

## **APPENDIX A – STUDY MEETING DOCUMENTS AND PRESENTATIONS**

A.1. Cost Sharing Agreement

A.2. August 2<sup>nd</sup> Meeting

- a) Sign-In Sheet
- b) NWS Presentation
- c)USGS Presentation

A.3. September 18<sup>th</sup> Meeting

- a) Sign-In Sheet
- b) DEQ Presentations

A.4. February 5<sup>th</sup> Study Meeting

- a) Sign-In Sheet
- b) Study Presentation

**COST-SHARING AGREEMENT  
FOR  
PLANNING ASSISTANCE BETWEEN  
THE U.S. ARMY CORPS OF ENGINEERS, NORFOLK DISTRICT  
AND  
THE COMMONWEALTH OF VIRGINIA**

THIS AGREEMENT, entered into this 24<sup>th</sup> day of August, 2012, by and between the United States of America (hereinafter called the "Government"), represented by the U.S. Army Corps of Engineers, Norfolk District Commander executing this Agreement, and the Commonwealth of Virginia (hereinafter called the "Sponsor").

WITNESSETH, THAT

WHEREAS, the Congress has authorized the U.S. Army Corps of Engineers in Section 22 of the Water Resources Development Act of 1974 (Public Law 93-251) as amended to assist the States in the preparation of comprehensive plans for the development, utilization and conservation of water and related land resources; and whereas, Section 319 of the Water Resources Development Act of 1990 (Public Law 101-640) authorized the Government to collect from non-Federal entities fees for the purpose of recovering fifty (50) percent of the cost of the program; and,

WHEREAS, the Sponsor has reviewed its comprehensive water plans and identified the need for planning assistance as described in the Scope of Work (Appendix A) and Cost Estimate (Appendix B) incorporated into this Agreement; and,

WHEREAS, the Sponsor has the authority and capability to furnish the cooperation hereinafter set forth and is willing to participate in the Study cost-sharing and financing in accordance with the terms of this Agreement;

NOW THEREFORE, the Parties agree as follows:

1. The Government, using funds contributed by the Sponsor and appropriated by the Congress, shall expeditiously prosecute and complete the work items, currently estimated to be completed by 14 December 2012, substantially in compliance with the Scope of Study attached as Appendix A and in conformity with applicable Federal laws and regulations and mutually acceptable standards of engineering practice.
2. The Government and the Sponsor shall contribute fifty (50) percent and fifty (50) percent, respectively, for conduct of the Study, the total cost of which is currently estimated to be \$90,000, as specified in the cost estimate attached as Appendix B. The Sponsor agrees to provide a check or an electronic wire transfer for its share of the study effort, made payable to FAO, USAED, Norfolk District, or its assigns, prior to any work being performed under this Agreement.

3. No Federal funds may be used to meet the local Sponsor's share of the Study costs under this Agreement unless the expenditure of such funds is expressly authorized by statute as verified by the Granting agency.

4. Before any Party to the Agreement may bring suit in any court concerning any issue relating to this Agreement, such Party must first seek in good faith to resolve the issue through negotiation or another form of non-binding alternate dispute resolution mutually acceptable to the Parties.

5. In the event that any one or more of the provisions of this Agreement is found to be invalid, illegal, or unenforceable, by a court of competent jurisdiction, the validity of the remaining provisions shall not in any way be affected or impaired and shall continue in effect until the Agreement is completed.

6. This Agreement shall become effective upon the signature of both Parties.

For the Sponsor:

For the Government:

By: David A. Johnson  
DAVID A. JOHNSON

By: Paul B. Olsen  
PAUL B. OLSEN  
Colonel, U. S. Army  
Commanding

Title: Director  
Department of Conservation  
and Recreation  
Commonwealth of Virginia

Title: District Commander  
Norfolk District

Date: August 23, 2012

Date: 8/24/12

## Appendix A. Scope of Work

### Identification of the Location, Number and Types of Stream/Rainfall/Water Quality Gages for the Rappahannock River Basin, VA

#### Background:

The Rappahannock River Basin is located in the northeastern portion of Virginia, and includes an area of 2715 square miles and includes the counties of Albemarle, Caroline, Essex, Fauquier, Greene, King George, Lancaster, Madison, Middlesex, Northumberland, Orange, Rappahannock, Richmond, Spotsylvania, Stafford and Westmoreland. The City of Fredericksburg, along with several towns, is also a part of the watershed. The Rappahannock River is formed on the eastern slopes of the Blue Ridge Mountains; the headwaters of the southern streams meet to form the Rapidan River which converges west of the City of Fredericksburg with the Rappahannock River, formed in its headwaters by the northern streams of the Basin. The Rappahannock River then flows south east until it continues into the Chesapeake Bay. A location map of the Rappahannock River Basin is presented below.



