



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

April 13, 2012

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. 12EMSD0036 for operation and maintenance of selected gaging stations and for various hydrologic investigations including hydrogeologic data collection and analysis, applications of groundwater-flow modeling, and storm-water monitoring. This agreement spans the period from January 1, 2012 through December 31, 2012. The City of Rapid City's share of the program will be \$138,000.00 and will be matched by \$134,450.00 of U.S. Geological Survey's (USGS) cooperative funds. USGS also will provide additional funding of \$3,550.00 from the National Streamflow Information Program (NSIP) for streamflow gaging. This will effectively result in a 50/50 match ratio for the overall program. 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 April 2012, July 2012, September 2012, and January 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

**RECEIVED**

APR 17 2012

**ENGINEERING  
SERVICES**

Enclosure

Form 9-1366  
 (Oct. 2005)

**U.S. Department of the Interior  
 U.S. Geological Survey  
 Joint Funding Agreement**

Customer #: 600000745  
 Agreement #: 12EMSD0036  
 Project #: 00100; 9ZR;  
 TIN #: 46-6000380  
 Fixed Cost Agreement  Yes  No

Page 1 of 2

**FOR  
 WATER RESOURCES INVESTIGATIONS**

THIS AGREEMENT is entered into as of the 1st day of January, 2012, 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, and storm-water monitoring, 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) \$134,450.00 by the party of the first part during the period  
 January 1, 2012 to December 31, 2012

(b) \$138,000.00 by the party of the second part during the period  
 January 1, 2012 to December 31, 2012

(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.
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.

Form 9-1366  
continued

U.S. Department of the Interior  
U.S. Geological Survey  
Joint Funding Agreement

Customer #: 600000745  
Agreement #: 12EMSD0036  
Project #: 00100; 9ZR;  
TIN #: 46-6000380

- 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

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 57701-2724  
Telephone: 605-394-4154  
Email:

Signatures

Signatures

By  Date 4/13/12  
Name: Mark T. Anderson  
Title: Director, SD Water Science Center

By \_\_\_\_\_ Date \_\_\_\_\_  
Name:  
Title:

By \_\_\_\_\_ Date \_\_\_\_\_  
Name:  
Title:

By \_\_\_\_\_ Date \_\_\_\_\_  
Name:  
Title:

By \_\_\_\_\_ Date \_\_\_\_\_  
Name:  
Title:

By \_\_\_\_\_ Date \_\_\_\_\_  
Name:  
Title:

Form 9-1366  
(Oct. 2005)

**U.S. Department of the Interior  
U.S. Geological Survey  
Joint Funding Agreement**

Customer #: 6000000745  
 Agreement #: 12EMSD0036  
 Project #: 00100; 9ZR;  
 TIN #: 46-6000380  
 Fixed Cost Agreement  Yes  No

Page 1 of 2

**FOR  
WATER RESOURCES INVESTIGATIONS**

THIS AGREEMENT is entered into as of the 1st day of January, 2012, 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, and storm-water monitoring, 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) \$134,450.00 by the party of the first part during the period  
 January 1, 2012 to December 31, 2012

(b) \$138,000.00 by the party of the second part during the period  
 January 1, 2012 to December 31, 2012

(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.
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.

Form 9-1366  
continued

U.S. Department of the Interior  
U.S. Geological Survey  
Joint Funding Agreement

Customer #: 600000745  
Agreement #: 12EMSD0036  
Project #: 00100; 9ZR;  
TIN #: 46-6000380

- 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

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 57701-2724  
Telephone: 605-394-4154  
Email:

Signatures

Signatures

By  Date 9/18/12  
Name: Mark T. Anderson  
Title: Director, SD Water Science Center

By \_\_\_\_\_ Date \_\_\_\_\_  
Name:  
Title:

By \_\_\_\_\_ Date \_\_\_\_\_  
Name:  
Title:

By \_\_\_\_\_ Date \_\_\_\_\_  
Name:  
Title:

By \_\_\_\_\_ Date \_\_\_\_\_  
Name:  
Title:

By \_\_\_\_\_ Date \_\_\_\_\_  
Name:  
Title:

**Work plan for USGS activities during 2012**

**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

November 8, 2011

## 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. The 2012 Work Plan is designed to assist the City with hydrologic data and additional interpretive information that is 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 50/50 cost-share arrangement between USGS and Rapid City. This work plan was finalized November 8, 2011, following a meeting that date between USGS and Rapid City staff.

