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CIMARRON WATERSHED ALLIANCE, INC.

**WATERSHED GEOGRAPHIC INFORMATION SYSTEM
PROJECT PROPOSAL**

FOR PRESENTATION TO BOARD OF DIRECTORS

DECEMBER 6, 2006

PROJECT NAME: WATERSHED GEOGRAPHIC INFORMATION SYSTEM

GRANT SUBTASK & CORE WORK PLAN TASK:

- Grant: Federal Clean Water Act Section 319 (h), FY 03 Cimarron Watershed Alliance, Inc. Project; Contract No. 05-667-5000-0009.
- Core Workplan Task II: The implementation of BMPs. Subtask d: Evaluate and report on projects; March 18, 2006 Revision.
- Core Workplan Task III: Communicate with stakeholders, agencies, municipalities, and businesses to improve the health of the watershed and water. Subtask a: Include at least one demonstration project per year to build capacity for additional development of like projects and Subtask c: Educate the public on watershed issues and Best Management Practices (BMPs); March 18, 2006 Revision.
- Core Workplan Task IV: Evaluate projects for completion and success, evaluate compliance with standards, and monitor the state of the water and watershed. Subtask b: Compile and summarize existing data from monitoring in an effort to understand trends, BMP effectiveness, and project success in the watershed.
- Deliverables: Procurement, development, and implementation of a Watershed Geographic Information System that is accessible, searchable, and relevant to the stakeholders of the Cimarron River Watershed.
- Amendment: This project will be added as Amendment III.c.5 to the Cimarron Watershed Alliance Core Work Plan, March 18, 2006 Revision.

OBJECTIVE OF PROJECT: The primary objective of this project is to create a GIS program for the Cimarron River Watershed stakeholder. This in turn will facilitate public understanding of issues and best management practices applications relating to the continued maintenance and

enhancement of water quality and quantity in the Cimarron River Watershed. The creation and use of a watershed level GIS capability will yield a greater awareness and more in-depth understanding of the consequences of human use and management. This information will be categorized so that the public can easily acquire the knowledge to implement treatments and management practices that aid in the mitigation of watershed health impairments such as turbidity, fecal coliform, and temperature. The GIS program is expected to be scalable to the needs and use of other watershed groups and educational organizations in New Mexico.

BACKGROUND AND PROJECT DESCRIPTION:

State of New Mexico Online Watershed GIS:

During the summer of 2006, the Cimarron Watershed Alliance, Inc. (CWA) was asked to provide input for a statewide watershed GIS (see Appendix A) for New Mexico (NM-Watershed GIS). The NM-Watershed GIS is in the early design stage and is being led by the Energy Minerals and Natural Resource Department (EMNRD). The NM-Watershed GIS will eventually be an online GIS providing software and data access for watershed groups and users throughout the state. The website will offer basic online mapping solutions and also act as a spatial data clearinghouse to aid in developing a watershed “information network” within the state. CWA is offering input on the design of the NM-Watershed GIS and plans to utilize the data and resources of the NM-Watershed GIS once it is operational. At this time an estimated operational date of the system is unknown.

The EMNRD has recognized that the NM-Watershed GIS will have limitations in terms of online analysis and modeling. Analysis extensions such as 3D visualization and in depth spatial analysis will not be available with their system. Also, the grant for the NM-Watershed

GIS does not cover any hardware for local users. The CWA would have to provide a GIS ready computer, printer and GPS units to use in conjunction with the NM-Watershed GIS.

Proposed Cimarron Watershed Alliance GIS:

Due to the limited analysis capabilities, lack of hardware funding, and unknown time frame of the NM-Watershed GIS development, the CWA is proposing to implement its own GIS program (CWA-GIS). The CWA-GIS would be located on a computer in the CWA office. The CWA-GIS would allow for local management of CWA project data, easier GPS data down/uploading, and for the in depth analyses that could greatly benefit CWA projects. Some examples of possible CWA-GIS analyses could include:

- Wildland Fire Analysis using LANDFIRE or GAP data (landcover data)
- Erosion Profiles
- Stream Gradient Profiles, Hydrologic Network Modeling
- Delineating sub-watershed regions
- Identifying possible sources of high TMDL values
- Locating sites for possible remediation or pollution sources

Training will be offered for CWA project team members in the use of GPS and GIS technologies and a consulting GIS specialist has volunteered time to develop the CWA-GIS as well as conduct analyses for CWA projects. Once trained, CWA project team leaders will assist CWA stakeholders in the use of the GIS.