The Rappahannock River Basin Section 22 Gaging Study will provide information on where and what type of additional stream, rain, and water quality gages should be implemented in the Basin. The information presented below shows an overview of flooding events captured in the current gage records, data sources for existing stream and rain gages, and sources for collection of water quality information in the Basin.

The Rappahannock River Basin has experienced flooding events on a recurring basis. Listed below are the top ten flooding events and any additional flooding events from the past ten years from existing gages at the upper portion of the basin, at Remington, and in the middle portion of the Basin, just above the City of Fredericksburg.

### **Upper Rappahannock River, Stream Gage at Remington**

Flood Stages:

Major Flood Stage: 25 ft

Moderate Flood Stage: 20 ft

Flood Stage: 15 ft

Action Stage: 12 ft

#### **Historical Crests:**

- (1) 30.00 ft on 10/16/1942
- (2) 29.20 ft on 04/26/1937
- (3) 26.70 ft on 06/02/1889
- (4) 24.82 ft on 06/22/1972 (Hurricane Agnes)
- (5) 24.04 ft on 09/07/1996 (Hurricane Fran)
- (6) 23.52 ft on 08/18/1955 (Hurricane Connie and Diane)
- (7) 21.97 ft on 10/10/1976
- (8) 21.96 ft on 03/05/1993
- (9) 21.21 ft on 02/15/1984
- (10) 21.05 ft on 01/20/1996

Crests since 2002:

- (15) 19.06 ft on 04/17/2011
- (18) 18.76 ft on 12/11/2003
- (24) 18.09 ft on 03/14/2010
- (25) 17.96 ft on 01/26/2010
- (26) 17.93 ft on 09/24/2003
- (38) 17.05 ft on 05/12/2008
- (45) 16.30 ft on 03/11/2011
- (56) 15.95 ft on 03/21/2003
- (57) 15.80 ft on 11/30/2005
- (60) 15.52 ft on 02/23/2003

## **Middle Rappahannock River, Stream Gage above Fredericksburg**

### **Flood Stages:**

Major Flood Stage: 23 ft

Moderate Flood Stage: 16 ft

Flood Stage: 13 ft

Action Stage: 10 ft

### **Historical Crests:**

- (1) 25.90 ft on 10/16/1942
- (2) 25.14 ft on 04/26/1937
- (3) 22.56 ft on 06/22/1972 (Hurricane Agnes)
- (4) 17.97 ft on 09/07/1996 (Hurricane Fran)
- (5) 17.14 ft on 06/28/1995
- (6) 17.00 ft on 08/19/1955 (Hurricane Connie and Diane)
- (7) 16.50 ft on 09/13/1924
- (8) 15.54 ft on 03/05/1993
- (9) 15.10 ft on 10/01/1924
- (10) 15.03 ft on 05/06/1989

