

Agenda Item: 7.

MEMORANDUM

TO: Programs, Projects and Operations Subcommittee

FROM: Amanda Grint, Water Resources Engineer

SUBJECT: Renewal of USGS Maintenance Agreement for Papio Floodwarning System Gages

DATE: December 7, 2015

In 1993, the District worked with the US Army Corps of Engineers (USACE) to install a flood warning system for the Papillion Creek Watershed. The system was upgraded in 2012, and consists of 22 gage stations. Five stations report rain data and the remaining 17 stations report rain and stream stage data. The attached map shows the location of the gages. The data is reported real time and is available to the public through the National Weather Service (NWS) and USGS web sites. The address of the NWS website is <http://water.weather.gov/ahps2/index.php?wfo=oax>. An agreement is in place with Douglas County, Sarpy County, Washington County and the City of Omaha to share the cost of the system.

For the past three years the USGS has been providing maintenance for the Papillion Creek system and the operation of the stream gage on Omaha Creek at Homer. A recent amendment, in the amount of \$4,981, has added the groundwater/surface water interaction gage at Waterloo to the system. The attached proposal is a renewal of the maintenance contract with the USGS for 2016 in the total amount of \$153,340. The USGS cost share is \$16,325, through their cooperative water program reflected in the attached contract. An additional \$17,205 in discretionary funds from their National Streamflow Information Program, were used by the USGS to offset the total costs bringing the USGS contribution to \$33,530. This year's contract maintains the same level of service from USGS as in 2015 with the District share now at \$119,810, increased from the 2015 contribution of \$117,455. The maintenance for gage sites is a fixed cost across the state and supporting documentation is attached showing the tasks included for maintenance, discharge readings during events, establishing rating curves and quality assuring and publishing the data from the sites.

Throughout 2015, the USGS provided quality data and valuable information to NWS to improve the potential for forecasting in the Papio watershed and to the District for operation and monitoring of the Papio flood control system during the numerous large rainfall events. Their work includes installation of additional and replacement equipment at problem sites at no additional cost to the District. The NWS, USGS and the District continue to discuss upgrades to the system and transmission to better serve the agencies using the data as well as working to make the information more readily available to the public.

Management recommends that the Subcommittee recommend to the Board that the General Manager be authorized to execute a proposed contract with the USGS in the amount of \$119,810 in District funds for the operation of the District's floodwarning system for 2016 subject to changes deemed necessary by the General Manager.