Web-based Mapping:

The NM-Watershed GIS will eventually provide an online, interactive mapping tool for all watershed users in New Mexico. The CWA website will also provide a mapping component.

Due to the nature of the state system, the CWA website maps do not need to provide as extensive

interactive mapping; the state system will augment the CWA mapping capability. The website will provide various watershed maps with hot-spot links to specific project maps, digital photos, project information pages, water quality data, etc. After a set time period, the mapping component of the CWA website and the NM-Watershed GIS online mapping should be evaluated to ensure that a more sophisticated CWA web-mapping component is not required.

Implications:

The Environmental Systems Research Institute, Inc.(ESRI) Conservation Program (ECP) has determined that the most efficient use of GIS is empowering local users.¹ The CWA-GIS would add a powerful analysis tool to the organization to aid existing projects, enhance the development of innovative natural resource management solutions, and strengthen the CWA's efforts of TMDL mitigation (see Appendix B for detailed information layering).

SITE AND LOCATION: This project will be developed and housed under the direction of the CWA (see Appendix C for workflow and server housing).

COST: (To include Grant and CWA In-Kind Matching)

Grant: Cost to the Cimarron Watershed Alliance Grant will be in the range of **\$15,041.00 to \$17,541.00** (*to be penned down before submitted for official BOD approval*) for the purchase of project supplies, project development, and initial maintenance (see Appendix D for cost structure).

CWA Match: **\$6,016.40 to \$7,016.40**, which will be generated by project and CWA in-kind activities (*note that the internal match generated, \$18,200.00, will over-match this project*).

Total Project Economic Activity: **\$33,241.40 to \$34,241.40**

¹ See: <http://www.esri.com/library/whitepapers/pdfs/consprgm.pdf>

SCHEDULE AND TIMELINE: The administration of this project will commence upon the approval of the Cimarron Watershed Alliance, Inc. Board of Directors. The project will be implemented in four phases; with cumulative development and implementation timeframe of approximately 12 months (see Appendix E).

PROJECT EVALUATION & MAINTENANCE PLAN: This project will be evaluated by information produced by stakeholder usage and feedback as compiled by the Team Leaders under the direction on the CWA Monitoring Committee. The Team Leaders will report to the Cimarron Watershed Alliance Stakeholders on project effectiveness as directed by the CWA Monitoring Committee.

TEAM LEADER AND PARTICIPANTS:

Team Leaders: Sara Holm and Mike Bain (others interested???)

Participants: Cimarron Watershed Alliance

PERMISSIONS AND PERMITTING:

Dredge & Fill Clearance Required? __ Yes No

Is any work proposed within the high water mark of a river, stream or Arroyo __ Yes
No

Cultural Resource Clearance Required? __ Yes No

Does this proposal involve any earth disturbing activity? __ Yes No

LIABILITY: None foreseen.

ACKNOWLEDGMENTS:

TEAM LEADER

DATE

CWA EXECUTIVE OFFICER

DATE

Appendix A

Cimarron Watershed Alliance, Inc. GIS Project Proposal Summary

Watershed groups and their associated stakeholders need a broad array of usable information to deal effectively with the complex issues arising in watershed management. Commonly, watershed groups must address concurrent ecological, economic, educational, boundary, and cultural components to arrive at a successful solution. The development of a comprehensive Geographic Information System (GIS) directed at watershed groups and their specific needs holds considerable promise as a facilitating tool in deriving practical, meaningful, and achievable watershed management solutions that address these multifaceted challenges. The Cimarron Watershed Alliance (CWA) envisions a GIS system that compiles watershed-specific information from available sources, and positions that information in a format readily available to watershed stakeholders.

