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RAPID CITY
PUBLIC WORKS



United States Department of the Interior

U. S. GEOLOGICAL SURVEY SOUTH DAKOTA WATER SCIENCE CENTER

1608 Mt. View Road
Rapid City, South Dakota 57702
Phone: (605)394-3200 Fax (605)355-4523

March 18, 2013

Mr. Terry Wolterstorff
Public Works Director
City of Rapid City
300 Sixth Street
Rapid City, South Dakota 57701-2724

Dear Mr. Wolterstorff:

Enclosed for your signature are two copies of Joint Funding Agreement (JFA) No. 13EMSD0027 for operation and maintenance of selected gaging stations and for various hydrologic investigations including hydrogeologic data collection and analysis, applications of groundwater-flow modeling, storm-water monitoring, and hydrologic effects from bark beetles. This agreement spans the period from January 1, 2013 through December 31, 2013. The City of Rapid City's share of the program will be \$138,000.00 and will be matched by \$110,092.00 of U.S. Geological Survey's (USGS) cooperative funds. USGS also will provide additional funding of \$3,090.00 from the National Streamflow Information Program (NSIP) for streamflow gaging. The planned funding distribution among streamflow gaging and other study components is described in the attached work plan. Please obtain signatures on both copies of the Joint Funding Agreement and return one copy to our office. You may retain one copy for your records.

Billing for this project will be done quarterly, in the amount of \$34,500.00 each quarter, in March 2013, June 2013, August 2013, and December 2013, on the USGS Bill for Collection, Form DI-1040. Work performed with funds from this agreement will be on a fixed-price basis. The results of all work under this agreement will be available for publication by the U.S. Geological Survey.

If you have any questions, please contact Dan Driscoll at (605) 394-3211, Joyce Williamson at 394-3219, or me at 394-3220. We look forward to continuing to partner with the City of Rapid City in these programs.

Sincerely,

Mark T. Anderson
Director

Form 9-1366

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

JOINT FUNDING AGREEMENT

Customer #: 6000000745
Agreement #: 13EMSD0027
Project #: NT00-00100 & 9ZR
TIN #: 46-6000380
Fixed Cost YES
Agreement

**FOR
WATER RESOURCES INVESTIGATIONS**

THIS AGREEMENT is entered into as of the, 1st day of January, 2013 by the U.S. GEOLOGICAL SURVEY, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the City of Rapid City, South Dakota, 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 for operation and maintenance of selected gaging stations and for various hydrologic investigations including hydrogeologic data collection and analysis, applications of groundwater-flow modeling, storm-water monitoring, and hydrologic effects from bark beetles, 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
\$110,092.00	January 1, 2013		December 31, 2013

(b) by the party of the second part during the period

Amount	Date	to	Date
\$138,000.00	January 1, 2013		December 31, 2013
\$27,908.00 unmatched			

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(c) 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.

(d) 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.

JOINT FUNDING AGREEMENT (CONTINUATION)

Customer Number
600000745

Agreement Number
13EMSD0027

Project Number
NT00-00100 & 9ZR

- 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.
- 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, 1982)

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

CITY OF RAPID CITY, SOUTH DAKOTA

USGS POINT OF CONTACT

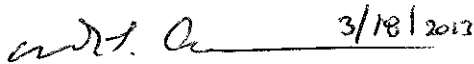
CUSTOMER POINT OF CONTACT

Name: Daniel G. Driscoll
Address: 1608 Mt. View Road, Rapid City, SD
57702 USGS DUNS# 126301386
Telephone: 605-394-3211
Email: dgdrisco@usgs.gov

Name: Terry Wolterstorff
Address: 300 Sixth Street, Rapid City, SD 57702
Telephone: 605-394-4154
Email:

SIGNATURE AND DATE

SIGNATURE AND DATE

Signature: 
Date: 3/18/2013
Name: Mark T. Anderson
Title: Director, SD Water Science Center

Signature: _____
Date: _____
Name: Sam Kooiker
Title: Mayor

SIGNATURE AND DATE

SIGNATURE AND DATE

Signature: _____
Date: _____
Name: _____
Title: _____

Signature: _____
Date: _____
Name: Pauline Sumption
Title: Finance Officer

Form 9-1366

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

JOINT FUNDING AGREEMENT

Customer #: 6000000745
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Amount	Date	to	Date
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\$27,908.00 unmatched			

 - (c)
 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.