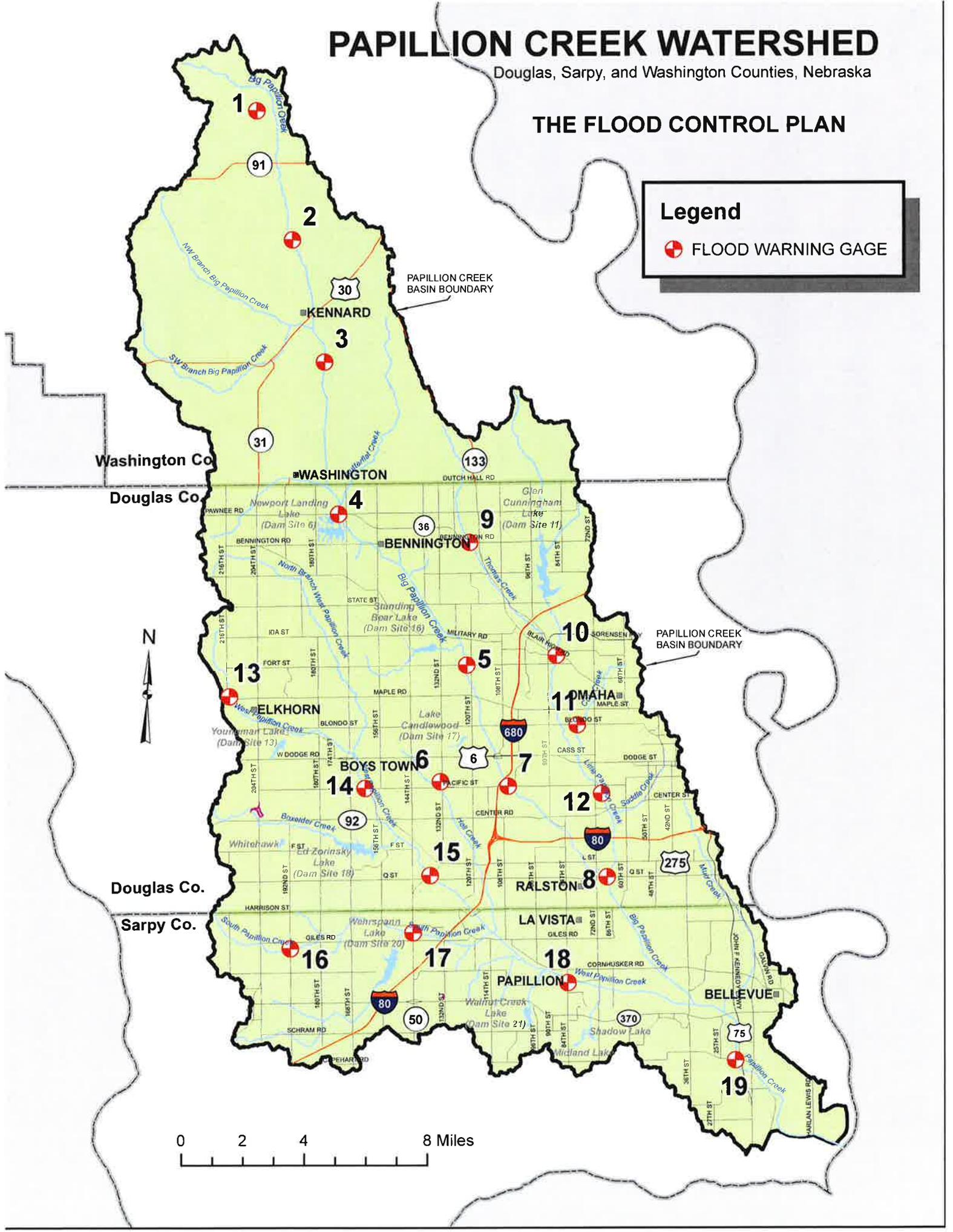
PAPILLION CREEK WATERSHED

Douglas, Sarpy, and Washington Counties, Nebraska

THE FLOOD CONTROL PLAN

Legend

 FLOOD WARNING GAGE



Breakdown of tasks associated with operating USGS streamgages in Papillion Watershed

1. 6-8 site visits per year based on routine (scheduled) and hydrologic need (unscheduled)
 - a. Travel cost
 - 1) Vehicle cost (mileage, gas maintenance, etc.)
 - 2) Hotel/per diem costs (if overnight travel is necessary)
 - b. Employee field costs
 - 1) Driving to/from streamgage, time at streamgage
 - 2) Application of USGS Quality Standards for data collection
 - a) Inspection of equipment, collection of field readings for stage and measurement of discharge
 - b) Maintenance of equipment, trouble-shooting, preventive maintenance, run periodic levels to verify that outside stage references have not moved (currently tied into National Geodetic Vertical Datum of 1929)
 - c. Instrumentation costs
 - 1) Instrumentation used to collect data (data collection platform (recorder and GOES satellite transmitter), antenna, cables, pressure sensors, pressure system, battery, solar panel, gage housing, outside reference gage, etc.). This cost includes ongoing replacement, repair, and maintenance for equipment, shelter, and site.
 - d. Costs noted in this portion are a "network" cost; which means gages in close proximity to the Water Science Center (WSC) are funded at the same rate as gages furthest from the WSC.
2. Data processing and archival (including maintenance of station documentation)
 - a. Acquisition of data
 - 1) Real-time 15-minute stage and discharge data transmitted via radio
 - a) Automatic entry of stage data into the USGS national database throughout the day.
 - b) Data is automatically monitored and filtered for potential illogical spikes.
 - c) Data is visually monitored by a USGS personnel on business days and every day during extreme events (several times a day during extreme events)
 - d) Automatic push of provisional real-time stage and discharge data onto NWIS-web for public observation (generally within 5 minutes of the last radio transmission).
 - Streamflow and water level data can be viewed as unit and daily values.
 - Streamflow measurements.
 - Ancillary station information and site map.
 - Streamflow statistics (daily, monthly, annually, peaks, etc.) with "presentation-quality" graphics immediately available.
 - b. Processing of data (three different USGS personnel perform the work/check/review of data for Quality Assurance).
 - 1) Work: input of data, stage corrections, and shifts determined from site visits, verification and updating (if necessary) of stage-discharge rating, analyze station datum and determine if datum corrections are necessary for the site.
 - 2) Check: check of input corrections and shifts, and verification of hydrologic reasoning.
 - 3) Final review of inputs and overall hydrologic history for streamgage during past year.