While there are many excellent GIS sites available, none of these systems focus on the individual watershed. From the perspective of a watershed stakeholder and project manager, the data available is fragmented and must be laboriously mined to obtain any useful information. And when found, this information is generally disjointed from any complementary information that would lend itself to a timely understanding of, or solution to, the issues at hand. For example, a landowner may have a situation where a head cut is working its way up a meadow and desires to research the causes and treatments available to stop its progression. Typically, the landowner might try a solution that others in the area have tried, such as dumping debris into the head cut hoping to stop its progression. On closer inspection, he notices the cut keeps marching up the drainage, and he wonders if there is a better way to approach the problem. A properly designed GIS system focused on the watershed would give the landowner the tools to research the dynamics of the erosion problem with multimedia resources, provide possible causes and choices of solutions to the problem, and feature projects in the same watershed that have successfully addressed that problem. Thus, the GIS system would not only provide a solution to the immediate problem, but also provide the educational resources enabling a change in management practices to prevent the same situation from repeating itself.

With this potential in mind, the CWA proposes that GIS systems be given a fresh look, a look originating with the end-user—namely the watershed stakeholder and project manager. We believe that if the GIS system is designed to meet the needs of the watershed stakeholder, the needs of all individuals and entities tasked with promoting watershed health will be realized as well. In addition, the CWA believes that an important ancillary benefit will be the ability of the data providers (NMED, EMNRD, USFS, EPA, etc.) to see first hand how their data is put to use by the stakeholder, building a positive feed-back loop that continuously refines the collection, delivery, and use of information.

To facilitate the state-wide development of a watershed-based GIS system, the CWA proposes the “in-house” development, by the CWA, of a scalable to state level map-based model GIS system that focuses initially on the Cimarron and Upper Canadian Watersheds. This approach will draw on the considerable expertise and experience of the CWA Board of Directors and Technical Advisory Panel to ensure that the watershed stakeholders’ needs remain at the forefront in the development process. The idea is to ask the relevant questions of the model during its development stage, which will help ensure scalability to the needs of watershed stakeholders state-wide. In other words, we believe our needs will resemble other stakeholders’ needs in other watersheds, the main differences being the specific data needs of the individual watershed. An outline of the model system’s scope, data breadth, goals, platform, development timeframe, and delivery is below.

- ◆ Geographic Scope: The Cimarron and Upper Canadian Watersheds as delimited by the area above the confluence of the Cimarron and Canadian Rivers.
- ◆ Goals:
 - To develop an end-user friendly model GIS system that is scalable to the needs of all of New Mexico’s watersheds and their stakeholders.
 - To facilitate the development of a system that recruits and maintains the most precise, reliable, most geospatially accurate and up-to-date information available.

Appendix A

- To encourage the development of GIS systems at all data reporting levels (such as the county level) to ensure the timely sharing and accuracy of data.
 - To develop a dynamic, fluid system that addresses the current needs of the watershed stakeholder, as well as anticipating future needs of same.
 - To facilitate the development and maintenance of a seamless data exchange mechanism with data providers.
 - To initiate and develop collaborative, ongoing data recruitment relationships with all relevant state, federal, non-profit, and private data sources.
 - To acquire and develop the educational tools to enhance GIS based watershed educational outreach activities.
 - To assess the depth of the human capital needs of a full-time, adequately funded professional staff to maintain the state-level system and to insure that staff's sensitivity to the needs of the watershed stakeholder, to include individual stakeholder consultation.
- ◆ **Data Breadth:** Initially, data for the model GIS will draw on current, publicly available information and consist of broad information layers such as soil types, vegetation cover, and elevation. During development, the data sources will be expanded to meet realistic modeling needs and to anticipate the information needs of a state-wide system. A sampling of possible data categories and sources follows:
- Soil Survey Geographic (SSURGO) Database
 - United States Geological Survey Geologic Maps
 - New Mexico Gap Analysis Program
 - Landcover Data (Vegetation cover)
 - State Agency Data
 - Federal Agency Data
 - County Landownership Parcel Files
 - Aerial Photography
 - Predictive Quantitative Analysis Applications
 - Land Use Mapping
- ◆ **Platform:** ArcGIS 9.x
- ◆ **Deliverable:** A functioning GIS model readily scalable in terms of its ability to assimilate new and more sophisticated types of data and expandable to all the state's watersheds.
- ◆ **Time Frame:**
- GIS platform development—Three months
 - Web application development—Two months
 - GIS web based testing—One month (here we have our stakeholders access and challenge the site to their informational needs—within the constraints of the developmental data.)
 - Model GIS project to commence July 1, 2006; Functioning model by December 1, 2006; Deliverable model by December 31, 2006.

