunicator (GC) and GeographyNetwork (GN), providers (NILS customers/end users) of survey spatial information would share their data and activities in a searchable index or locate their geographic extents of interest on a map interface, and enable information flow through email contact and links or paths to existing data stores. GN and GC would also be used to coordinate on-going tasks and establish a system where agencies and people that download information from the Internet would have a sense of updates and notifications related to that data. Survey Management and Measurement Management would be able to share data and information using GN and GC. The use of a common data model would facilitate the exchange of data.

3.4.3.1 Data Exchange Agreements

None.

3.4.3.2 Metadata Standards

All Survey Management and Measurement Management data will be collected and shared in conformance with the FGDC metadata standards.

3.4.4 Data Contacts

The entire cadastral surveying community, government and non-government.

3.5 Maximizing the usefulness of the information within the system

The common data model of NILS would contain information about the BLM's (and others) land; it would contain the land information assimilated from the many existing system. One data model would efficiently, accurately and consistently make use of land data used in the BLM's business processes. Survey Management and Measurement Management would make use of or contribute data to the store based on the model.

For customers internal and external to the BLM, land data and information would be more readily available. The time to gather data for reports, etc. would be greatly reduced if it were available from a common source and not researched among several offices, then analyzed and reformatted before distribution. Integrity of the data would be enhanced.

The confidentiality of parts of BLM's data is an issue being addressed by NILS. Conformance to the practices and regulations pertaining to proprietary data would be maintained.

3.6 Coordination with State, Local and Tribal Governments

The basic processes within the requirements gathering phase of NILS, from the very beginning, have included the expertise of representatives from many agencies at all levels of government (US Forest Service; state, county and local governments).

The Bureau of Indian Affairs (BIA) reviewed the COURS document and provided many valuable comments and is an active participant in the NILS Project; Minerals Management Service and the US Fish and Wildlife service also actively participate.

3.7 Summary of Public Outreach and Communication for the NILS Project

The National Integrated Land System (NILS) has made a conscious effort to gather requirements and inform the public of the NILS project through public meetings, workshops, presentations at user group meetings, and through the Internet. The NILS goal is to get as much user involvement from the widest audience as possible. This includes involving users through out the United States from the Federal, State, local and regional governments, and from the private sector. The NILS public outreach activities are summarized below.

Requirements Gathering and Review Workshops
The goal of the business requirements workshops was to develop cadastral and land requirements for Survey Management, Measurement Management, Parcel Management, GeoCommunicator, and the components of NILS. High-level business requirements and detailed analysis workshops are held through out the year at various locations to gather and refine requirements, to develop and review design specifications and prototypes, etc.

Representative users are:
- BLM (AK, AZ, CA, CO, OR, MT)
- Forest Service (AZ, CO, GA, OR, WO)
- Boulder County
- Salt Lake County-UT
- Polk County-OR
- Oakland County-MI
- Pinal County-AZ
- Maricopa County-AZ
- State of Arizona
- State of Washington
- Private industry
- University of Maine

Site Visits
The purpose of the site visits was to verify the requirements use cases with the business processes from the State, Federal, and County agencies in the Pacific Northwest and in the Eastern United States on their survey, record management, and GIS business practices. The information was used in the validation of the business process requirements being gathered for the National Integrated Land System (NILS).

The following sites were visited:
- BLM Oregon State Office Portland, OR
- Forest Service Region 6 Portland, OR
- Polk County, OR
- Washington State Dept. of Natural Resources Olympia, WA
- Thurston County, WA
- Forest Service Region 2 Atlanta, GA
- TVA Chatanooga, TN

- Fulton County, GA
- State of Florida Tallahassee, FL

User Group Meetings and Presentations
The purpose of the presentations is to give an overview of the NILS project, and to inform the general public of where and how to comment on any aspects of the project. NILS project overviews were conducted at the following meetings:

- National Association of Counties, St. Louis, MO (July 1999)
- Utah GIS Council Conference, Snowbird, UT (Sept. 1999)
- GIS in the Rockies Conference, Denver, CO (Oct. 1999)
- FGDC Group, Washington, DC (Oct. 1999)
- SWUG Conference Breckenridge, CO (Oct. 1999)
- National States GIS Council, New Orleans, LA (Aug. 1999)
- BIA Denver, CO (Feb. 2000)
- IRMAC (Mar. 2000, Aug. 2000)
- Western Governors Association Meeting, UT (March 2000)
- Arizona Professional Land Surveyors (ALPS) Show Low, Kingman, Benson, Tucson, and Phoenix, AZ (2000)
- ESRI User Conference San Diego, CA (1999, 2000)
- BLM GIS Phoenix, AZ (April 2000)
- Integrating GIS and CAMA, Miami, FL (April 2000)
- BLM Wyoming State Office (July 2000)
- Fluids conference (July 2000)
- DOI Information Technology Conference, Denver, CO (October 2000)