- 4) Annual Data Report containing processed data and statistics from the last year, historical statistics, and streamgage information.
 - a) Viewable and downloadable from NWIS-web with presentation-quality graphics for most data elements.
 - c. Archiving of processed and unprocessed data within the USGS database for future use in trends analysis
 - d. Option of hydrologic alert notifications ("WaterAlert") and/or daily hydrologic reports via email or text

For more information, please contact:

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U.S. Geological Survey Streamgage Operation and Maintenance Cost Evaluation

...from the National Streamflow Information Program

This Fact-Sheet is one in a series that highlights information or recent research findings from the USGS National Streamflow Information Program (NSIP). The investigations and scientific results reported in this series require a nationally consistent streamgage network with stable long-term monitoring sites and a rigorous program of data collection, quality assurance, management, archiving, and synthesis. NSIP produces multipurpose, unbiased surface-water information that is readily accessible to all.

To help meet the goal of providing earth-science information to the Nation, the U.S. Geological Survey (USGS) operates and maintains the largest streamgage network in the world, with over 7,600 active streamgages in 2010. This network is operated in cooperation with over 850 Federal, tribal, State, and local funding partners. The streamflow information provided by the USGS is used for the protection of life and property; for the assessment, allocation, and management of water resources; for the design of roads, bridges, dams, and water works; for the delineation of flood plains; for the assessment and evaluation of habitat; for understanding the effects of land-use, water-use, and climate changes; for evaluation of water quality; and for recreational safety and enjoyment.

USGS streamgages are managed and operated to rigorous national standards, allowing analyses of data from streamgages in different areas and spanning long time periods, some with more than 100 years of data. About 90 percent of USGS streamgages provide streamflow information real-time on the web. Physical measurements of streamflow are made at streamgages multiple times a year, depending on flow conditions, to ensure the highest level of accuracy possible. In addition, multiple reviews and quality assurance checks are performed before the data is finalized.

In 2006, the USGS reviewed all activities, operations, equipment, support, and costs associated with operating and maintaining a streamgage program (Norris and others, 2008). A summary of the percentages of costs associated with activities required to operate a streamgage on an annual basis are presented in figure 1. This information represents what it costs to fund a “typical” USGS streamgage and how those funds are utilized. It should be noted that some USGS streamgages have higher percentages for some categories than do others depending on location and conditions. Forty-one percent of the funding for the typical USGS streamgage is for labor costs of the USGS staff responsible for the measurement of the streamflow in the field and the time in the office to quality assure and finalize the data (fig. 1). It is reasonable that funding for the entire national streamgage network would closely follow the percentages shown in figure 1 as to how the funds are invested in the network. However, actual costs are specific

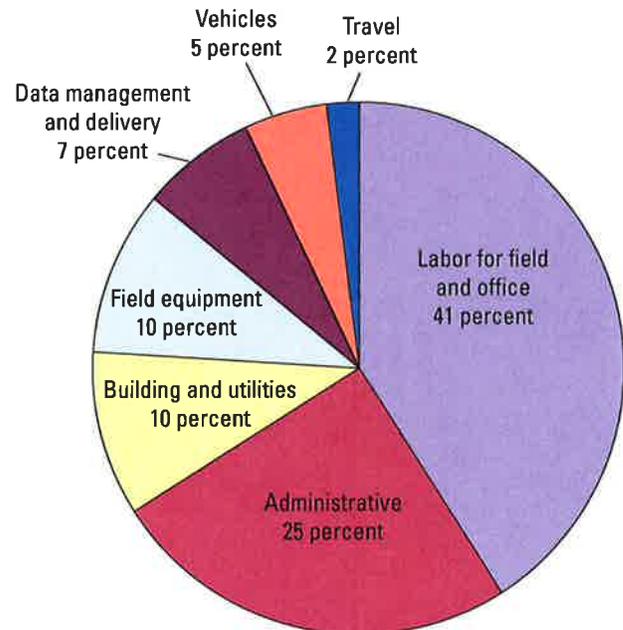


Figure 1. Percentage of operation and maintenance funding invested in various activities for a typical USGS streamgage.

to a particular streamgage and can vary substantially depending on location and operational issues.

Reference Cited

Norris and others, 2008, Qualitative comparison of streamflow information programs of the U.S. Geological Survey and three non-Federal agencies: U.S. Geological Survey Open-File Report 2007-1426, 12 p.