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JOINT FUNDING AGREEMENT (CONTINUATION)

Customer Number	Agreement Number	Project Number
600000745	13EMSD0027	NT00-00100 & 92R

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

CITY OF RAPID CITY, SOUTH DAKOTA

USGS POINT OF CONTACT


CUSTOMER POINT OF CONTACT

Name: Daniel G. Driscoll
Address: 1608 Mt. View Road, Rapid City, SD 57702 USGS DUNS# 126301386
Telephone: 605-394-3211
Email: dgdrisco@usgs.gov

Name: Terry Wolterstorff
Address: 300 Sixth Street, Rapid City, SD 57702
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Email:

SIGNATURE AND DATE

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Signature: 
Date: 3/18/10
Name: Mark T. Anderson
Title: Director, SD Water Science Center

Signature: _____
Date: _____
Name: Sam Kooiker
Title: Mayor

SIGNATURE AND DATE

SIGNATURE AND DATE

Signature: _____
Date: _____
Name: _____
Title: _____

Signature: _____
Date: _____
Name: Pauline Sumption
Title: Finance Officer

Work plan for USGS activities during 2013
In cooperation with Rapid City, South Dakota

Prepared for
City of Rapid City

by

U.S. Geological Survey
South Dakota Water Science Center
1608 Mountain View Road
Rapid City, South Dakota 57702

March 15, 2013

Introduction

The U.S. Geological Survey (USGS) and the city of Rapid City have had a long-term cooperative relationship to conduct hydrologic investigations to better understand the complex systems that comprise water resources for Rapid City and the surrounding area. This 2013 work plan will provide the City with hydrologic data and interpretive information relevant to (1) providing a sustainable, high-quality, regional water supply; (2) protecting ecological resources; and (3) addressing public safety. Funding will be provided through a 45/55 (USGS/city) cost-share arrangement between USGS and Rapid City. The change from the historical 50/50 match ratio does not increase the cooperator funding share and has resulted only from an internal USGS accounting change where funds that support activities such as NWISWeb, database support, and data archive no longer appear as part of USGS matching dollars. This work plan was finalized March 14, 2013, following planning meetings involving USGS and Rapid City staff.

Work plan activities for 2013

Planned activities for 2013 are described in five categories below. Monitoring of Rapid Creek streamflow is described in section **(1) streamgaging**. Water-levels and well inventory in the Madison and Minnelusa aquifers and seepage tracing with stable isotopes are described in section **(2) hydrogeologic data collection and analysis**. Activities to further analyze the Madison and Minnelusa aquifers with a numerical groundwater flow model are described in section **(3) application and regionalization of groundwater-flow model**. Continued evaluation of stormwater runoff is described in section **(4) stormwater monitoring**. A new activity is described in section **(5) hydrologic effects of bark beetles**. The total proposed funding package for the complete program and an approximate distribution of funding between the four individual programmatic areas are discussed in the final section of this work plan.

(1) Streamgaging

The proposed streamgaging program for water year 2013 (Oct. 1, 2012 to Sept. 30, 2013) is presented in table 1, which also reflects participation from various other agencies. The proposed program is essentially identical to last year's program, with an inflationary increase of 3.05 percent in the annual cost of a streamgage for the City. The aforementioned change to a 45/55 match ratio is reflected in the total 2013 cost of \$13,700 for an individual streamgage, which has been reduced from \$14,600 for 2012. Total funding from Rapid City for the streamgaging program will consist of \$24,400 that will be matched by USGS with \$16,940 of Federal Matching Funds (see table 2 on last page of this document) and \$3,090 from the National Stream Information Program (NSIP).

One new item included for water year 2013 will involve upgrading of the “Rapid Creek at Rapid City” gage to become a “showcase” gage for public outreach. This will involve one-time-only funding of \$2,000 from Rapid City and \$1,640 from USGS to replace the existing gage house with one that is better suited for increased public visibility in the new park-like setting of the area and that will allow viewing of internal equipment by the public.