NILS requirements review presentations were conducted at the following meetings:
- Geographic Coordinate Database (GCDB) Technical Advisory Group (GTAG) at the University of Maine in Orono-ME (Sept. 1999),
- Southwest Users Group Breckenridge-CO (Oct. 1999),
- GCDB Management & FGDC Cadastral Subcommittee Billings-MT (Nov. 1999)
- BLM and US Forest Service Lands Group Billings, MT (Nov. 1999).

NILS Public Meetings
Public meetings were conducted in five cities across the country to present the draft *Concept of Operations and Business Process Requirements Document*. Announcement of the meetings was sent to all public agencies in the area via mail, E-mail, and through the Internet via the NILS web site. The goal of the public meetings was to inform the public of the NILS project, to present the requirements document, and to solicit comments. The public meetings were held in:
- Portland, OR
- Phoenix, AZ
- Denver, CO
- Atlanta, GA
- Washington, DC

One hundred eighty nine people attended the public meetings. Sixty-five organizations were

represented. The number of participants by organization type is as follows:

City	4
County	16
Federal Agency	116
BLM	48
MMS	2
National Geodetic Society	3
NPS	8
NSZ	3
USACE	1
USBOR	9
US Census Bureau	1
USOSM	1
Farm Service Agency	1
USFS	13
USFWS	19
USGS	7
Non-profit Assoc./Organ.	3
Private Firm	32
Regional Government	2
State Agency	13
Tribe	1
University/College	2

Comments have been received on the draft *Concept of Operations and Business Process Requirements Document* as follows:

- 12 comments received on-line
- 21 comments received through E-mail/US mail

Internet/Intranet

The National Integrated Land System Project maintains two web sites to keep the general public, BLM employees, and NILS partners up-to-date on all activities related to the project. The NILS Internet site is located at http://www.blm.gov/nils and the Intranet site is located at http://web.blm.gov/lris/nils. The NILS Internet web site has received 5,800 visits since January 2000.

The NILS web site contains planning documents, a calendar of activities, meeting/workshop notes, informational slide shows, business requirements, detailed analysis specifications, comment forms, links, etc. The public can register on-line, through the mail, or by phone as an interested party, as a vendor of products and services, or to submit comments. New and updated project information is put on the web site, as it becomes available. Mass mailings through E-mails and the general mail are made periodically to inform the registered parties and partners of new and updated information, to review detailed requirements specification, to inform them of public meetings, and to requests comments.

The NILS project used Team Room to develop a forum and place to archive documents for the development of GeoCommunicator. Team Room was used to communicate between team members from different agencies and the public; to announce meetings; to display meeting notes, project design, and PowerPoint mockups; to gather comments; and to hold discussions.

NILS continues to use all methods necessary to inform the public and team members and to seek their involvement at all levels in the project.

3.8 System Accessibility

The BLM Information Technology Architecture Technical Reference Model (TRM), version 1.1, 5/24/01 makes recommendations for the usability of computer systems and software applications. It refers to and makes use of Human Factors Engineering (HFE), which provides standards and guidelines to accommodate physically disabled users and to ensure their maximum productivity as well as that of all users. HFE employs the concepts of adaptive and assistive technologies which apply to the design and implementation of human-computer interfaces and computer applications.

It addresses the following architectural principles and technology components.

Effective human-computer interfaces and application should:

- Behave in ways that are consistent with users' expectations.
- Be intuitive to the users.
- Allow for a wide range in variations of user skills.
- Not require the users to become involved with the inner workings of the system.
- Provide the means to save the work, undo operations and abort the activities.
- Require a minimum amount of input from the user.
- Anticipate the users' requirements.
- Provide a standard and predictable behavior.
- Have consistent appearance.
- Have a consistent behavior.

The Graphical User Interface (GUI) should:

- Allow for color vision deficiency among users.
- Avoid use of color schemes to interpret critical information.
- Accommodate user color preferences and allow screen customization.
- Not have color dependent, on-line documentation.