USGS Streamflow Information can be found at:

- <http://waterdata.usgs.gov/nwis>
- <http://water.usgs.gov/waterwatch>
- <http://water.usgs.gov/nsip>

by J. Michael Norris

Streamgage Operation and Maintenance Tasks

Labor for Field and Office:

Field

- Routine visits to streamgages
- Emergency repair visits to streamgages
- Visits during flooding
- Maintenance and inspection visits
- Surveying visits
- Streamflow measurements
- Analysis of the discharge computations (field and office)
- Technical training



Office

- Stage data edits
- Development and maintenance of rating curves
- Analysis of rating curve-shifts from changing channel conditions
- Monitoring real-time information for instrumentation problems
- Review of records for rating-curve and discharge computations
- Quality assurance of the data
- Finalization and publication of the streamflow information
- Safety and administrative training

Administrative:



- Safety program management
- National and local management and technical oversight of the program
- Local quality assurance
- Facility costs
- Personnel management
- Purchasing and contracts
- Financial management
- Salary of hydrographers/supervisors
- Salary of administrative support required by the program
- Funding-partner interactions (over 850 nationwide)
- USGS communications (with Congress, the public, and media)
- Development of funding agreements

Building and Utilities:

- Secure storage space for files
- Vehicle parking space, boat storage
- Shop space, laboratory space, warehouse space



- Office space for the streamgage program staff
- Heating, cooling, trash, water, gas, and electric power for office space and streamgages

Field Equipment:

- Gage houses, data loggers, stage or velocity sensors, telemetry equipment, and other equipment for streamgage operation
- Boats and motors, boat maintenance, snowmobiles, all-terrain vehicles, and annual repair and maintenance costs
- Generators, survey equipment, field laptop computers, and hand and power tools
- Equipment for measuring streamflow (meters, Acoustic Doppler Current Profilers, bridge cranes, and automated loggers)
- Safety equipment such as traffic-control equipment and confined-space safety equipment
- Waders, personal floatation devices, and cell phone

Data Management and Delivery:

- Telemetry (satellite up-links, phone lines, etc.)



- Local Information Technology infrastructure, including servers, computers, printers, plotters, and scanners
- Information Technology support, support of the data base, Web access, data archival and retrieval, and network communications

Vehicles:

- Purchasing or leasing field vehicles
- Fuel and vehicle maintenance

Travel:

- Lodging and per diem for staff during visits to streamgages

Form 9-1366
(April 2015)

**U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY**

JOINT FUNDING AGREEMENT

FOR

WATER RESOURCES INVESTIGATIONS

Customer #: 6000000134
 Agreement #: 16EMNE000190
 Project #: NR009R9
 TIN #: 47-0542469
 Fixed Cost Agreement YES

THIS AGREEMENT is entered into as of the, 1st day of October, 2015 by the U.S. GEOLOGICAL SURVEY, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT, party of the second part.

1. The parties hereto agree that subject to availability of appropriations and in accordance with their respective authorities there shall be maintained in cooperation the operation of one streamgage at Omaha Creek at Homer; 22 gages (9 stage/discharge/precipitation, 9 stage/precipitation/rating development, and 5 rain-only) in the Papillion Creek watershed and one groundwater/surface water interaction gage at Waterloo, herein called the program. The USGS legal authority is 43 USC 36C; 43 USC 50; and 43 USC 50b.
2. The following amounts shall be contributed to cover all of the cost of the necessary field and analytical work directly related to this program. 2(b) includes In-Kind Services in the amount of \$0.00
 - (a) by the party of the first part during the period

Amount	Date	to	Date
\$16,325.00	October 1, 2015		September 30, 2016
 - (b) by the party of the second part during the period

Amount	Date	to	Date
\$119,810.00	October 1, 2015		September 30, 2016
 - (c) Contributions are provided by the party of the first part through other USGS regional or national programs, in the amount of: \$17,205.00

 Description of the USGS regional/national program:
 National Streamflow Information Program
 - (d) Additional or reduced amounts by each party during the above period or succeeding periods as may be determined by mutual agreement and set forth in an exchange of letters between the parties.
 - (e) The performance period may be changed by mutual agreement and set forth in an exchange of letters between the parties.
3. The costs of this program may be paid by either party in conformity with the laws and regulations respectively governing each party.
4. The field and analytical work pertaining to this program shall be under the direction of or subject to periodic review by an authorized representative of the party of the first part.
5. The areas to be included in the program shall be determined by mutual agreement between the parties hereto or their authorized representatives. The methods employed in the field and office shall be those adopted by the party of the first part to insure the required standards of accuracy subject to modification by mutual agreement.
6. During the course of this program, all field and analytical work of either party pertaining to this program shall be open to the inspection of the other party, and if the work is not being carried on in a mutually satisfactory manner, either party may terminate this agreement upon 60 days written notice to the other party.