## Work plan activities for 2012

Planned activities for 2012 are described in four categories below. Monitoring of Rapid Creek streamflow is described in section **(1) streamflow gaging**. 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**. 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) Streamflow Gaging**

The proposed streamflow-gaging program for water year 2012 (Oct. 1, 2011 to Sept. 30, 2012) is presented below in table 1. The proposed program is essentially identical to last year's program, with an inflationary increase of 2.8 percent in the annual operational cost of a gage. Total funding from Rapid City for the gaging program will consist of \$21,735 that will be matched by USGS with \$18,085 of Federal Matching Funds and \$3,650 from the National Stream Information Program (NSIP).

Table 1. Proposed streamflow gaging program for water year 2012 – City of Rapid City

Gaging Station and Cooperators	Unmatched Federal	Local & State Cooperators	USGS Match	Total
<b>Rapid Creek at Rapid City</b>				
US Army Corps of Engineers	\$7,300			\$7,300
USGS NSIP Funding			\$3,650	\$3,650
Rapid City		\$3,650		\$3,650
<b>subtotals</b>	<b>\$7,300</b>	<b>\$3,650</b>	<b>\$3,650</b>	<b>\$14,600</b>
<b>Rapid Creek below Sewage Plant</b>				
Rapid City		\$7,300	\$7,300	\$14,600
<b>subtotals</b>		<b>\$7,300</b>	<b>\$7,300</b>	<b>\$14,600</b>
<b>Rapid Creek near Farmingdale</b>				
DENR		\$3,650	\$3,650	\$7,300
Rapid City		\$3,650	\$3,650	\$7,300
<b>subtotals</b>		<b>\$7,300</b>	<b>\$7,300</b>	<b>\$14,600</b>
<b>Rapid Creek at Water Treatment Plant (phone modem and stage record)</b>				
Rapid City		\$2,410	\$2,410	\$4,820
<b>subtotals</b>		<b>\$2,410</b>	<b>\$2,410</b>	<b>\$4,820</b>
<b>Rapid Creek below Pactola Dam and below Deerfield Dam (2 gages)</b>				
USBR	\$6,300			\$6,300
Rapid City		\$4,725	\$4,725	\$9,450
SDGF&P		\$2,363	\$2,363	\$4,726
RWWCD		\$2,362	\$2,362	\$4,724
<b>subtotals</b>	<b>\$6,300</b>	<b>\$9,450</b>	<b>\$9,450</b>	<b>\$25,200</b>
<b>Summary of funding for all gages</b>				
	<b>Rapid City</b>	<b>Others</b>	<b>USGS</b>	<b>Total</b>
Rapid Creek below Sewage Plant	\$7,300		\$7,300	\$14,600
Rapid Creek near Farmingdale	\$3,650	\$3,650	\$7,300	\$14,600
Rapid Creek at Jackson Boulevard (Water Treatment Plant)	\$2,410		\$2,410	\$4,820
Rapid Creek below Pactola and Deerfield	\$4,725	\$11,025	\$9,450	\$25,200
Rapid Creek at Rapid City	\$3,650	\$7,300	\$3,650	\$14,600
<b>Total Funding</b>	<b>\$21,735</b>	<b>\$21,975</b>	<b>\$30,110</b>	<b>\$73,820</b>



## **(2) Hydrogeologic Data Collection and Analysis**

Water-level monitoring using continuous recorders will be continued during 2012 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 observation well south of Rapid City. Inventory of selected new wells completed in the Madison and Minnelusa aquifers will be continued in 2012 and relevant information will be entered into the USGS groundwater data base. Selected sites will be visited to determine accurate locations of wells and land-surface and water-level altitudes. Technical assistance will continue 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.

## **(3) Application and Regionalization of Groundwater Flow Model**

Applications for the recently-published groundwater flow model will continue on an as needed basis, with needs to be determined through discussions with Rapid City staff. Previously updated transient data sets that included recharge to the Madison and Minnelusa aquifers from streamflow and infiltration of precipitation on the outcrop for the period from 1998-2009 could be included with the published 1988-1997 simulation period. Pumping withdrawals from the aquifer, and observed water levels also were tabulated for the 1988-1997 period. Maintenance of the model with these data sets provides the basis for evaluating how the model can best be used to simulate the effects of hypothetical scenarios such as drought and additional pumping withdrawals. The funding increment identified for 2012 would be used for model simulations with the updated data sets along with selected hypothetical pumping scenarios. The product for this effort would be development and publication of a USGS Scientific Investigations Report that documents the data sets used in model maintenance, comparison of observed heads and spring flows to simulated values, and hypothetical simulations of potential future stresses. It is anticipated that this product would be part of a 5-year cooperative effort with the city that includes other study elements summarized in this work plan. The distribution of funding between study elements and the timeframe for the publication will be based on priorities established in consultation with the city.