Table 1. Proposed streamgaging program for water year 2013 – City of Rapid City

Streamgage and Cooperators	Unmatched Federal	Local & State Cooperators	USGS Match	Total
Rapid Creek at Rapid City				
US Army Corps of Engineers	\$6,850			\$6,850
USGS NSIP Funding			\$3,090	\$3,090
Rapid City		\$3,760		\$3,760
subtotals	\$6,850	\$3,760	\$3,090	\$13,700
Rapid Creek below Sewage Plant				
Rapid City		\$7,520	\$6,180	\$13,700
subtotals		\$7,520	\$6,180	\$13,700
Rapid Creek near Farmingdale				
DENR		\$3,760	\$3,090	\$6,850
Rapid City		\$3,760	\$3,090	\$6,850
subtotals		\$7,520	\$6,180	\$13,700
Rapid Creek at Water Treatment Plant (phone modem and stage record)				
Rapid City		\$2,493	\$2,047	\$4,540
subtotals		\$2,493	\$2,047	\$4,540
Rapid Creek below Pactola Dam and below Deerfield Dam (2 gages)				
USBR	\$6,000			\$6,000
Rapid City		\$4,867	\$3,983	\$8,850
SDGF&P		\$2,434	\$1,991	\$4,425
RVWCD		\$2,434	\$1,991	\$4,425
subtotals	\$6,000	\$9,735	\$7,965	\$23,700
Summary of funding for all streamgages				
	Rapid City	Others	USGS	Total
Rapid Creek below Sewage Plant	\$7,520		\$6,180	\$13,700
Rapid Creek near Farmingdale	\$3,760	\$3,760	\$6,180	\$13,700
Rapid Creek at Jackson Boulevard (Water Treatment Plant)	\$2,493		\$2,047	\$4,540
Rapid Creek below Pactola and Deerfield	\$4,867	\$10,868	\$7,965	\$23,700
Rapid Creek at Rapid City	\$3,760	\$6,850	\$3,090	\$13,700
Rapid Creek at Rapid City – gage-house upgrade	\$2,000	0	\$1,640	\$3,640
Total Funding	\$24,400	\$21,478	\$27,102	\$72,980

(2) Hydrogeologic Data Collection and Analysis

Water-level monitoring using continuous recorders will be continued during 2013 for nine observation wells that are completed in the Madison, Minnelusa, and Minnekahta aquifers. Synoptic water-level measurements also will continue for one Madison well in Rapid City and one Deadwood well south of Rapid City. Technical assistance will continue, as needed, for collection and analysis of water samples for stable isotopes at selected seepage sites for comparison with stable isotope values for municipal production water. Stable isotope signatures can be substantially different for native groundwater and municipal production water, and such sampling can be useful in helping to evaluate whether areas with groundwater seepage might be influenced by leaks in the municipal distribution system. Geophysical methods, including microgravity, direct-current resistivity, ground-penetrating radar (GPR), and nuclear-magnetic resonance (NMR), will be applied to recharge areas of the Madison and Minnelusa aquifers that affect Rapid City's groundwater supply. These methods are useful for estimating effective porosity and characterizing the spatial distribution of voids in selected aquifer locations.

(3) Application and Regionalization of Groundwater Flow Model

Participation in a multi-agency effort for development of a regional groundwater flow model of the Madison and Minnelusa aquifers for the entire Black Hills area will continue. This model will serve as a regional framework for embedding more detailed models for site-specific areas such as Rapid City and other communities. This modeling effort will substantially improve modeling capabilities for the Rapid City area because effects of the regional flow system on local groundwater will be better simulated. The effects of increased water use near the boundaries of the existing model will be more accurately simulated with this proposed regional model because artificial boundary effects will be eliminated. These improvements will facilitate analyses of water supply issues in a regional context, which will be useful for long-term planning. Continuing participation in development of the regional groundwater flow model will be contingent on continued participation from other area agencies.

Initial efforts towards development of a regional model have been underway since 2011. To date, contributions from other agencies have totaled about \$115,000 with funds provided during Federal Fiscal Years (FY) 2011-2013 by the National Park Service and the Black Hills National Forest. A proposal for this regional modeling effort has been shared with several other local agencies including the West Dakota Water Development District, city of Spearfish, Lawrence County, all of whom have expressed preliminary conceptual support for the idea. The proposal has been reviewed by staff from the South Dakota Department Environment of Natural Resources. Plans are that the proposal would be submitted by a consortium of local agencies for

consideration and funding under the umbrella of the State Water Plan, which could provide a mechanism for obtaining State matching funds in a dollar-for-dollar ratio with local funds.

(4) Stormwater Monitoring

Rapid City has implemented programs to improve stormwater quality in response to the 'Phase II Final Rule' stormwater guidelines issued by the U.S. Environmental Protection Agency. As part of this program, the City has published guidance (2009 Stormwater Quality Manual) on construction and post-construction control of stormwater discharges through best management practices (BMPs). Within the Stormwater Quality Manual, various BMP devices are suggested and described in detail, however little information exists on field-verified performance measures of these BMPs in Rapid City. Within the past few years, several BMP devices have been installed during site developments that include designs targeted at improving water quality (as opposed to the traditional large flood detention ponds). Such devices include extended sand-filter detention basins and constructed wetlands.