9-1366 (Continuation)

Customer #:

6000000134

Agreement #:

16EMNE000190

7. The original records resulting from this program will be deposited in the office of origin of those records. Upon request, copies of the original records will be provided to the office of the other party.
8. The maps, records, or reports resulting from this program shall be made available to the public as promptly as possible. The maps, records, or reports normally will be published by the party of the first part. However, the party of the second part reserves the right to publish the results of this program and, if already published by the party of the first part shall, upon request, be furnished by the party of the first part, at costs, impressions suitable for purposes of reproduction similar to that for which the original copy was prepared. The maps, records, or reports published by either party shall contain a statement of the cooperative relations between the parties.
9. USGS will issue billings utilizing Department of the Interior Bill for Collection (form DI-1040). Billing documents are to be rendered QUARTERLY. Payments of bills are due within 60 days after the billing date. If not paid by the due date, interest will be charged at the current Treasury rate for each 30 day period, or portion thereof, that the payment is delayed beyond the due date. (31 USC 3717; Comptroller General File B-212222, August 23, 1983).

**U.S. Geological Survey
United States
Department of the Interior**

Papio-Missouri River Natural Resources District

USGS Point of ContactCustomer Point of Contact

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Signatures and Date

Signature:



Date:

11/24/15

Signature:

Date:

Name: Robert B. Swanson

Name:

Title: NEWSO Director

Title:

Table 1. Summary of proposed funding for operation of stream gages, rain stations, and one groundwater gage supported by the Papio-Missouri River Natural Resources District and other partners for period October 1, 2015 -- September 30, 2016.

[CR, continuous-record; SR, seasonal-record (Mar. 1-Oct. 31); CSG, crest-stage gage; CMF, USGS, Cooperative matching funds; PMR NRD, Papio-Missouri River Natural Resources District; NSIP, National Streamflow Information Program; RT, real-time (satellite telemetry); USGS, U.S. Geological Survey; Q, Discharge; ST, Stage; PR, Rain; RD, Stage-Discharge Rating Development; WL, Water Level; WT, Water Temperature]