Adaptive and Assistive Technologies for computer desktop workstations:

- Keyboard enhancement
- Enhanced monitors and video displays.
- Verbal enhancement, e.g., verbal echo of the screen display.
- Printers which verbally announce the front panel displays.

- Voice recognition software.

4.0 Target System Requirements

4.1 Supporting Documents

Document Citation	Date	Information Content	On Web Site?
NILS Concept of Operations and User Requirements document.	March , 2000	Project requirements which would drive the analysis/build/review phase	http://www.blm.gov/nils
Manual of Surveying Instructions	1973	BLM surveying business rules	No
BLM Information Technology Architecture Technical Reference Model Vol. 1, Management Overview	7/31/00	Direction for design, construction, purchase, deployment and management of Information Technology	http://web.wo.blm.gov/blma
Detailed Feature/Funtion-ality Specifications.	9/18/00		http://www.blm.gov/nils
Software Development Plan		Structure and content of software	http://www.blm.gov/nils
Use Case Analysis document		Detailed requirements.	http://www.blm.gov/nils
Use Case Glossary of Terms		Concepts and Terms used in Use Case Analysis document	http://www.blm.gov/nils

4.2 General System Requirements Description

Functional Category	Functional Requirement	Description
Cadastral/land data Data Architecture	Object-oriented Data model	Implementation with extensible architecture adaptable to custom deployment.
	FGDC Compliance	NILS architecture will comply with and possibly extend the FGDC content.
	Tiered Network	Support map management as topologically related layers of parcel-based features.
	Feature-level Metadata	Automatically capture the metadata of parcel-based features.

Functional Category	Functional Requirement	Description
	History/Lineage management	Maintain parent-child relationship of cadastral data.
Geographic Information systems	Map Data and Display	Display, pan zoom, modify, select, annotate feature-level geometry.
	Query	Search for and refine selected features and feature sub-sets.
	Analysis	Spatial, logical, boolean, mathematical analysis.
	Reporting and Plotting	Create text reports, map plots of specialized cadastral/land management information.
Database Management	Manage Data and Subsets	Find and manage files; select, create subsets, merge, append data.
	Manage Data Properties and Relationships	Edit properties of selected data.
	Perform Datum Transformation	Convert projections, perform x,y,z data transformations.
	Administer Access Rights	In mulit-user environment, maintain passwords and database security.
	Transactions and Versioning	Manage locking, commits, rollbacks, version conflicts
	Data Automation Support	Provide tools which support migration from existing databases to the NILS data schema ; support digitizing, scanning, manual data entry.
	Import/Export	Ability to share data in various formats.
System Integration	Workflow, Document and Event Management	Guide and track business transactions
	Architecture for Data Sharing	Access, integrate, manage spatial and tabular datasets across various platforms.
	Audit Support	Quality control, auditing, system event logging, operational review.

5.0 Target System Architecture

5.1 Supporting Documents

Document Citation	Date	Information Content	On Web Site?
BLM IT Architecture Study	March, 2000	BLM IT requirements, business structure and future direction.	
BLM Strategic Plan	March, 2000		
BLM Enterprise Architecture	March, 2000		
BLM Information Technology Architecture Technical Reference Model Vol. 1, Management Overview	7/31/00	Direction for design, construction, purchase, deployment and management of Information Technology	http://web.wo.blm.gov/blma/

5.2 Planned Architecture

5.2.1 Operational Architecture

5.2.1.1 Existing System

The existing BLM hardware architecture configuration consists of IBM AIX, NT, Macintosh and SUN platforms. Server configurations incorporate the SUN E10K as the Bureau enterprise server, AIX J50's as departmental servers and NT's as the workgroup servers and desktop clients. There are presently 684 servers Bureau-wide and 9362 desktops of which 3000 are IBM AIX, 6800 NT's, 500 Novell and 500 other platforms. BLM's State and Field Offices are operating a 10/100 megabit LAN within the office, 56K to 1.5 megabit WAN, 56K WAN between State and Field Offices, 1.5 Megabit between State Offices and the World Wide Web backbone.

5.2.1.2 Proposed System

An assessment of the network and hardware requirements for NILS will be undertaken. Implementation of GIS-oriented applications, data transactions, data transfers may place new demands on the existing infrastructure. NILS infrastructure requirements will be documented.

5.2.1.3 Modified Components

The hardware/software requirements required for the Survey Management and Measurement Management applications installations are listed in the following table). As stated in 5.2.1.2, these items would be shared with other projects.