Another proposed programmatic direction is 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 that would serve as a framework for embedded detailed models for site-specific areas such as Rapid City and other communities. Analysis of future water supply

issues in a regional context could be useful for long-term planning. This modeling effort would 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 could be more accurately simulated with this proposed regional model because artificial boundary effects will be eliminated. Implementation of this proposed effort would be contingent on participation from other area agencies.

Initial efforts towards development of a regional model already are underway due to funding of \$15,000 each that was provided during Federal fiscal year (FY) 2011 by the National Park and the Black Hills National Forest. Additional funding for FY 2012 currently is under negotiation. In response to this initial funding increment, a formal proposal for development of a regional groundwater flow model has been developed and will be provided to Rapid City staff. This proposal already has been shared with several other local agencies including Lawrence County, the city of Spearfish, and the West Dakota Water Development District, all of whom have expressed preliminary conceptual support for the idea. The proposal currently is being 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. In 2008, the City requested that USGS provide assistance in developing strategies for a stormwater monitoring plan and USGS responded by planning and implementing a preliminary monitoring program for the Arrowhead Basin, and expanded the monitoring program to the Meade-Hawthorne basin in 2010. Data collected from 2008–11 indicate concentrations of fecal coliform bacteria and total suspended solids that exceed EPA target goals for Rapid Creek. A comparison of the 2010–11 water-quality data between the two monitored basins demonstrates the effects of sediment controls (open vegetated channels, detention ponds, or wetlands). Event-mean concentrations were consistently higher in the Meade-Hawthorne basin, characterized by predominantly closed-pipe or concrete channels, in contrast to the predominantly open vegetated channels in the Arrowhead basin.

Preliminary plans for 2012 are geared towards finalizing datasets collected from 2008–11, incorporating the data into a calibrated watershed model, and initial preparations for a technical report. General tasks include (1) continuous discharge monitoring within the Arrowhead and Meade-Hawthorne basins at the three sites that were used during 2010; (2) scaled-back bacteria

and TSS monitoring during two storm events; and (3) create and calibrate a rainfall-runoff water-quality model (SWMM or HEC-HMS) for the Arrowhead and Meade-Hawthorne basins.

Another possible programmatic direction may be participation in a regional study of stormwater quality that would include multiple communities within South Dakota and build on efforts initiated by the cooperative study between Rapid City and USGS. The foundation for the concept is that Rapid City and other communities could achieve substantial efficiency by combining resources to evaluate influences in a variety of land-use and developmental settings throughout the state. A concept paper for this potential study effort was developed by USGS and was with staff from Rapid City, other MS4 stormwater communities (including South Dakota Department of Transportation), and South Dakota Department Environment of Natural Resources. The concept for pursuing a possible regional study will continue to be pursued by USGS staff, contingent on conceptual approval from Rapid City.

Detailed planning for 2012 activities will be accomplished through discussions of priorities with staff from the Stormwater Program of the Public Works Department. Further monitoring efforts at stormwater ponds or other BMPs are not planned, but could be implemented if this information is desired. Another potential urban runoff concern, road salts in snowmelt, could be monitored during late winter months for uncurbed, vegetated areas at risk of receiving salt-laden runoff.

### Planned 2012 funding by task

Approximate funding allocations among planned program activities for 2012 are listed in Table 2. Planned work efforts and associated funding are to be on a calendar year basis for 2012, with the exception of Item 1 (streamflow gaging), which will be for water year 2012 (Oct. 1, 2011 to Sept. 30, 2012). A 50/50 cost share between Rapid City and USGS will be accomplished for all program components. The proposed distribution of program funding is subject to modification during 2012, depending on possible changes in priorities established through discussions with Rapid City staff.

**Table 2. Planned allocation of funding for 2012 work activities**

Item number	Proposed activity	Rapid City share	USGS share	Total
1	Streamflow gaging <sup>1</sup>	\$21,735	<sup>1</sup> \$18,085	\$39,820
2	Hydrogeologic data collection and analysis	\$25,000	\$25,000	\$50,000
3	Applications of groundwater-flow model	\$45,000	\$45,000	\$90,000
4	Storm water monitoring	\$46,265	\$46,265	\$92,530
<b>Totals to be shown on Joint Funding Agreement</b>		<b>\$138,000</b>	<b><sup>1</sup>\$134,350</b>	<b>\$272,350</b>

<sup>1</sup> Additional funding of \$3,650 for the streamflow gaging program will be provided by USGS through the National Streamflow Information Program, to accomplish an effective 50/50 match.