USGS Station number	PMR NRD Station Number	Station name	Funding				Gage type(s)	Data to be published	Footnote
			USGS CMF	PMR NRD	USGS NSIP	Total			
06601000		Omaha Creek at Homer	\$0	\$8,595	\$6,160	\$14,755	RT CR - 12 month: Q, ST	Annual daily Q and ST for Oct. 1-Sept. 30.	a
413403096135001	1	Rain gage near Orum	\$260	\$1,275		\$1,535	RT SR - 8 month (Mar. 1 - Oct. 31): PR	Precipitation data collected, not published.	
06610705	2	Big Papillion Creek near Blair	\$685	\$3,535		\$4,220	RT SR - 8 month (Mar. 1 - Oct. 31): ST, PR, RD	ST for Mar. 1 - Oct. 31. Rain data collected, not published. Three measurements of discharge for rating development.	
06610710	3	Big Papillion Creek near Kennard	\$685	\$3,535		\$4,220	RT SR - 8 month (Mar. 1 - Oct. 31): ST, PR, RD	ST for Mar. 1 - Oct. 31. Rain data collected, not published. Three measurements of discharge for rating development.	
06610720	4	Big Papillion Creek near Bennington	\$1,655	\$8,575		\$10,230	RT SR - 8 month (Mar. 1 - Oct. 31): Q, ST, PR	Daily Q and ST for Mar. 1 - Oct. 31. Rain data collected, not published.	
06610732	5	Big Papillion Creek at Fort Street at Omaha	\$0	\$5,905	\$4,325	\$10,230	RT SR - 8 month (Mar. 1 - Oct. 31): Q, ST, PR	Daily Q and ST for Mar. 1 - Oct. 31. Rain data collected, not published.	a
411504096071601	6	Rain Gage at Boys Town at Omaha	\$260	\$1,275		\$1,535	RT SR - 8 month (Mar. 1 - Oct. 31): PR	Precipitation data collected, not published.	
06610740	7	Big Papillion Creek at Pacific St at Omaha	\$685	\$3,535		\$4,220	RT SR - 8 month (Mar. 1 - Oct. 31): ST, PR, RD	ST for Mar. 1 - Oct. 31. Rain data collected, not published. Three measurements of discharge for rating development.	
06610742	9	Thomas Creek near Bennington	\$685	\$3,535		\$4,220	RT SR - 8 month (Mar. 1 - Oct. 31): ST, PR, RD	ST for Mar. 1 - Oct. 31. Rain data collected, not published. Three measurements of discharge for rating development.	
06610750	10	Little Papillion Creek near Irvington	\$0	\$7,990	\$2,240	\$10,230	RT SR - 8 month (Mar. 1 - Oct. 31): Q, ST, PR	Daily Q and ST for Mar. 1 - Oct. 31. Rain data collected, not published.	a
06610760	11	Cole Creek at Blondo Street at Omaha	\$685	\$3,535		\$4,220	RT SR - 8 month (Mar. 1 - Oct. 31): ST, PR, RD	ST for Mar. 1 - Oct. 31. Rain data collected, not published. Three measurements of discharge for rating development.	
06610765	12	Little Papillion Creek at Ak-Sar-Ben at Omaha	\$1,655	\$8,575		\$10,230	RT SR - 8 month (Mar. 1 - Oct. 31): Q, ST, PR	Daily Q and ST for Mar. 1 - Oct. 31. Rain data collected, not published.	
06610770	8	Big Papillion Creek at Q Street at Omaha	\$1,655	\$8,575		\$10,230	RT SR - 8 month (Mar. 1 - Oct. 31): Q, ST, PR	Daily Q and ST for Mar. 1 - Oct. 31. Rain data collected, not published.	
06610773	13	West Papillion Creek at Elkhorn	\$685	\$3,535		\$4,220	RT SR - 8 month (Mar. 1 - Oct. 31): ST, PR, RD	ST for Mar. 1 - Oct. 31. Rain data collected, not published. Three measurements of discharge for rating development.	
06610780	14	West Papillion Creek at Pacific St at Omaha	\$685	\$3,535		\$4,220	RT SR - 8 month (Mar. 1 - Oct. 31): ST, PR, RD	ST for Mar. 1 - Oct. 31. Rain data collected, not published. Three measurements of discharge for rating development.	
06610785	15	West Papillion Creek at Millard	\$1,655	\$8,575		\$10,230	RT SR - 8 month (Mar. 1 - Oct. 31): Q, ST, PR	Daily Q and ST for Mar. 1 - Oct. 31. Rain data collected, not published.	
06610786	16	South Papillion Creek near Gretna	\$685	\$3,535		\$4,220	RT SR - 8 month (Mar. 1 - Oct. 31): ST, PR, RD	ST for Mar. 1 - Oct. 31. Rain data collected, not published. Three measurements of discharge for rating development.	
06610786	17	South Papillion Creek at Chalco	\$1,655	\$8,575		\$10,230	RT SR - 8 month (Mar. 1 - Oct. 31): Q, ST, PR	Daily Q and ST for Mar. 1 - Oct. 31. Rain data collected, not published.	
06610793	18	(West) Papillion Creek at Papillion	\$0	\$7,990	\$2,240	\$10,230	RT SR - 8 month (Mar. 1 - Oct. 31): Q, ST, PR	Daily Q and ST for Mar. 1 - Oct. 31. Rain data collected, not published.	a
06610795	19	Papillion Creek at Fort Crook	\$0	\$7,990	\$2,240	\$10,230	RT SR - 8 month (Mar. 1 - Oct. 31): Q, ST, PR	Daily Q and ST for Mar. 1 - Oct. 31. Rain data collected, not published.	a
411232095584201	20	Rain Gage at Hitchcock Park at Omaha	\$260	\$1,275		\$1,535	RT SR - 8 month (Mar. 1 - Oct. 31): PR	Precipitation data collected, not published.	
411701095570601	21	Rain Gage at city Maintenance Shop at Omaha	\$260	\$1,275		\$1,535	RT SR - 8 month (Mar. 1 - Oct. 31): PR	Precipitation data collected, not published.	
411857095545301	22	Rain Gage at Eppley Fire Station at Omaha	\$260	\$1,275		\$1,535	RT SR - 8 month (Mar. 1 - Oct. 31): PR	Precipitation data collected, not published.	
411736096170201		015N 10E 3CDDA1 Waterloo groundwater gage	\$1,270	\$3,810		\$5,080	RT CR - 12 month: WL, WT	Groundwater/surface water interaction gage	
Funding partner totals			\$16,325	\$119,810	\$17,205	\$153,340			

a USGS NSIP funds used in place of CMF as match with PM NRD