Architecture Components and COTS required by Survey Management and Measurement

Management:

Required Component	Characteristics	Location	Source/Ownership
NT workstation	Desktop computing environment	User and field locations would require workstations and GIS software. Databases and data-serving software would be required for local and centralized data storage. LAN/WAN configurations, sufficient to support the software and databases would be required.	
Microsoft Office Professional	Business tools		
Web Browser	Basis for GeographyNetwork and GeoCommunicator		
Lotus Notes	Inter-office communication		
ESRI ARC INFO, Ver. 8	GIS environment to support NILS land management tools		
Database engine	Store for NILS data model		
ESRI SDE	Data serving software.		
Data Server	Physical data storage		
LAN/WAN/Internet	Provide transmission media for data sharing and communication		
ESRI Internet Map Server	Functionality to provide GIS products (maps) to the Internet.		

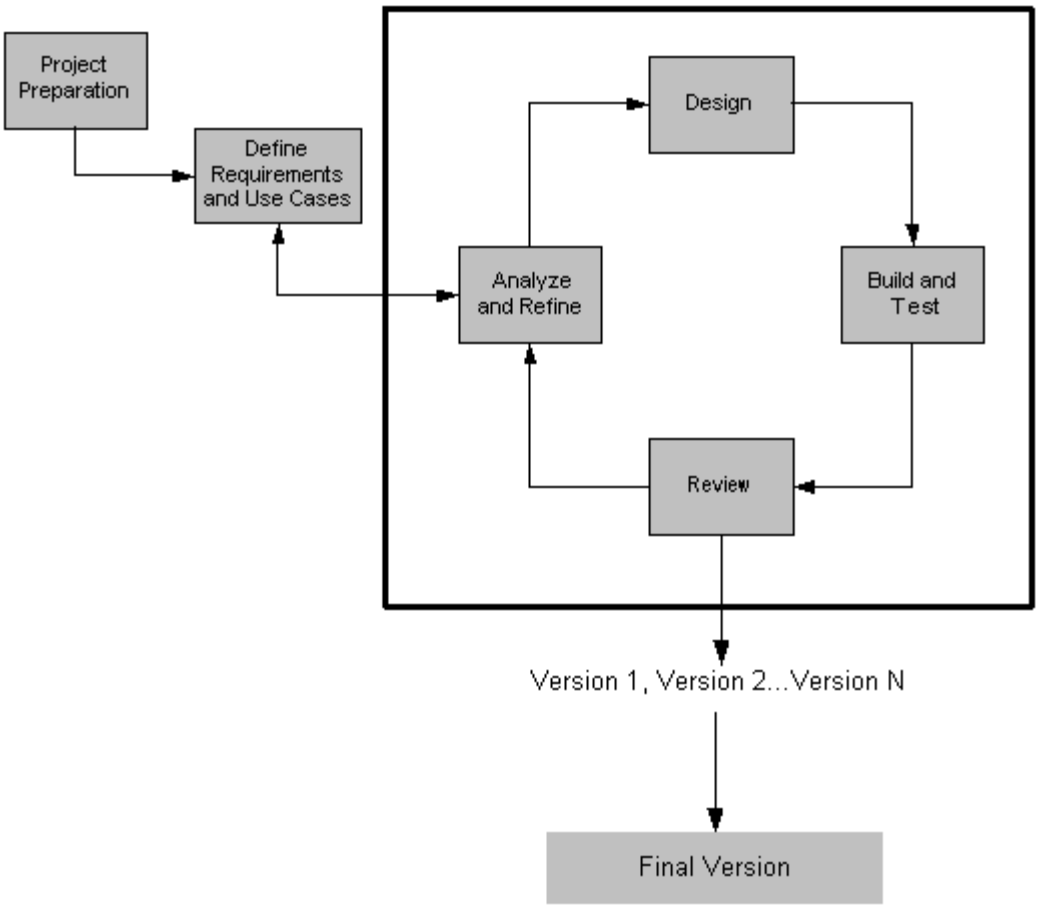
5.2.2 Development Environment

The Survey Management and Measurement Management application software would be analyzed, built, reviewed and developed by a contractor in their corporate offices. The contractor's progress would be tracked by the NILS Project Staff Team Leads. See Survey Management and Measurement Management Work Breakdown Structure, Task M6, Project management. Development would be in a Rapid Application Development (RAD) environment. Object-oriented Analysis and Design, Managed Evolutionary Development and Life Cycle Management techniques would be applied throughout the entire evolution of NILS.