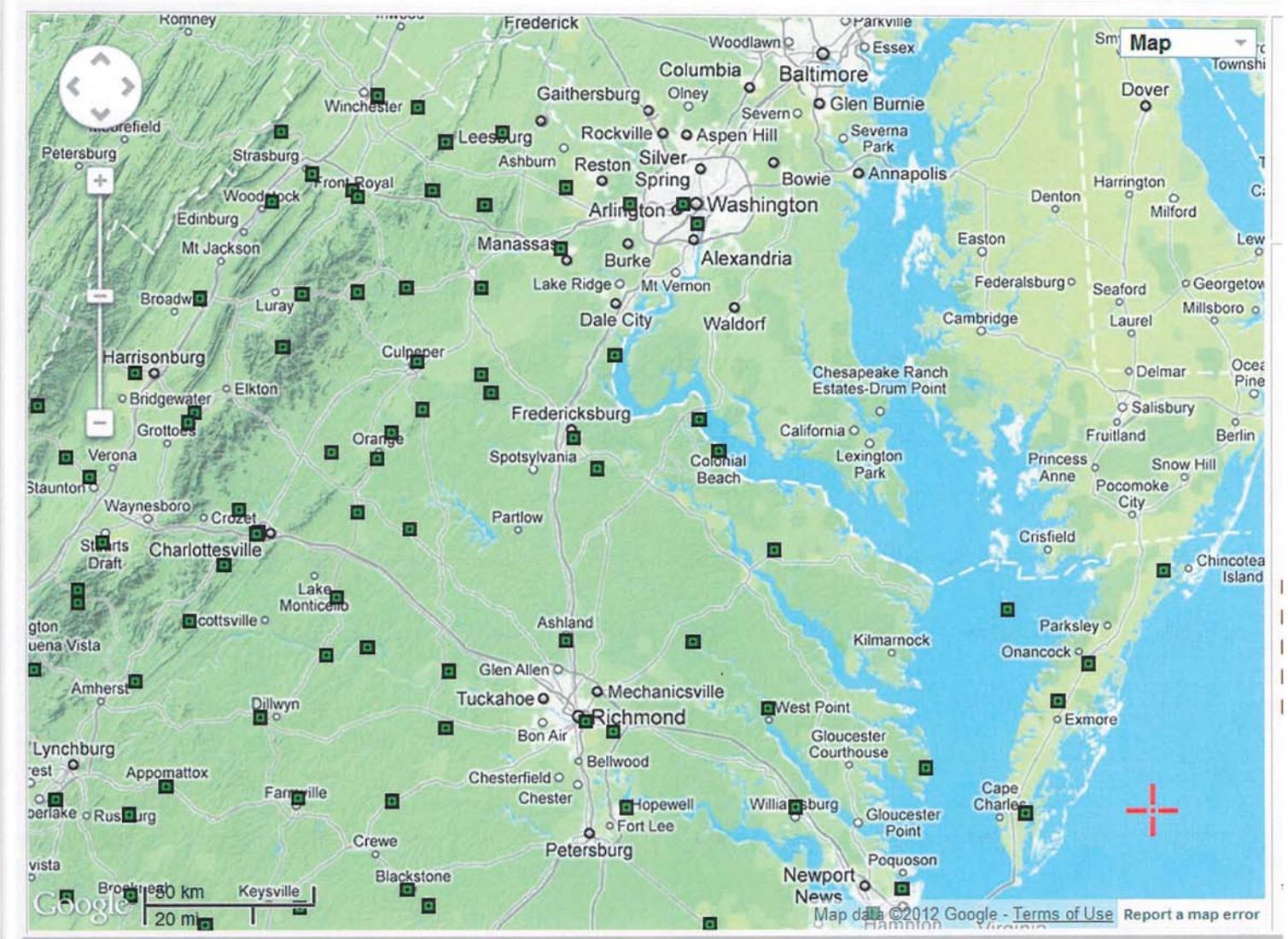
### **Crests since 2002:**

- (21) 12.69 ft on 12/11/2003
- (23) 12.53 ft on 09/20/2003
- (31) 11.81 ft on 01/26/2010
- (32) 11.73 ft on 01/15/2005
- (39) 11.10 ft on 05/12/2008
- (47) 10.88 ft on 03/07/2011
- (50) 10.77 ft on 03/11/2011