In closing, the CWA believes that a GIS system concentrating on the needs of the individual watershed is a central requirement in the effort of watershed groups to fulfill their mission of protecting, restoring, and maintaining the health of their local watersheds. This combined effort will, in turn, help ensure that all citizens of New Mexico can look forward to a future with clean, healthy water, and a properly functioning system of watersheds. We offer this proposal as a means to help facilitate that outcome.

Appendix A

GIS Proposal Development Team:

- ◆ Sara Holm: *GIS Mapping Consultant*
- ◆ Gus Holm: *Environmental Geologist, Vermejo Park Ranch*
- ◆ Jack Chatfield: *Canadian River Riparian Restoration, Project Manager*
- ◆ Pat Walsh: *Regional Interpretive Ranger, NM State Parks, Northeast Region*
- ◆ Chris Cudia: *New Mexico Environment Department, CWA 319 Project Manager*
- ◆ Rose Marchetti Lew: *CWA VP, Canadian Operations*
- ◆ Steve Steinberger: *Colfax County Planner*
- ◆ Michael Bain: *CWA Executive Director*

Appendix A

Cimarron Watershed Alliance, Inc. (CWA)

Model Geographic Information Systems (GIS)

Phase I

Goals and Objectives: Create a basic and functional watershed GIS of the Cimarron and Upper Canadian Watersheds to be located on a pc in the CWA office. Educate CWA key personnel in primary use of GIS software and familiarize them with data layers.

Targeted End-user: CWA personnel

Timeframe: 90 days

Methodology:

- Obtain basic data layers (see Purchased Data and Free Data sections)
- Data Compilation and Clipping to Project Boundary
- Metadata
- Incorporate existing project data (i.e. locations & general info) where available
- Build map documents for set of usable user-friendly maps
- Conduct GIS training seminar for CWA staff

Hardware Requirements:

- GIS capable Desktop Computer
- Dual Monitors
- 42" Color Plotter/Large Format Printer

Software Requirements:

- ESRI ArcView 9.x License
- ESRI Spatial Analyst License - for shaded relief mapping, elevation models, watershed analysis, grid analysis, contouring, etc.
- ESRI 3D Analyst License - for road/stream grade profiles (i.e. identifying erosion control project areas), view sheds, etc.

Purchased Data:

- Seamless Mosaic'ed USGS Digital 1:24,000 Topographic Maps
- Seamless Mosaic'ed USGS Digital 1:100,000 Topographic Maps
- Seamless Mosaic'ed 10m USGS Digital Elevation Model

Free Data:

- Soils Survey Geographic SSURGO Database: Soils Data available from Soils Data Mart
- United States Geologic Survey Geologic Map
- New Mexico Gap Analysis Program (GAP) Data
- Landcover Data (GAP, other)
- Colfax County Land Ownership Parcels
- Aerial Photography, State of New Mexico DOQ quality photography
- Waste Management Layers (Colfax County GIS)
- Well Data – Ground Water layer (availability unknown)
- New Mexico State Environmental, Forestry, Energy and Minerals Data
- New Mexico Resource GIS (RGIS) Data

Personnel: GIS Coordinator

Phase II

Goals and Objectives: Create an informational map oriented portion of the existing web site with hotspot interaction to display CWA maps and project information.

Appendix A

Timeframe: Completion prior to December 1st, 2006

Targeted End-user(s): CWA personnel, members and community

Methodology:

- Create map jpeg's (image files)
- Develop GIS web section text
- Build map hotspots for navigation between maps
- Obtain digital photos and summaries of CWA projects
- Link project photos and summaries to hotspots

Additional Hardware Requirements: None

Additional Software Requirements: MS FrontPage

Purchased Data: None

Free Data: Digital Photos of Projects

Personnel: GIS Coordinator, CWA Staff and webmaster

Phase III

Goals and Objectives: Test GIS Web Site functionality.

Timeframe: Completion prior to December 31st, 2006

Targeted End-user(s): CWA personnel, members and community

Methodology:

- Test web site to determine if site is suitable for end-user needs
- Gather feedback from end-users
- Make necessary adjustments to mapping web site

Additional Hardware Requirements: None

Additional Software Requirements: None

Purchased Data: None

Free Data: Additional photos, maps, etc.

Personnel: GIS Coordinator, CWA Staff and webmaster

Phase IV

Goals and Objectives: Further develop CWA project GIS. Educate CWA members/project participants in GPS technology. Develop educational GIS format for introduction of GIS and watershed science to CWA area schools.