5.2.3 Test Environment

Survey Management and Measurement Management are being developed using Object-Oriented Analysis and Design (OOAD) techniques. OOAD is based upon the iterative development process in which specifications and requirements are constantly reviewed and revisited by workshop teams. This approach eliminates the design-and-develop-once model. Thus, during the analysis/build/review phase, testing is a continual process until a solid application is completed.

The following diagram depicts the iterative analysis/build/review cycle:



Prior to actual implementation, the NILS application would be tested on the appropriate platforms and in the required environments following approved Bureau guidelines. A test plan would be developed.

5.2.4 Training Environment

Since the Survey Management and Measurement Management applications would serve users other than those of the BLM, training must accommodate several agency environments. The contractor would develop a training plan to address the various differing needs. Possible alternatives include Internet-based training and local instruction sessions. Varied levels if GIS training would be required for users.

5.2.5 Back-Up and Recovery Architecture

Back-up and recovery for the NILS data would comply with the existing BLM procedures for servers and workstations. The Partners would comply with their own procedures.

6.0 Master Plan and Schedule

6.1 Implementation Plan for Project

6.1.1 Roles and Responsibilities

Key Project Roles	Name	Phone	Email Address
NILS Project Manager	Leslie Cone	303-236-0815	Leslie_Cone@ blm.gov
NILS Deputy Project Manager	Chris Hamilton	303-236-6539	Chris_Hamilton@ blm.gov
NILS Technical Lead	Roy King	303-236-2628	Roy_King@ blm.gov
Staff Lead - Field Survey	Jerry Sullivan	303-236-1089	Jerry_Sullivan@ blm.gov
Staff Lead - Measurement Management	Jerry Sullivan	303-236-1089	Jerry_Sullivan@ blm.gov
Technical Lead – Survey Management	David Grainger	916-978-4327	David_Grainger@ blm.gov
Technical Lead - Measurement Management	Dennis McKay	602-417-9579	Dennis_McKay @blm.gov
NILS GIS Specialist	John Reitsma	303-236-1984	John_Reitsma@ blm.gov

6.1.2 Project Schedule

6.1.2.1 High Level Gantt Chart
See Appendix 1.

6.1.2.2 Detailed Gantt Chart
See Appendix 2.

6.1.3 Project Activities – Work Breakdown Structure

6.1.3.1 Summary Work Breakdown Structure
See Appendix 1.

6.1.3.2 Detailed Work Breakdown Structure
See Appendix 2.

6.1.4 Key Milestones and Products

Milestones	Product
Partnership Agreement	
Completion of Requirements Document	Concept of Operations and User Requirements document. (High-level requirements, scope and direction for NILS)
Completion of Detailed Feature/Functionality Document	Detailed Feature/Functionality document (Expansion of high-level requirements)
Completion of Analysis Document	Analysis document (Refined use cases)
Completion of Software Development Document	Software Development Document (Plan and proposal for software).
Completion of Development and Construction	Survey Management and/or Measurement Management Application Software
Deployment	Software Applications to users.
SM and MM turned over to Operations and Maintenance. Close-out	Operations and Maintenance supports Survey Management and Measurement Management applications and users. Finalize Survey Management and Measurement Management extensions.

6.1.5 Resource Requirements

6.1.5.1 Detailed Resource Requirements

Resource	Title/Position	Commitment
Leslie Cone	NILS Project Manager	25%
Chris Hamilton	NILS Deputy Project Manager	50%
Janet Beavers	Admin. Assistant	10%
Roy King	NILS Technical Lead	100%
Jerry Sullivan	Domain Staff Lead	100%
Dennis McKay	Domain Technical Lead	100%
David Grainger	Domain Technical Lead	100%
John Reitsma	GIS Specialist	100%

6.1.5.2 Future Resource Requirements

Future resource requirements would be defined by evaluations conducted during the Operations and Maintenance phase of the project.

6.2 Project Justification and Investment Management

6.2.1 Project Justification

In order to effectively accomplish its mission of administering the nation's public lands, the BLM must have at its disposal the most efficient land surveying technologies. With the increasing complexity of federal land management business rules and regulatory requirements, standardized and accurate methods for locating monuments, corners, boundaries and features (wells, rights of way, etc) are a must. Currently, many different land-based systems and methods exist for performing the day-to-day business tasks of the BLM and other agencies. The unrelated and dissimilar nature of these applications create unnecessary work and backlogs, opens the door for error and is very inefficient. A common basis of doing business throughout all agencies must be made available to management and staff.