At the request of city staff, a concentrated effort will be made to assess the performance of recently installed BMP devices. One newly installed BMP is associated with the ongoing rebuild of Jackson Boulevard in west Rapid City near the Water Treatment Plant. An extended sand-filter pond west of North Haines was examined previously in 2011 and is another candidate for further monitoring. Three BMP features (constructed wetland channels) located in the downtown greenway between East Boulevard and 3rd Street also could be investigated. Another candidate is a targeted reach of grassed waterway with negligible non-point inflows, which may be representative of an engineered swale BMP. It is expected that 1 to 3 BMP structures could be assessed with some level of detail, and plans for monitoring will be developed through discussions with city staff. At each site, inflow and outflow data will be collected for several storm runoff events to document the volume of stormwater treated and mass of pollutants removed. This information can be used to supplement the Stormwater Quality Manual with expected pollutant-specific removal rates. Pollutants will include at minimum total suspended sediment and bacteria, with additional possible constituents including nutrients, metals, and/or hydrocarbons. Another potential urban runoff concern, road salts in snowmelt, could be monitored in one or more selected locations.

Equipment used to perform monitoring will include stage sensors, data loggers, and automated sampling devices. Installation of such equipment will be temporary and as non-invasive as possible; however, minimal disturbance to inlet or outlet structures may be necessary to mount equipment, and will first be discussed with city staff. In areas of high public visibility (such as parks), equipment shelters will be hidden or painted in the most aesthetic way possible.

Plans are that storm-event water-quality sampling will no longer continue in 2013 at the three previously monitored main channel sites in the Arrowhead and Meade/Hawthorne basins (Arrowhead Golf Course, Meadowbrook Golf Course, and Meade drainage at Creek Drive). Stage data will continue to be collected at these sites for estimation of runoff volumes.

Data will be stored on the National Water Information System (NWIS), and intermediate reporting of results will be in the form of progress reports and conference presentations. To build a larger range of data, USGS will seek to expand upon this program with other cooperating municipalities or local government agencies also interested in BMP assessments. Results will be published in a formal USGS report that will be planned for completion within the next 2 to 4 years and be determined by the level of participation that develops from other interested communities and the resulting scope of future activities.

(5) Hydrologic Effects from Bark Beetles

At the request of city staff, a new activity has been added to address potential hydrologic effects from loss of ponderosa pine forest cover due to mortality from mountain pine beetles. A short document that summarizes conceptual approaches for this work has been provided to city staff. In general, the effects of various deforestation levels (such as dead stands, clear cut, or forest fire) will be assessed in terms of expected changes to runoff volume and peak flows. One aspect will include an updated analysis of the hydrologic effects of the 1988 Galena fire, where long-term continuous streamflow data have been collected at a streamgage downstream from a large burned area. Streamflow data now include 11 years of pre-fire data and 24 years of post-fire data. Although a forest fire can represent a much more sudden and dramatic environmental change compared to the gradual decline of forest cover due to mountain pine beetle deforestation, this information can depict the “high end” of hydrological impacts and could be applied to areas in the Rapid Creek watershed at increased risk of fire due to beetle kill. A second approach to this activity will include the use of a calibrated watershed model (HEC-HMS or similar) to compare deforestation scenarios in sensitive watersheds (those with high likelihood of widespread beetle infestation). Various other agencies also have expressed interest in this activity and discussions regarding possible collaboration and funding partnerships currently are underway. Final scoping will be determined when future levels of participation and specific study needs have been determined through discussions with collaborating agencies.

Planned 2013 funding by task

Approximate funding allocations among planned program activities for 2013 are listed in Table 2. Planned work efforts and associated funding are to be on a calendar year basis for 2013, with the exception of Item 1 (streamflow gaging), which will be for water year 2013 (Oct. 1, 2012 to Sept. 30, 2013). A 45/55 cost share between Rapid City and USGS is accomplished for all program components. The proposed distribution of program funding is subject to modification during 2013, depending on possible changes in priorities established through discussions with Rapid City staff.

Table 2. Planned allocation of funding for 2013 work activities

Item number	Proposed activity	Rapid City share	USGS share	Total
1	Streamgaging ¹	\$24,400	¹ \$16,940	\$41,340
2	Hydrogeologic data collection and analysis	\$25,000	\$20,500	\$45,500
3	Applications of groundwater-flow model	\$13,000	\$10,660	\$23,660
4	Storm water monitoring	\$45,600	\$37,392	\$82,992
5	Hydrologic effects of bark beetles	\$30,000	24,600	\$54,600
Totals to be shown on Joint Funding Agreement		\$138,000	¹\$110,092	\$248,092

¹ Additional funding of \$3,090 for the streamgaging program will be provided by USGS through the National Streamflow Information Program, to accomplish an effective 45/55 match.