Timeframe: Six Months

Targeted End-user(s): State Parks Staff, CWA personnel, members and community

Methodology:

- Conduct GPS training seminar with CWA Garmin GPS Units
- Obtain and integrate additional project information
- Conduct individual project analyses if needed
- Update web based project information pages/links
- Work with State Park personnel to develop a school unit on watershed science/GIS

Additional Hardware Requirements: Garmin Etrex Legend GPS units, Educational Program: Laptop, Garmin Etrex Legend GPS units, and digital camera.

Additional Software Requirements: DNR Garmin (free), MapSource CD-ROM for Garmin GPS units

Purchased Data: Dependant on projects, some ideas listed below

- High quality riparian aerial imagery – 1m data with precision of <10m (optional)
- 60cm Pan-Sharpended Satellite Imagery of entire CWA Project Area (optional)

Appendix A

Free Data: Dependant on projects

Personnel: GIS Coordinator, CWA project participants

Phase V

Goals and Objectives: Assist other New Mexico Watershed Groups or Citizens Coalitions in developing Geographic Information Systems. Continue to develop the CWA GIS as end-user needs are further defined.

Timeframe: fiscal 2008?

Targeted End-user(s): NM Watershed Groups, Citizens Coalitions

Methodology:

- Respond to requests from watershed groups or citizens coalitions for input/assistance for developing GIS
- Continue to respond to CWA needs with additional data, maps, updated web pages, project modeling, etc.

Additional Hardware Requirements:

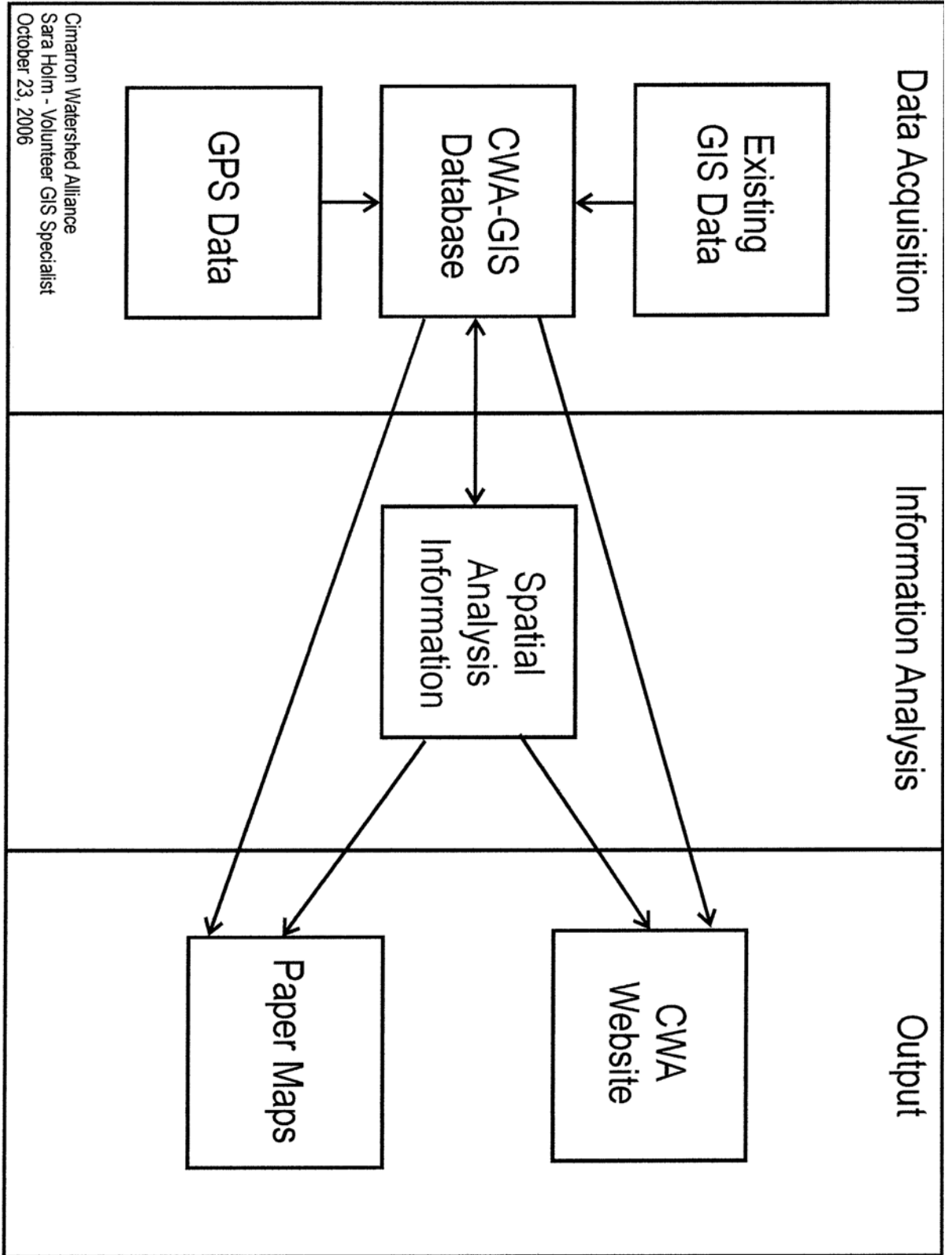
Additional Software Requirements:

Purchased Data: Responsibility of other watershed/coalition groups or dependent on CWA project

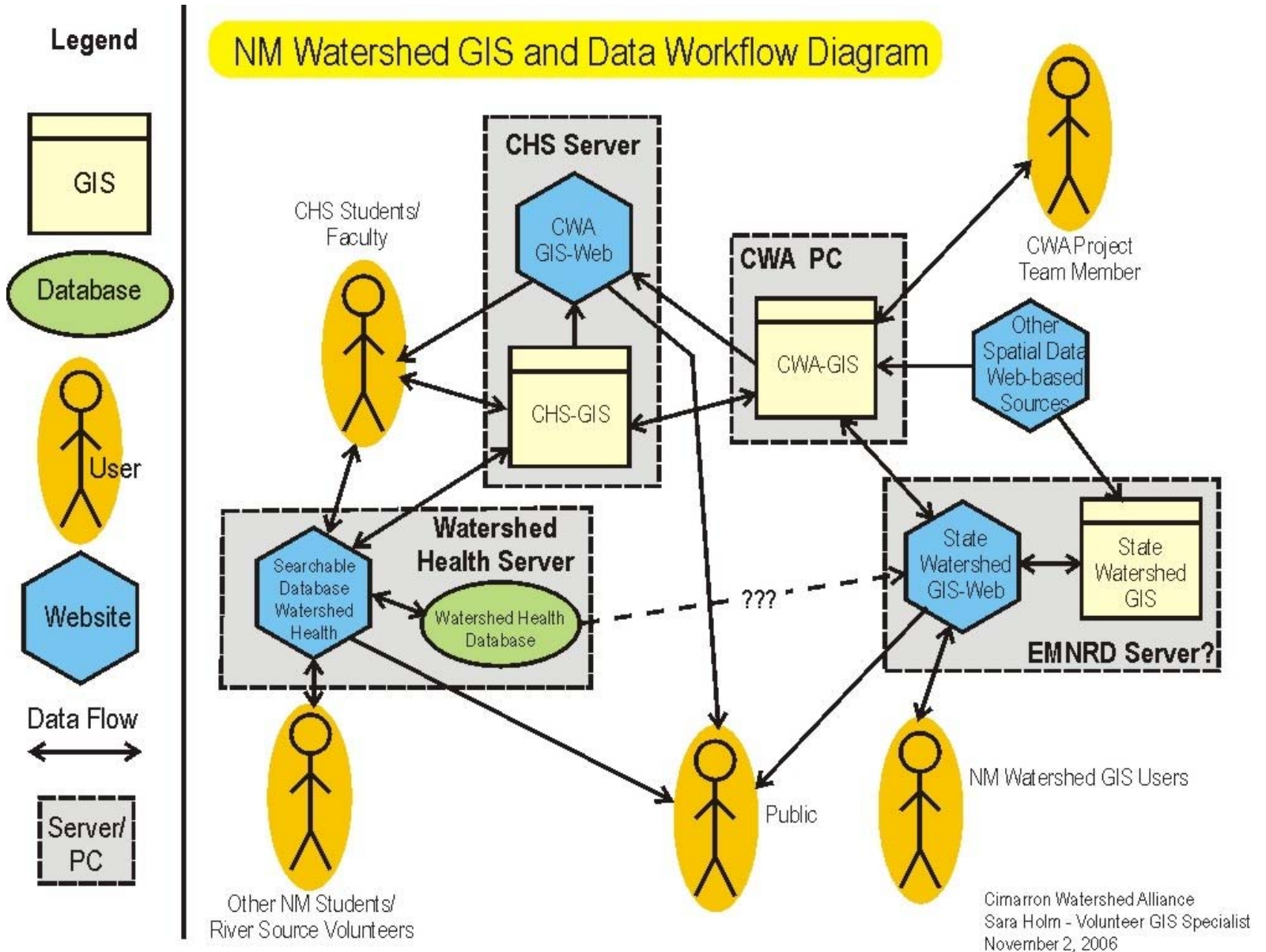
Free Data: Responsibility of other watershed/coalition groups or dependent on CWA project