Achievement of these demands can only be met with user tools which conform to a standard, are automated as much as possible and are maintained in a Geographic Information System (GIS) environment which preserves its data in a store conforming to a standard model. Survey Management would provide the BLM and its customers with software to support the automated capture of survey data into the database format. Measurement Management would provide the mathematical and survey adjustment processes to create high quality control networks. Together Survey Management and Measurement Management would furnish the basis for efficient parcel management, which is the ultimate goal of land managers.

6.2.2 Return on Investment Summary

See Appendix 3.

6.2.2.1 Tables Summarizing Return on Investment Data

See Appendix 4.

6.2.2.2 Scope of ROI Analysis and Assumptions

See Appendix 5.

6.2.2.3 Costs and Benefits

See Appendix 6.

6.3 Sensitivity Analysis

Resource Risk	Description
All development costs increased by factor of 2	Benefit/cost ratio reduced from 2.7 to 2.4
Yearly shared costs increased by factor of 2	Benefit/cost ratio reduced from 2.7 to 2.2
Increased, by 5%, the cost estimate to "Support adjudication and derive land status to support case processing" under NILS (this item has single largest cost savings/year of any business process)	Benefit/cost ratio reduced from 2.7 to 1.1
Increased all project direct and indirect costs by 50%. Includes Hardware Purchases/Support, Software Purchases, Contracted Project Costs, BLM Support Costs, Training Costs, and Indirect Costs	Benefit/cost ratio reduced from 2.7 to 2.0

6.4 Risk Identification and Management

Overall risks, which apply equally to Survey Management, Measurement Management and the NILS project have been identified. See the table in the next sub-paragraph. These risks are managed by the NILS Project Team. New risks (and the corresponding mitigation) are identified as the project progresses through its phases. Mitigation plans are developed as new risks arise

The contractor identifies and manages risks which are directly related to the software development processes. It is their responsibility to mitigate risks that would result in deviation from the project timeline.

6.4.1 Risks Managed by NILS Team

RISK	MITIGATION

RISK	MITIGATION
1. Dedicated technology lead and extension teams from BLM are required	Personnel assigned and teams formed during Project Initiation phase.
2. Decentralized data conversion effort	QA analysis program; data content standard; GCDB; subsequent enforcement Data Integration effort
3. Missing fundamental user requirements	OOAD process to guide design; user validation
4. Late, infrequent deliverables to illustrate progress	Project web site, iterative prototyping; communications plan
5. Lack of user support and/or acceptance because of perceived insufficient input from multiple levels of users	Publicity and support drive, communication plan; users participate in requirements phase.
6. Tools do not enforce data model standard and business rules effectively	Iterative Prototyping
7. System not capable of aggregating and splitting land units properly	Enforce BLM business rules within analysis of requirements.
8. Newly legislated business requirements	Easily versioned software to accommodate new functionalities and business rules.
9. Changes in Freedom of Information Act (FOIA) requirements.	Same.
10. Changes in the nature of confidential BLM data and information.	Same.

6.4.2 Risk Management Summary Spreadsheet

See Appendix 7.

Appendix 1. High-Level Gantt Chart and WBS

Appendix 2. Detailed WBS and Gantt Chart

Appendix 3. Return on Investment Summary

Appendix 4. Summary of Return on Investment Data

Appendix 5. Return on Investment Assumptions

Appendix 6. Costs and Benefits

Appendix 7. Risk Management Summary Spreadsheet

Priority	Risk Statement	Project Phase	Assigned to:	Overall Risk Rating
1.	Dedicated technology lead from BLM is required	All	Staff	***Risk eliminated***
2.	Decentralized data conversion effort	All	Staff	***Risk static***
3.	Missing fundamental user requirements	All	Staff	***Risk decreasing***
4.	Late, infrequent deliverables to illustrate progress	All	Staff	***Risk eliminated***
5.	Lack of support and/or acceptance because of perceived insufficient input from multiple levels of users	All	Staff	***Risk eliminated***
6.	Tools do not enforce data model standard and business rules effectively	All	Staff	***Risk decreasing***
7.	System not capable of aggregating and splitting land units properly	All	Staff	***Risk decreasing***
8.	Changes in business rules mandated by legislation.	All	Staff	***Risk static***
9.	Freedom of Information Act mandates.	All	Staff	***Risk static***
10.	Software and procedures unfamiliar to users.	All	Staff	***Risk static***