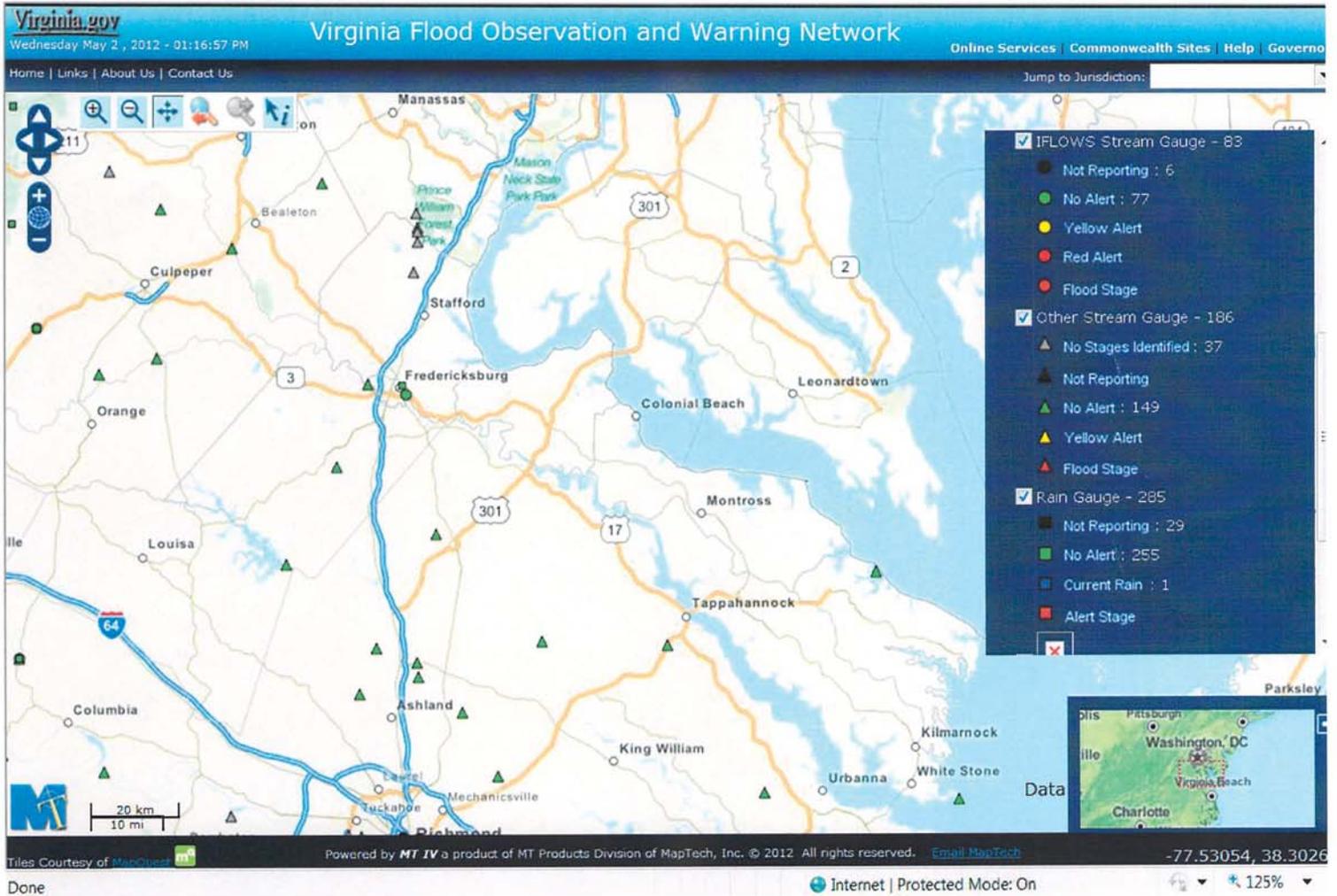
It should be noted that although the top ten flooding events for each gage station have not occurred in the last ten years, the flood stage and moderate stage events that have occurred in the last ten years have still caused significant harm to the communities of the Basin. In order to combat flooding events, a complete network of real time flood and rain gages will provide much needed information. The map on the next page displays where the United States Geological Survey (USGS) current and historical real time stream gages are located. As shown there are currently eight active stream gages in the basin. Stream gage and rainfall gage information can be obtained from USGS, the National Weather Service (NWS), and from the Virginia Integrated Flood Observing and Warning System (IFLOWS) Program managed by the Virginia Department of Emergency Management (VDEM).



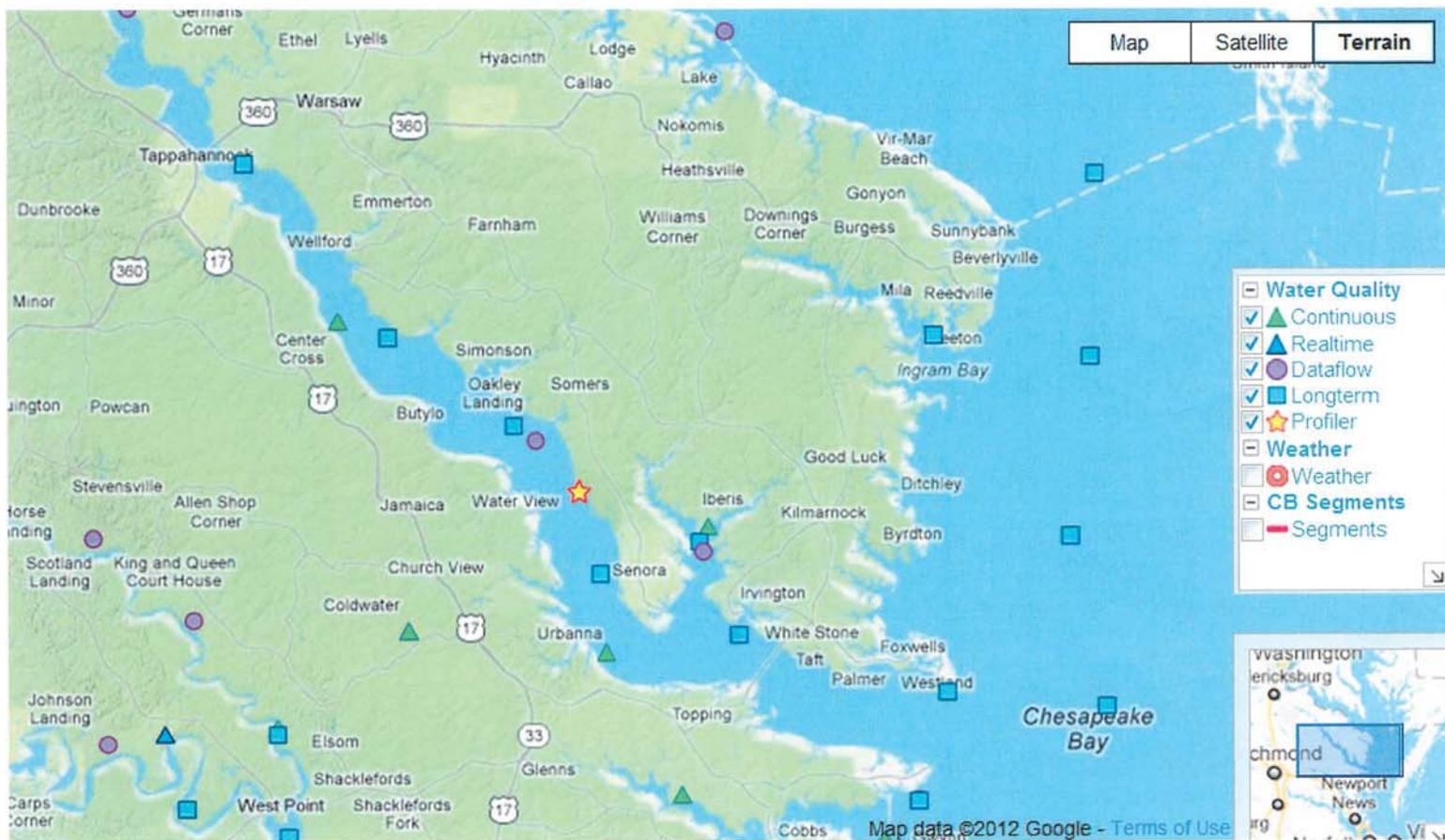
The following map displays current rainfall monitoring stations from the NWS's Hydrometeorological Design Studies Center, Precipitation Frequency Data Server (PFDS) webpage.



The map below is from the VDEM iFLOWS webpage and displays information on stream gages and rain gages in the iFLOWS network. The iFLOWS program is a partnership between VDEM, the NWS, and local emergency managers who work together to manage stream and rainfall gages in real time. There is only one rain gage, shown at the City of Fredericksburg, in the iFLOWS program for the Rappahannock River Basin.



Water quality gages will provide support to the communities to identify and monitor pollution sources, assist in planning to meet their long term environmental goals, and help provide information to stay in compliance with the Virginia Department of Environmental Quality (DEQ) Virginia Pollutant Discharge Elimination System (VPDES) program as a part of the Environmental Protection Agency's (EPA) requirements. Water quality data for the Rappahannock River Basin is currently collected by several sources. The VA DEQ has many monitoring stations that are tested on a regular basis for various water quality parameters, mostly manually by field personnel. Additionally, the Virginia Estuarine and Coastal Observing System (VECOS) collect water quality data in the lower tidal portion of the Rappahannock River, ending at approximately 20 miles below Fredericksburg. Real time water quality gages placed in strategic locations and monitored as a network will bring water quality information together to have an overall understanding of water quality issues in the Basin. VA DEQ monitoring stations have varying lengths of record and are tested for particular parameters based on the site. Locations of these sites will be investigated further in the gaging study. The VECOS water quality monitoring stations for the Rappahannock River Basin is shown in the map below from the VECOS webpage.



## **Scope of Work:**

### Federal Fiscal Year 2012 Funding (Section 22 Study):

- (1) Establish a technical advisory committee (TAC) to include membership of, but not be limited to, the Rappahannock River Basin Commission, NWS, USGS, FEMA, the Corps of Engineers, State Agencies, Cities, Counties, Towns, and significant non-governmental organizations.
- (2) Work with the TAC to establish the scope of work for the Section 22 effort. The Corps dollars will not purchase the gages and any additional hardware. These items will have to be provided by a combination of other Federal a/o State dollars; however, identifying what is needed through this study will promote implementation.
- (3) The TAC will analyze all available information to make a decision on the proposed locations and type of the new stream, rain, and water quality gages. Data to be collected would consider (1) what stakeholders need and types of information for their respective decision making, and (2) how that information collected would be provided from the gaging network.
- (4) The associated costs for installation, as well as, for annual operation and maintenance will be determined; and the study team can coordinate to determine the best route to obtain implementation funding from various stakeholders and Federal agencies.
- (5) The Study will result in a report which will develop the recommendations for the TAC for the desired future synchronized gaging network.
- (5) Cost sharing is 50% Federal and 50% non-Federal; see Appendix B, Cost Estimate.