Personnel: GIS Coordinator, Outside Watershed/Coalition Staff

Appendix B



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Appendix C



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Appendix D

Item	Unit Cost	Quantity	Additional Costs	Total	Matching	Notes
Phase One: Initial GIS						
Hardware:						
GIS capable Desktop Computer w/ dual monitors (\$3000)	\$500	1		\$500		\$2500 probably will be donated by outside org.
HP InkJet 2800: 13x19" Color Printer w/supplies	\$650	1		\$650		
Garmin GPSMap 60CSx and case	\$520	2		\$1,040		
MapSource US Topo Maps for Garmin GPS CD-ROM	\$100	1		\$100		
Software:						
ESRI 9.x ArcView Single Use License	\$1,500	1		\$1,500		
ESRI 9.x ArcView Yearly Maintenance	\$400	1		\$400		
Purchased Data:						
Seamless/Collarless Mosaic USGS 1:24000 DRG topographic maps	\$6	32	\$100	\$292		Addtnl costs: mosaic, shipping and CD-ROM fees
Seamless/Collarless Mosaic USGS 1:100000 DRG topographic maps	\$6	4	\$50	\$74		Addtnl costs: mosaic, shipping and CD-ROM fees
Seamless Mosaic USGS Digital Elevation Model	\$5	32	\$100	\$260		Addtnl costs: mosaic, shipping and CD-ROM fees
Personnel:						
GIS Coordinator (volunteer approx. 20 hours per week)		260		\$0	\$11,700	Note: timeframe of three months (\$45/hr)
Phase One Total Costs				\$4,816	\$11,700	\$7,316 without outside donation
Phase Two: GIS Informational Web Design						
Software:						
Microsoft FrontPage License (if CWA doesn't already have license)	\$225	1		\$225		
Personnel:						
GIS Coordinator (volunteer approx. 20 hours per week)	\$0	180		\$0	\$8,100	Note: timeframe of two months (\$45/hr)
Phase Two Total Costs				\$225	\$8,100	
Phase Three: GIS Informational Web Testing						
Personnel:						
GIS Coordinator (volunteer approx. 20 hours per week)	\$0	80		\$0	\$3,600	Note: timeframe of one month (\$45/hr)
Phase Three Total Costs				\$0	\$3,600	
Total Estimated Cost Phase 1-3:				\$5,041	\$23,400	\$7,541 without outside donation
Phase Four: Watershed Project GIS & Analyses**						

Appendix D

Software:					
ESRI Spatial Analyst Extension	\$2,500	1	\$2,500		option: may apply for ECP Software Grant
ESRI 3D Analyst Extension	\$2,500	1	\$2,500		option: may apply for ECP Software Grant
ESRI Maintenance (yearly)*	\$1,000	1	\$1,000		
HP DesignJet 500: 42" Large Format Color Printer w/supplies	\$4,000	1	\$4,000		
Personnel:					
GIS Coordinator (volunteer approx. 20 hours per week)	\$0	520	\$0	\$18,200	Note: timeframe of six months (\$35/hr)
Phase Four Total Costs			\$10,000	\$18,200	
Total Estimated Cost Phases 1-4:			\$15,041	\$41,600	\$17,541 without outside donation

* If CWA can purchase ArcView & Extensions at the same time, the maintenance sounds like it would be \$1000 total vs. \$1400.

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Appendix E

CWA-GIS Timeline for development and implementation:

